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Adapting Educational Programs for Students with Disabilities

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Adapting Zoos Victoria Educational Programs for Students with Disabilities

An Interactive Qualifying Project Report
submitted to Zoos Victoria and the faculty of
Worcester Polytechnic Institute in partial
fulfillment of the requirements for
the Degree of Bachelor of Science
by

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Abstract

Zoos Victoria, in an endeavor to comply with legislation regarding disability inclusion, has sought to make adaptations to its educational programs. Existing methods for teaching students with disabilities were identified through interviews with special education teachers, school administrators, Victorian Department of Education officers, zoo and museum staff, mobility specialists and teachers of the blind and deaf. Specific programming at Zoos Victoria was assessed to identify accessibility issues and barriers to learning for students with disabilities. The knowledge gained from this research was used to develop a framework for adapting educational programs at the zoo. The framework encompasses principles of universal design as well as specific accommodations for students with mobility, hearing, vision, and cognitive impairments.

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Nomenclature

- ABS-The Australian Bureau of Statistics
- ADA- Americans with Disabilities Act
- ADD - Attention Deficit Disorder
- AD/HD - Attention Deficit and Hyperactivity Disorder
- ASL – American Sign Language
- Auslan- Australian Sign Language
- CDD- Childhood Disintegrative Disorder
- CERA- Center for Education and Research on Ageing (Australia)
- DAS-Differential Ability Scales (Australia)
- DAISY-Digital Accessible Information System
- DDA Australia – Australia's Disability Discrimination Act
- Difficulty- A non-categorical term used to describe someone who may have trouble learning a basic skill (ALDA, 2006).
- Disability – A categorical term that refers to impairments that limit participation in daily activities (JAN, 2006).
- Discovery and Learning Programs- The educational programs at Zoos Victoria which encourage students to learn "beyond the classroom" through interactive experiences (Zoos Victoria, 2008).
- DMD- Duchenne Muscular Dystrophy
- ESL-English as a Second Language
- Formal education- Learning that takes place in the classroom, and is often highly structured and regulated (Smith, 2007)
- GCA- General Conceptual Ability (Australia)
- HREOC- Human Rights and Equal Opportunity Commission (Australia)
- IDEA-Individuals with Disabilities Education Act (USA)
- IEP– Individualized Education Program (USA)
- ILP – Individualized Learning Plan (Australia)
- Informal Education- Life-long learning process through which knowledge is gained on a common, gradual level outside the framework of formal education. Some of the

characteristics of informal education are that it is self-guided and self-pacing, and tends to be very object and visually oriented (NSF, 2006).

- MD-Muscular Dystrophy
- NASA-The National Aeronautics and Space Administration
- PCS-Picture Common Symbol
- PDD-NOS-Pervasive Developmental Disorder - Not Otherwise Specified
- PSG- Parent Support Group (Australia)
- Reasonable Adjustment- An appropriate adjustment made to accommodate one with a disability (Australian Government, 2006).
- RNC- Royal National College for the Blind (England)
- RP-Retinitis Pigmentosa
- SDAC-Survey of Disability, Ageing and Carers (Australia)
- T3-Talking Tactile Table
- TAFE-Technical and Further Education College (Australia)
- Universal Design- The goal of Universal Design is "to simplify life for everyone by making products, communications, and the built environment more usable by as many people as possible at little or no extra cost." Universal Design is a concept which benefits everyone (CAST, 2007).
- VCAL-Victorian Certificate of Applied Learning (Australia)
- VCE-Victorian Certificate of Education (Australia)
- VELS – Victorian Essential Learning Standards (Australia)

Executive Summary

Discovery and Learning is a division of Zoos Victoria that works with schools to provide education to students. The mission of Discovery and Learning educational programs is to connect students with the natural world and empower them with the knowledge to make a difference. Every year over 150,000 individuals participate in these programs. The programs are led by professional zoo educators and incorporate close-up animal encounters. As an education provider, Zoos Victoria has the legal and moral responsibility to ensure the inclusion of students with disabilities. While many of their programs include beneficial elements for students with disabilities, no formal framework exists to adapt the programs. As a leader in providing informal education to students, Zoos Victoria sought to develop a guide to address accessibility issues within their Discovery and Learning programs as well as at the zoo as a whole.

In conjunction with the goals set forth by Zoos Victoria, the project team developed a framework for adapting the educational programming at the zoo for students with mobility, hearing, vision, and cognitive impairments. This framework took the form of the Program Accessibility Reference or PAR. Case studies were performed based on PAR to provide examples of how to evaluate programs and address the accessibility issues. One case study was used for each type of disability to highlight the range of accommodations necessary within a specific program. Recommendations were also made regarding annual training sessions for zoo educators, and guidelines for pre-visit phone calls and teacher evaluation forms. The framework, case studies, and recommendations all act as references for Zoos Victoria to use in adapting their educational programming for students with disabilities.

In working towards the goals of this project, the following objectives were created: establish a greater understanding of accessibility issues; gain insight into different disabilities and their limitations; determine various methods of accommodation used by teachers; evaluate Zoos Victoria programming; develop a framework for adapting educational programs at the zoo for students with disabilities; and demonstrate the application of the framework to zoo programs. The project team completed these objectives by performing an in-depth literature review to gather information relating to informal education, disability legislation, types of disabilities, and certain adaptations. Interviews were then conducted in both the United States and Australia to gain further information. School teachers, Victorian Department of Education officers, zoo and museum staff, specialty school teachers, disability specialists, and Discovery and Learning

educators provided valuable input regarding disabilities and accommodations made for students. The knowledge gained from these interviews served as the foundation for the development of the framework.

Along with interviews, the project team also performed a detailed evaluation of Zoos Victoria educational programming. A wide range of programs were observed and barriers for students with disabilities were identified in each program. The results were compiled in a barrier checklist along with potential solutions. This checklist was eventually expanded for each disability to form the framework. In addition to observation, the project team also reviewed the lesson plans for every program offered at the zoo to identify other potential barriers for students with disabilities.

At this point the project team had gathered enough information regarding disabilities and educational programming for the creation of its framework. The Program Accessibility Reference, PAR, was developed to provide methods for adapting educational programming at the zoo for students with disabilities. PAR was broken into five sections; a section on universal design and a section for each type of disability. The universal design section outlines several accommodations that should be made within any educational program regardless of the disability present. When applied, these principles will improve the education of all students, not only students with disabilities. A description of all the accommodations is provided and includes specific recommendations regarding the structure of educational programs and the methods of teaching.

The four disability-specific sections of PAR offer more specific accommodations for students with mobility, hearing, vision, and cognitive impairments. Because the types of disabilities within each of these categories can range significantly, each disability was broken down into a spectrum. For mobility the spectrum included limited fine motor skills, limited gross motor skills, limited strength, and limited range of motion. The auditory spectrum was established based on the type of communication used. There are two forms of communication, oral and manual, and in each case there are students with no hearing and those with some residual hearing. The vision spectrum was broken into color-blindness, limited field of vision, low vision, and blindness. The cognitive spectrum was created based on the student's skills and abilities. Thus it was divided into behavioral difficulties, comprehension difficulties, communication difficulties, and performance difficulties.

Based on the results from program observations, tasks were then identified for each disability. A description of the task and what types of barriers it could create in an educational program was included. The tasks ranged from activities such as writing or measuring to communication and comprehension issues. Within each disability the accommodations for these tasks had the potential to vary based on the spectrum. Some tasks affected every part of the spectrum while others were specific to one category.

At its completion, each disability-specific section of PAR took the form of a matrix. The columns of the matrix contain the four categories of the spectrum while the rows list all of the tasks. Within each corresponding box in the matrix a solution for adapting the particular task for the specific type of disability is placed. The key component to each matrix is the row labeled "All Tasks" as these solutions are relevant for every task. The solution codes in the cells of the matrix correspond to recommended adaptations for this task to be accessible for a student with the specific disability as identified by the spectrum. For each solution code a more detailed description is provided along with a bulleted list to highlight the main ideas of each solution. An excerpt from Auditory PAR is provided below to illustrate the structure of the matrix.

Auditory PAR

Spectrum / Task	Residual Hearing-Oral	No Hearing-Oral	Residual Hearing-Manual	No Hearing-Manual
All Tasks	*A1, A2, A6, A7, A9*	*A1, A2, A5, A6*	*A1, A2, A5, A6, A7, A9, A10*	*A1, A2, A5, A6, A10, A11*
Access oral information	A5	A8, A9, A11	See All Tasks	A8
Nonverbal sounds	See All Tasks	A8	See All Tasks	A8

Figure 1: Excerpt from Auditory PAR

The following is a sample of an adaptation keyed by one of the solution codes:

A1 Enhance With Visual and Tactile Elements

- *Provide photographs, posters, and images relevant to the program*
- *Include diagrams or images of concepts that are difficult to put into words*
- *Have sounds represented by a vibration or a flashing light*

The final version of PAR was compiled using knowledge gained from the literature review, interviews, program observations, and feedback from specialists in the areas of mobility, hearing, vision, and cognitive impairments. The goal of PAR is to create a user-friendly reference for educators in addressing accessibility issues. In working to achieve this goal the project team incorporated hyperlinks into the matrices to facilitate access to the information. Any other suggestions that were made by specialists or zoo staff were accounted for in the final version.

The key to the development of PAR was to present it in the most accessible and easy-to-use format. Due to the amount of information contained in each section, a compact means of conveying the information was required. The matrix proved to be the most readily accessible tool for displaying this information. The addition of hyperlinks makes maneuvering throughout the section much simpler and less time consuming. The goal was to create a framework that could be used by any education provider and be simple and compact enough to understand.

Through the use of PAR the education of students with disabilities will improve in an informal education setting. As a leader among informal education providers, Zoos Victoria has a responsibility to set the example for disability inclusion in their educational programming. Applying the principles of PAR regarding universal design and disability-specific accommodations will ensure that Zoos Victoria is not only in compliance with the requirements set forth in the Disability Discrimination Act, but also a leader in changing the informal education environment to make it more accessible for students with disabilities. Ultimately, PAR will be used to achieve a situation where students with disabilities are recognized for their capabilities and are given every opportunity to use their unique skills in furtherance of their education.

1. Introduction

The effectiveness of education lies in the ability to promote learning and to develop the minds of individuals. Consequently, there are numerous ways to enhance educational experiences to accommodate for the learning styles and needs of different students. Alternatives to the structured curriculum of classrooms can enable students to actively participate in the learning process. Informal education, referring to any learning that occurs outside the structured format of a classroom, provides a unique and stimulating environment by presenting interactive and multi-sensory programs that expand the ways in which students can learn. These alternate forms of education may often prove very beneficial for students with disabilities, in creating an environment that has the ability to cater to their needs.

Students with disabilities can benefit society in a variety of ways. It is society's obligation to ensure that they are given an equal opportunity to learn. History has shown that when given the chance to succeed, persons with disabilities can have a significant influence. Helen Keller, who was both blind and deaf, was influential in adjusting society's mindset towards people with disabilities. In her own words, "'The public must learn that the blind man is neither genius nor a freak nor an idiot. He has a mind that can be educated, a hand which can be trained, ambitions which it is right for him to strive to realise, and it is the duty of the public to help him make the best of himself so that he can win light through work'" (RNIB, 2007). Equally profound, Albert Einstein overcame a learning disability to contribute important theories in the areas of math and science. In recognition of his achievements, Einstein was awarded the Nobel Prize in Physics in 1921. Think of the consequences that would have followed if these individuals had not been encouraged to succeed. It would be morally irresponsible of society to ignore the needs and rights of persons with disabilities.

The Australian Disability Discrimination Act of 1992 aims "to ensure, as far as practicable, that persons with disabilities have the same rights to equality before the law as the rest of the community" (Australian Parliament, 2006). Since this applies to informal education, Zoos Victoria has taken a vested interest in evaluating the accessibility of their educational programs. "The Victorian Essential Learning Standards (VELS) describe what is essential for Victorian students to achieve from Prep to Year 10. They provide a whole school curriculum planning framework that sets out learning standards for schools to use to plan their teaching and learning programs" (Victorian Curriculum and Assessment Authority, 2006). The existing

educational programs offered by Zoos Victoria go to great lengths to comply with the VELS but must be adapted to accommodate students with disabilities.

In an ideal setting, every educational program would cater to all students regardless of special needs or disabilities. This is the principle of universal design, where programs account for the needs of any student without requiring adaptation. While the zoo is inherently geared towards informal education, additional steps need to be taken within the context of their programs to fully embrace the idea of universal design. In order to work towards this goal, it is essential to develop an understanding of the various disabilities that students visiting Zoos Victoria may have. Mobility, sensory, and learning/cognitive disabilities all present different obstacles to learning. Sensory disabilities, such as hearing or vision impairments, limit the ability to fully engage in an interactive experience at the zoo. A slideshow of images from the Serengeti and an audio recording of different owl calls would not be fully accessible to students with sensory limitations. On the other hand, mobility impairments may hinder the participation in hands-on activities, while learning disabilities may prevent students from comprehending the lessons offered in the educational programs. Australian legislation requires that these situations be addressed but does not specify the methods (Australian Parliament, 2006). The goal of this project is to assist Zoos Victoria in establishing a framework that can be used to adapt their educational programs to improve accessibility. We must gain an understanding of the audience participating in the educational programs, particularly students with disabilities. The barriers to education that these disabilities present must be evaluated and applied to the programs at the zoo.

In working to address these problems, our group performed an in-depth literature review to fully comprehend the topics relevant to our project, such as informal education, disability legislation, types of disabilities, special education, zoo programming, and universal design. The knowledge gained from this research laid the foundation for the development of our objectives. These objectives include helping Zoos Victoria adapt their educational programs to comply with Australia's disability legislation and developing a framework to address accessibility issues. In the pursuit of these objectives, we gathered information by conducting interviews, reviewing case studies, and participating in hands-on experiences while in Australia to provide a basis for developing our framework. We presented a detailed recommendation to the zoo education staff of Zoos Victoria on how to enhance the accessibility of their educational programs.

2. Literature Review

This literature review provides background information on the topics relating to the project. This section defines key concepts such as informal and special education. The educational programs at Zoos Victoria fall under the category of informal education, and it is therefore imperative that this concept be fully understood before developing a framework for any changes. Educational programs must conform to a variety of learning standards and legislative guidelines, so this section looks at guidelines both in Australia as well as in the United States. There is also background on specific disabilities, how education can be adapted for them, and the concept of universal design. By covering all topics relating to adapting educational programs at the zoo, this section provides the comprehensive background necessary for the completion of the project.

2.1 Informal Education

In order to truly understand informal education, it is necessary to understand formal education first. Formal education is most commonly associated with the learning that takes place in the classroom, and is often highly structured and regulated. There are rules and guidelines that many educational establishments must conform to, such as the Victorian Essential Learning Standards (VELS) for the Australian state of Victoria. VELS provide a framework for teachers to clarify what should be accomplished by students from years Prep to 10. Through this set of guidelines, education is divided into three major strands: physical, personal, and social learning; discipline based learning; and interdisciplinary learning. Each of the major strands is further broken down into domains and dimensions to outline the expectations and measures of progress. Mark Smith, a specialist in the field of informal education and community learning, defines formal education as "the hierarchically structured, chronologically graded 'education system', running from primary school through the university and including, in addition to general academic studies, a variety of specialised programmes and institutions for full-time technical and professional training" (Smith, 2007). With formal education comes the government regulated guidelines and standards, the expectations imposed on students, and the restrictions enforced upon instructors. This view of formal education is necessary to understanding the need for informal education.

The restricted nature of formal education creates a need for informal education. Research and studies showing trends in education over time relevant to the presence or absence of informal education can also highlight the need for informal education. La Belle writes that, "during the 1970's, in much of the Third World, nonformal education became a more frequent programmatic alternative for some youths and adults who were either unserved or poorly served by schools, or who needed to supplement the schooling they already received" (Belle, 1982). The phrase nonformal education is often used interchangeably with informal education. Culture also has some influence on learning styles. Within Australia specifically, the indigenous people have different approaches to education. One study noted that, "Aboriginal children have several distinctive learning characteristics, such as simultaneous processing as opposed to successive, learning by trial and error of practical skills rather than direct instruction, and that they have advanced spatial and visual recall skills" (Boulton-Lewis, Marton, Lewis, & Wilss, 2000). These qualities lend themselves to a more informal definition of education, which could be influential when planning educational programs in areas nearby to Aboriginal lands.

There are several distinguishing characteristics found in informal education. As the research suggests, informal education and nonformal education are used either interchangeably or to describe two distinct modes of education. In many sources, informal education refers to the life-long learning process through which knowledge is gained on a common, gradual level. Nonformal education is described then as the organized programs that occur outside the framework of formal education. This project corresponds more closely with the nonformal definition, but will use both terms interchangeably. Belle describes how "the issues of cost effectiveness, flexibility, basic skills, equity, health, economic production, and so on, have led to what appears to be a greater use of nonformal education" (Belle, 1982). Some of the characteristics of informal education are that it is self-guided and self-pacing, and tends to be very object and visually oriented. There is often a greater emphasis on interactions, which is seen through the utilization of group work. There is a strong sense of accomplishment that stems from the problem-solving qualities of informal education. Informal education often mirrors real life experiences, and this, in combination with all of the other aspects of this mode of learning, sparks an increased interest in the topics being learned.

The term "informal education" can refer to numerous types of programs in any setting. Experiences at zoos, museums, outreach programs, and hands-on group work can all fall under

the category of informal education. In order to gain a full appreciation for existing forms of informal education, programs within the United States and Australia were researched. The United States' National Science Foundation has an Informal Science Education program that aims to promote learning in science, technology, engineering, and math through various projects and grants (NSF, 2006). The National Aeronautics and Space Administration (NASA) also has multiple programs geared towards informal education in which individuals of all ages can interact and gain knowledge outside normal classroom settings in a fun and stimulating manner. One such program, the NASA's Earth Science Informal Education Project, develops science literacy via opportunities throughout a lifetime, rather than just inside a class at a young age. Museums such as the National Museum of Natural History and the National Museum of the American Indian in Washington, D.C. also provide fantastic opportunities for informal education. The manner in which students proceed through a museum lends itself to be defined as informal education: museums are most often self-led, and information is gained based on the students' own desire to learn.

In Australia there are also numerous informal education programs already in existence. Zoos, aquariums, and museums such as the Melbourne Museum, the National Museum of Australia, and the Australian History Museum all function as self-directed informal learning settings as well as providing interactive educational programs to their visitors. Zoos and aquariums such as the Sydney Aquarium and the three Zoos Victoria locations are also ideal examples of organizations that foster informal learning.

2.2 Discovery and Learning

Zoos Victoria works in conjunction with school systems to educate children on class visits. The Discovery and Learning programs at Zoos Victoria allow students to learn "beyond the classroom" (Zoos Victoria, 2008). The students connect with the animals through unique experiences such as behind the scenes tours and animal encounters. The interactive educational activities help to engage students in the learning process.

2.2.1 Discovery and Learning Visits

Discovery and Learning is a fundamental element of the three Zoos Victoria campuses. Over 150,000 individuals participate in the Discovery and Learning programs each year. Furthermore, educational excursions account for 17% of visitors each year. These results were retrieved from an Interactive Qualifying Project (May 2007) titled *Zoos Victoria Visitation Data Analysis*. This project examined school group visitation to Zoos Victoria. Data was retrieved from 2002 to 2007. The analysis concluded that student visits are constantly increasing, and Discovery and Learning programs are attracting more visitors each year (Bridgewater et al. 2007). Increased interest in educational programs demonstrates the effectiveness of hands-on education.

Discovery and Learning aspires to enhance knowledge in order to provoke action. The programs range from classification of animals, to animal conservation, to how species adapt to their environments. Zoos Victoria makes the learning experience enjoyable by actively involving the students. The programs are designed to connect students through formal and informal instruction. As stated in the Zoos Victoria Education Policy, the zoos intend to achieve this by "developing multi-sensory experiences that cater for the different backgrounds and learning styles of our visitors" (Zoos Victoria, 2008).

Booking a visit for the Discovery and Learning programs is a relatively easy process. Teachers can follow a step-by-step procedure online, or contact the zoo through phone or fax. The teachers must choose which campus they would like to attend, as well as which educational program they would like to focus on. Another decision is determining which type of session they would like to organize. Zoos Victoria offers sessions directed by professional zoo educators or self-guided independent visits. The independent visits are led by the teachers. The Zoos Victoria website provides resources for teachers to coordinate a successful independent visit (Zoos Victoria, 2008).

2.2.2 Discovery and Learning Resources

The Zoos Victoria website has a specific link for learning programs. This link leads to a series of Discovery and Learning curricula. The programs incorporate different levels of education by designing programs suitable for particular age groups. The age group categories include Early Childhood, Early Years, Middle Years, and Later Years. Categorizing the programs by age allows educators to choose a suitable program for their students. The website offers a generous amount of information and tools for students, as well as teachers (Zoos Victoria, 2008).

Teachers are encouraged to browse through the various Discovery and Learning programs on the zoo website. A central feature within the Learning Programs section is access to "Teacher Notes." The purpose of Teacher Notes is to provide supplementary materials for visitation to the zoo. The Teacher Notes provide the objectives and background information for each program. These notes are a great resource for independent visits. Teachers can research appropriate activities and lesson ideas for the class trip. The notes also contain answers to student booklets (Zoos Victoria, 2008).

Along with links for teachers, the Zoos Victoria website has links for students. Learning resources for individual programs can be found under the link "Student Trail." Once the teacher has chosen a specific program, students can access information regarding that topic. The information contains pictures of animals, background information, questions to stimulate thought, and assignments. Zoos Victoria recommends that teachers assign "pre-visit activities." Activities would include reading the background information and becoming familiar with the questions so that the children can take full advantage of the learning experience while at the zoo (Zoos Victoria, 2008).

In one of the Discovery and Learning programs called An African Experience, students become tourists on a Safari tour in Africa. The students are told that an elephant has been killed by poachers. The task of the students is to "become participants in a lively active role-play, as they plead their innocence and discuss the motives of other characters" (Zoos Victoria 2008). This specific program broadens awareness to important environmental issues such as poaching. The program also focuses on goals such as observation and exploration, teamwork, communication, and creative problem solving (Zoos Victoria, 2008). The underlying educational structure and content of the programs are very similar.

2.2.3 Discovery and Learning and the VELS

Discovery and Learning experiences are constantly being updated to comply with the Victorian Essential Learning Standards (VELS). The Zoos Victoria website contains VELS tables for each of the educational programs. The VELS tables describe the level of educational standards found in each program (Zoos Victoria, 2008).

The VELS delineates the required curriculum for Australian schools and is a guideline for establishing individual programs that are essential for years Prep to 10 (Victorian Curriculum and Assessment Authority, 2006). The VELS "contain a framework for planning inclusive curriculum so teachers can equip all students with the knowledge, skills, and behaviors to help them succeed in a world that is increasingly complex, rapidly changing, and rich in information and communications technology" (Victorian Curriculum and Assessment Authority, 2006). Since Zoos Victoria is considered a learning center, it must abide by the VELS. Discovery and Learning Programs are based on the curriculum standards issued by the VELS. The VELS programs help assure educators that the zoo programs follow the standards (Zoos Victoria, 2008).

2.3 Disability Legislation

All people deserve equal access to opportunities, and thus it is imperative to ensure the rights of people with disabilities. In order to protect these rights, many countries have established legislation to prevent discrimination as well as promote inclusiveness within the community.

2.3.1 Australian Legislation

In 1986, Parliament developed the Human Rights and Equal Opportunity Commission (HREOC). HREOC addresses discrimination issues in Australia. The commission ensures that people with disabilities are treated with respect (HREOC, 2006). To enforce this principle the Disability Discrimination Act 1992 was devised (DDA). The main intention of the DDA is "[t]o ensure, as far as practicable, that persons with disabilities have the same rights to equality before the law as the rest of the community; and... to promote recognition and acceptance within the community of the principle that persons with disabilities have the same fundamental rights as the rest of the community" (Australian Parliament, 2006). HREOC assists in making the public aware of the principles defined in the DDA.

The DDA requires that an individual with disabilities has an equal opportunity to access areas such as employment, education, public transport, access to public buildings and accommodation. Specifically, Standards for Education were announced on August 18, 2005 (Australian Parliament, 2006). The Standards are derived from the DDA and clearly state the requirements of educational programs. The Educational Standards apply to all "education providers." Essentially all educational institutions must fulfill the obligations of the Educational Standards.

The Educational Standards deem it necessary that educational providers implement the principles of the DDA into their curricula. Educational providers must also make a "reasonable adjustment" to their programs to accommodate students with disabilities. The DDA defines a reasonable adjustment as "taking into account the student's learning needs and balancing the interests of all parties affected" (Australian Government, 2006). A reasonable adjustment allows all students to participate in the learning process. In the case of a student with vision impairments, this would be making alternate documents with larger print to allow the student equal advantage.

The current disability legislation is a serious matter. The DDA states that if any person with a disability is "harassed" or "victimized," they have legal rights. One should file their complaint with HREOC. HREOC will explore the situation and determine whether an act is unlawful and if a case can be resolved or taken to the Federal Court of Australia (Australian Government, 2006).

2.3.2 United States Legislation

The United States developed standards to make programs more accessible to people with disabilities by implementing the Americans with Disabilities Act 1990 (ADA). The Act was signed by Congress on July 26, 1990. The president exclaimed at the ceremony, 'Let the shameful walls of exclusion finally come tumbling down.' The signing of the ADA represented the acknowledgement of equal opportunities for Americans with physical and mental disabilities (JAN, 2006).

The ADA defines a disabled person to have physical or mental impairments that limit participation in daily activities. Since people with disabilities have limitations, society stereotypes them as inferior. The ADA says that people with disabilities are "severely disadvantaged socially, vocationally, economically, and educationally." The objective of the ADA is to ensure that people with disabilities are not discriminated against, and that accommodations are made for equal opportunities. The ADA is enforced by the Department of Justice and fines start at US$55,000 for a violation (JAN, 2006).

The Individuals with Disabilities Education Act (IDEA) is the special education law of the United States. The IDEA was passed by Congress in 1975 and amended in 2004 (United States, IDEA, 2004). The IDEA focuses on appropriate education for all students. The IDEA ensures "quality of opportunity, full participation, independent living, and economic self-sufficiency for individuals with disabilities" (NICHCY, 2007). Children with disabilities are guaranteed a public education under the IDEA.

Before the IDEA was implemented, children with disabilities were excluded from public schools. The United States also lacked resources for assessing students with disabilities. The IDEA provides a framework for identifying learning disorders (NICHCY, 2007). The Act is concerned with, "academic, developmental, and functional needs of the child" (Cortiella, 2007). These aspects are addressed by the Individualized Education Program (IEP). The IEP process begins with an individual evaluation of a student with special needs. Accommodations and services are designed specifically to meet the individual child's needs. The main components of an IEP are records of academic achievements, measurable goals, and progress through annual reports. Identifying learning disabilities of individual students assists both the children and the school. The IEP and IDEA help to maximize the potential of students with disabilities (Cortiella, 2007).

2.4 Types of Disabilities

There are a large number of disabilities which in general fall into four basic categories: physical, sensory, cognitive and non-cognitive. The 2003 Survey of Disability, Ageing and Carers (SDAC) found that approximately one in five Australians (about 4 million) had a disability of some kind. The survey also broke down the disability percentages by age group. It revealed that 4.3% of children aged 0-4 and 10% of children aged 5-14 had a disability (Australian Bureau of Statistics, 2004). This information provides a general awareness of the scope of the issue in Australia. The following sections explore mobility, hearing, vision, and cognitive impairments with the purpose of understanding how these disabilities affect students.

2.4.1 Mobility Impairments

"The Australian Bureau of Statistics (ABS) estimates that at least 6% of Australians over the age of 5 years have mobility disabilities" (University of South Queensland, 2006). These disabilities can range from permanent disorders to temporary impairments. The most common causes of permanent mobility impairments are paralysis, cerebral palsy, stroke, multiple sclerosis, muscular dystrophy, and spinal cord injury. While some of these conditions are present at birth, the majority come via diseases or injuries during a person's lifetime. These impairments can affect a person's ability to maneuver, gain access to certain areas, and limit the dexterity necessary for hand functions such as writing, typing, and manipulating objects (University of Washington 2004). Some of the most prevalent impairments in children are cerebral palsy, muscular dystrophy, paralysis, and spinal cord injury. When present in children, these disabilities can greatly hinder the learning process of the student.

Muscular Dystrophy refers to a group of about 30 genetic diseases that cause weakness and degeneration of muscles throughout the body. Most forms of this disorder are caused by a genetic deficiency in a particular muscle protein called dystrophin (MayoClinic, 2005). The most common form of MD is Duchenne (DMD) which primarily affects boys as early as three years old. DMD affects approximately 1 boy in every 3,000 while a less severe form known as Becker occurs in about 1 in 18,000 births (PPMD). The Australian Bureau of Statistics 2006 census places the population of boys (ages 0-14) at approximately 2 million. This implies that around 750 boys in Australia suffer from DMD (Australian Bureau of Statistics, 2007). In its most severe form MD can prevent a child's ability to walk by age 12 and require the need for a

respirator to breathe (NINDS, 2007b). Some of the other forms of this disease progress more slowly, but all eventually limit an individual's capability for movement and flexibility. Currently there is no cure for Muscular Dystrophy.

Cerebral Palsy is a neurological disorder that appears in infancy or early childhood and causes permanent damage to movement and muscle coordination. This disorder can severely hinder a child's ability to perform necessary functions such as walking, talking, or eating. Although incurable, the affects of cerebral palsy can sometimes be alleviated with proper therapy and treatments. Some children can even go on to live "near-normal adult lives if their disabilities are properly managed" (NINDS, 2007a). Cerebral palsy affects approximately 764,000 children and adults in the United States. In addition, about 8,000 babies and 1,200-1,500 preschool age children are diagnosed with the condition each year (UCP, 2001). If the same percentages were to hold for children in Australia, then approximately 550 babies and 100 preschool age children would be diagnosed with the condition each year.

Paralysis in children is most often the result of spinal cord injuries sustained in various types of accidents. The degree of paralysis can vary significantly from person to person. Quadriplegia refers to paralysis from the neck down and is most often the result of injury to the neck in some form. Paraplegia refers to paralysis from the waist down, limiting the use of an individual's legs but allowing full motion in the arms. Approximately 4 to 5 million Americans have some degree of paralysis to the extremities (Christopher and Dana Reeve Foundation, 2007).

Spina Bifida is a birth defect that occurs when the spinal cord or its coverings do not fully develop. Children with this condition often have motor problems, meaning that the ability to perform normal hand functions is typically below average. In addition, it can hinder their perceptual skills as well. The range of severity for children with Spina Bifida is very large. While approximately 40% of Americans may have Spina Bifida Occulta, very few of them will ever experience any symptoms. This is because in the mild form of Spina Bifida no damage ever occurs to the spinal cord itself. This condition is rarely ever diagnosed unless an x-ray is taken. On the other hand, the severe form of the disease, Spina Bifida Manifesta occurs in approximately one out of every thousand births (NICHCY, 2004). Children with the severe form often experience some paralysis.

Common to all of these various conditions is the need for certain adaptations and aids of some kind. Mobility impairments in children raise the question of accessibility to enable maneuverability for wheelchairs and other mobility aids. Many of these individuals rely heavily on these aids to function in their daily lives.

2.4.2 Hearing Impairments

The level of hearing impairment in an individual can range from complete deafness to slight loss of hearing sensitivity. One in every 6 Australians has some hearing loss but the prevalence rises significantly with age. For example the rate is less than 1% for persons aged 15 or younger whereas 3 out of every 4 over the age of 70 have hearing loss (Vicdeaf, 2006). Despite this fact a significant number of children are still affected by hearing loss. In 2005 the overall prevalence of hearing loss in children in Australia was over 10,000 or approximately 2.5 out of every 1,000 births (Vicdeaf, 2006). Although the level of impairment varies among these individuals, in all cases it can affect the ability of the child to learn and interact in a classroom setting.

There are two main categories of hearing loss: conductive and sensorineural. Conductive hearing loss results from abnormalities or disease of the outer or middle ear that can be caused by blockage, infection, or tumors. Sensorineural hearing loss results from abnormalities or diseases to the inner ear or auditory nerve. In addition to these two types of hearing loss, impairment can occur in the auditory portions of the central nervous system.

Both conductive and sensorineural loss can be seen in children. Conductive hearing loss affects the individual's sensitivity to sound. However, this can often be overcome if the sound is amplified enough. Sensorineural hearing loss impacts the ability of an individual to hear different pitches of sound. For example, the person may be able to hear low-pitched tones but have nearly no sensitivity for higher-pitched tones. Hearing aids can be effective tools in both cases. However, children born with a severe case of sensorineural hearing loss will need special education to learn speech and language (McGraw-Hill, 2005).

Whether caused by genetic factors and present at birth or obtained through infections and diseases, hearing loss impacts the lives of many children. The fundamental ability of these children to learn is diminished and special education is often needed.

2.4.3 Vision Impairments

Another major disability among children is vision impairment. The government of Australia defines a person as "legally blind" if their "degree of sight loss entitles them to special benefits." In Australia a legally blind person is defined as having 6/60 vision, meaning that he or she cannot see at six meters what a person with normal vision sees at 60 meters. Additionally if a person's field of vision is diminished to less than 20 degrees they are also considered legally blind (Vision Australia, 2007).

Recent research has shown that more than 400,000 people in Australia have significant vision impairment. Eighty percent of this impairment is caused by one of five main eye conditions: under-corrected refractive error, cataract, diabetic retinopathy, glaucoma, and age-related macular degeneration (CERA, 2007). With the exception of macular degeneration, all these conditions can be evident in children. Some conditions can be congenital while others may develop later in childhood. Although the number of individuals affected by vision impairments is large, the majority of vision loss is correctable. According to the Center for Education and Research on Ageing (CERA) at least 50% of vision loss is correctable and 25% is preventable (CERA, 2007). This is accomplished through various treatments and the use of aids such as glasses or contact lenses.

Despite this fact, a number of children still remain visually impaired to the extent that special adaptations are needed for them to learn properly. One study found that only 3% to 5% of print material is available in accessible format (Vision Australia, 2007). For students with non-correctable vision loss, suitable materials must either be in large print or Braille. In many children with permanent vision loss, the ability to identify objects by sound is greatly heightened, opening a channel for specially adapted educational programs (Bower, 2005). These and other tools can be used to assist the developmental and learning processes for those with vision impairments.

2.4.4 Cognitive Impairments

According to the Disability Discrimination Act 1992, a learning disability is defined as "a disorder or malfunction that results in the person learning differently from a person without the disorder or malfunction" (ALDA, 2006). More specifically, the Learning Disabilities Association of America defines a learning disability as a "chronic condition of presumed

neurological origin" that affects the "acquisition, retention, understanding, organization or use of verbal and/or non-verbal information" (Elksnin & Elksnin, 2004) (ALDA, 2006). For consistency purposes, the term learning disabilities is synonymous with learning impairments and they both refer to the same types of cognitive impairments.

It is important to note the difference between a learning impairment and a learning difficulty. A learning difficulty is a non-categorical term used to describe someone who may have trouble learning a basic skill. It is not recognized under the Disability Discrimination Act and is something that, given time and effort, can be overcome. Conversely, a learning impairment is a categorical term that refers to lifelong problems that will have little to no response to educational interventions and are legally recognized under the federal Disability Discrimination Act   (ALDA, 2006).

There are an estimated 150 million children in the world who are learning disabled (Stanford, 2000). There are multiple tests that exist which analyze a person's cognitive abilities under different scenarios to prove if a learning impairment is present or not. The most basic form is an IQ test, but the tests range depending on what country the person lives in and the severity of the disability (CYH, 2007). The most common test used in Australia is the Differential Ability Scales (DAS) (Stanford et al., 2000). The purpose of this test is to "assess the cognitive ability and achievement of children" from the ages of 2 years 6 months to 17 years 11 months (Elliott). It is composed of 20 subtests, 17 of which are cognitive subtests and 3 are achievement subtests that are scored based on the General Conceptual Ability (GCA). The GCA score is determined by the ability of the individual to "perform complex mental processing that involves conceptualization and transformation of information" and it evaluates their "verbal, spatial, and nonverbal reasoning abilities" (Elliott, 1990). In other words, this test provides a good measure of the child's strengths and weaknesses regarding their cognitive abilities.

Learning impairments are caused by "genetic or other congenital and/or acquired neuro-biological factors" that are independent of any cultural or language differences and are the result of "nervous system dysfunction(s)" (ALDA, 2006). As a result, the person with the impairment may have trouble receiving and comprehending information accurately thus affecting their ability to think and reason. In the same sense, children with learning impairments are often below average in all the major academic areas such as reading, math, and spelling, because they

lack the skill to interpret information transmitted through conventional ways of teaching (Stanford et al., 2000).

The degree of severity of learning impairments ranges from mild to severe where no two cases are the same. What does remain constant is that the impairment interferes with one or more very important skills: oral language, reading, written language, mathematics, and organizational skills which include everything from listening, speaking, and writing to decoding, solving, and understanding (ALDA, 2006). Common types of learning impairments include dyslexia, dyscalculia, and dysgraphia. Dyslexia is the most common and affects a learner's ability to read, write and spell. In general, the person has difficulty "establishing awareness of elements of linguistic structure", recognizing the distinct sounds of words, decoding and recognizing words, and may struggle with punctuation, capitalization, and spelling (NHCC, 2005). Dysgraphia is a "neurological psychomotor disorder" that affects a person's ability to write. Students with dysgraphia may have trouble with composition, spelling, and printing legibly, and their writing may be inconsistent in size, shape, and upper and lower case. They may also have a hard time thinking and writing simultaneously, resulting in a slower work pace (NHCC, 2005). Lastly, dyscalculia is when a person has trouble solving problems and grasping concepts (LD Online, 2007). More specifically, the person may have trouble sequencing information and events, using steps to solve problems, recognizing patterns regarding mathematical functions and values, and understanding concepts related to time (NHCC, 2005).

Often learning impairments co-exist with other attention or behavior disorders even though the disorders are not the same. Attention Deficit/Hyperactivity Disorder (ADD/ADHD) is a neurological condition that, according to Dr. Heinrich Hoffman, who first described ADHD in 1845, is caused by a "genetic dysfunction and not by poor child rearing" (LD Online, 2007). The condition makes it difficult for children to sit calmly and pay attention because it is hard for them to control their "spontaneous" responses involving movement, speech, and attentiveness. The National Institute of Mental Health estimates that the number of children in the United States that have ADHD is between 3 and 5 percent, so given a class size of 25 to 30 children, it is likely that at least one student will have this disorder (Helpguide, 2007). Comparatively, the National Health and Medical Research Council reported in 1997 that certain Australian studies on ADHD found prevalence rates between 2.3 and 6 percent of school-aged children (Buckmaster, 2004).

Like all disorders, ADD/ADHD ranges in severity and type so not all children will face the same problems. There are three major subtypes to the disorder: predominantly inattentive, predominantly hyperactive-impulsive, and combined inattentive and hyperactive-impulsive (Helpguide, 2007a). Thus some children may be extremely hyperactive, fidgeting in their seats, making it visually apparent that he or she is not paying attention, whereas, on the opposite end of the spectrum, a child may be sitting quietly as if paying attention but in all actuality his or her mind is elsewhere.

Furthermore, Autism Spectrum Disorders, also known as pervasive developmental disorders, are not technically classified as learning impairments, but are common intellectual impairments that affect the child's ability to learn. Unlike learning impairments, intellectual impairments are more profound and prevalent. According to the Australian Bureau of Statistics, in 2001, 2.6 percent of students had an Autism Spectrum Disorder (Australian Bureau of Statistics, 2004). The most common types include Autism, Asperger's Syndrome, and Pervasive Developmental Disorder - Not Otherwise Specified (PDD-NOS). Additional types of disorders include Childhood Disintegrative Disorder (CDD) and Rett Syndrome but since they are rare forms of genetic diseases, they are not typically viewed as part of the autism spectrum (Helpguide, 2007b).

Autism is a type of impairment that forms in the early childhood and affects different aspects of the developmental process. As a result the child is faced with delays or problems with social, communication, and language skills. For instance, people with Autism do not always catch on to social cues, have a hard time conversing, and have difficulty interpreting as well as expressing emotion. Another common trait is that they tend to under- or over-react to sensory stimuli. Some show little to no response when given a tap on the back, but to others any sudden motion or sound such as a pencil suddenly hitting the floor can be very unsettling and put the child in a great deal of distress (Helpguide, 2007b).

The mildest form of the Autism Spectrum Disorders is Asperger's Syndrome. The difference between Asperger's and Autism is that children with Asperger's do not experience a delay or impairment in their speech. Rather, their language and verbal skills are good and their intellectual level ranges from normal to high. The problem is that children with Asperger's lack social and communication skills and often are seen as "socially clueless" or "eccentric" (Helpguide, 2007b). Additionally, despite the fact their intellectual levels may be equivalent to

others, people with Asperger's tend to narrow their interests to one subject in an overly excessive manner. For example, someone with Asperger's Syndrome may be interested in cars, so they will spend an immense amount of time collecting information, studying facts, or gathering materials relating to cars. In all fairness, it is perfectly acceptable to have a hobby, but when the hobby consumes one's life, it prevents one from maximizing his or her learning potential thus hindering the ability to become a well-educated and well-rounded person.

The aim is to be able to recognize the various types of cognitive impairments and be able to render the learning environment so that it meets the needs of as many students as possible. Since there are so many different types of impairments that range greatly within themselves, it is virtually impossible to provide a single recommended method of teaching, but it is realistic to develop a framework that can be molded to fit any given situation so that when the instructor is placed with a group of students including someone with a cognitive impairment, he or she will know what to do.

Type of Disability	Percentage of People	Number of People	Percentage of Children	Number of Children
Overall Disability	20%	4,000,000	8%	320,000
Mobility Disability	6% over age 5	N/A	N/A	N/A
Muscular Dystrophy	N/A	N/A	N/A	750 boys
Cerebral Palsy	N/A	N/A	N/A	8,000
Spina Bifida Manifesta	0.10%	20,000	0.10%	4,000
Hearing Loss	16.67%	330,000	0.25%	10,000
Vision Loss	20%	400,000	N/A	N/A
ADHD	N/A	N/A	2.3%-6%	70,000-180,000
Autism Spectrum Disorder	N/A	N/A	2.60%	80,000

Table 1: Disability Statistics for Australia

Table 1 provides approximate data for the percentage and number of people or children in Australia with particular disabilities. Where Australian statistics were not readily available, some of this information was assumed to be proportional to the number of people in the United States with disabilities.

2.5 Special Education

The challenges faced by students with each of these disabilities necessitate the need for adaptations to traditional classroom learning. The specific approaches to special education vary based on the type of disability present. In all cases though, the educational opportunities of the student are enhanced by addressing the accessibility issues and learning difficulties that he or she may encounter.

2.5.1 Adaptations for Mobility Impairments

It can be easy to identify a student with a disability by their particular impairment rather than focusing on their strengths and abilities (Lollar, 2001). While students with disabilities often lack motor skills or hand-eye coordination, these individuals will undoubtedly excel in many areas when given proper encouragement. It is important when teaching a student with a mobility disability to acknowledge the individual's impairment and to encourage communication between teacher and student to ensure that proper adaptations occur to address his or her needs. At the same time, though, it is equally important for the student to feel independent and capable of fully utilizing his or her abilities to learn.

Different mobility impairments require a different set of adaptations to educational curricula. Students with Spina Bifida often have perceptual-motor problems resulting in diminished hand-eye coordination. Other students may have paralysis in their arms and legs, severely limiting their motor skills. For these students, it is important to stimulate all of their senses such as seeing, hearing, touching, smelling, and tasting. In addition, assessing the accessibility issues within the particular educational programs is essential. For example, all equipment or materials must be located within reach for a student in a wheelchair. In writing and other hands-on activities, note takers or assistants may be required. Students with mobility disabilities are often very dependent on various types of walking aids, so it is important to ensure that a classroom or program setting is equipped to accommodate these needs (University of Washington, 2004). Besides these issues, there are many other factors that can arise based on the particular disability and the environment in which the student is placed.

As noted above, students with mobility impairments often benefit from multi-sensory approaches to learning. The zoo provides a unique environment for this type of education through programs that utilize a student's senses of hearing, seeing, smelling, and touch while

providing an avenue for learning. However, the outdoor setting of the zoo can also create accessibility issues for students with mobility impairments. To assess this situation, the zoo can raise a number of key questions such as: How accessible are the walkways for wheelchairs and other walking aids? Are students able to view the exhibits from the vantage point of a wheelchair? Are there alternate forms of transportation for these students and are items such as wheelchairs available for their use? (Trieglaff, 2007). These and other such questions can provide a general framework for addressing the accessibility of the zoo as a whole.

2.5.2 Adaptations for Hearing Impairments

The education of children with hearing impairments depends on effective language communication and multi-sensory approaches to learning. Deaf and hard-of-hearing students extract much of the information about their environment from the use of their eyes. A study on the visual performance of deaf adults and children found that, when compared to normal hearing individuals, deaf individuals have better visual performance and are able to obtain more vital visual information from their surrounding (Silva-Moreno & Sænchez-Marin, 2003). Thus providing an environment that utilizes the visual capabilities of a hearing impaired student can be essential in the education of that individual.

One of the most important aspects of special education for students with hearing impairments is language communication. Australian Sign Language (Auslan) is the language of the Australian deaf community. Auslan differs entirely from spoken or written English as its grammar and vocabulary often contain no direct English equivalents. The differences between Auslan and English make it difficult to sign Auslan fluently while speaking English. However, to compensate for this fact, finger spelling of words is often used where no sign for an English word exists. Currently efforts are being made to standardize Auslan usage to account for the large expansion of sign language interpreter services (RIDBC, 2004).

A 2005 study in the Journal of Research in Special Educational Needs assessed the effects of an image-based approach to learning. The results seemed to support the truth behind the old adage "a picture is worth a thousand words." What they discovered was that the use of images to promote reflection in students "bridged the gap between oral and literacy-based cultures." The image-based approach was most effective in communicating ideas where language discrepancies exist (Miles & Kaplan, 2005). Another study in the Journal of Deaf Studies and

Deaf education revealed that students with hearing impairments benefit from interaction with their peers. The focus of the study was moving past mere inclusion of students with disabilities to actual collaboration where hearing impaired students are able to share experiences and learn alongside hearing students. In almost all cases mutual respect developed among these students along with the growth of knowledge (Gaustad, 1999).

In an informal setting such as a zoo, the multi-sensory approaches to learning can often be employed in the education of students with hearing impairments. In addition to the enhanced visual capabilities of these students, a close relationship exists between the sense of hearing and the sense of touch. In fact, the inner sense organ of hearing is merely a highly specialized organ of touch. Thus the learning approaches for these students should be geared toward the use of their sight and their heightened sensitivity to touch. For example, an interactive educational experience that enabled students to touch and see animals while studying their characteristics would most effectively advance the learning process of students with hearing impairments.

Along with these approaches to learning for hearing impaired students, a number of technologies exist to help communication. Many individuals use hearing aids that enhance hearing by amplifying sound and minimizing background noise. More than 30,000 people worldwide have received cochlear implants which involve the surgical implanting of an electronic device to stimulate the auditory nerve. In addition, computer-based translation software is becoming more widely used. An example of this is C-Print, which was developed at Rochester Institute of Technology. C-Print uses computers to translate spoken words into text and is a very effective tool in the education of students with hearing impairments (RIT, 2007).

2.5.3 Adaptations for Vision Impairments

Visual impairments in students range from total blindness to low vision. The adaptations required to educate these students must focus on ways to use their unique capabilities. Just as students with hearing impairments have enhanced visual capabilities, so students with vision impairments have superior senses of hearing and touch. Understanding how to effectively use a multi-sensory approach to education will greatly augment the learning process for these students.

The major challenge facing students with vision impairments in any education setting is the amount of visual material to which they are exposed. Textbooks, chalkboards, visual cues, computer screens, projections, etc. are all used to a large degree for the education of students in

general. Overcoming the limitations that this presents to a visually impaired student requires the use of strategies that focus on the presentation of material and proper communication. In any situation where visual materials are used, a verbal description must follow. It is important to keep the student aware of the actions that are taking place beyond his or her realm of sight. Experts at the University of West Virginia make recommendations for teaching students with vision impairments. One key point is that handouts or notes be made available in a format that benefits the visually impaired student. This can be merely large print for those with low vision or audiotape recording and Braille formats for those with more severe vision loss (University of West Virginia, 2005).

The National Federation of the Blind Jernigan Institute has been a leader in using hands-on experiences and multi-sensory approaches to teaching students with vision impairments. One of their programs, the Circle of Life session, enables the students to discover the world by using their senses. The activities include exploring the Chesapeake Bay, learning about chemistry and electronics, and dissecting a dogfish shark. Another program offered at the National Centre for Blind Youth in Science is called Sounds of the Amazon and involves an actual trip through the Peruvian Amazon for students with vision impairments along with sighted students. During the trip the students will be able to experience the Amazon by using their enhanced senses of hearing and touch. The focus of the trip is for the students to study the biological diversity of the region primarily by sound rather than sight (National Centre for Blind Youth in Science, 2006).

At the Pretoria National Zoological Gardens in South Africa steps have been made to improve the experience of individuals with disabilities. The zoo currently offers an exhibit that is equipped with 200 taxidermy animal trophies and realistic sound recordings. The visually impaired are able to touch these animals and hear the sounds that the animal makes. This exhibit utilizes the two most important senses for gathering information that are available to a visually impaired person. In addition, each visitor receives Braille pamphlets containing more information about all the animals (South African National Council for the Blind, 2007). If the same philosophy that was adopted at the Pretoria Zoo were applied to educational programs, it could have a powerful influence on learning for students with vision impairments.

One of the key components to the education of students with vision impairments is the focus on collaboration with normal seeing students. Students with vision impairments benefit through interaction in the same way as students with hearing disabilities. The sharing of ideas

and experiences combined with multi-sensory educational programming will provide invaluable benefits to a visually impaired student by enhancing his or her ability to learn.

2.5.4 Adaptations for Cognitive Impairments

The impacts of cognitive impairments vary depending on the type of impairment and its severity but in any case accommodations must be made to ensure every child has the same educational opportunity. Accommodations are "alterations in the way tasks are presented that allow children with learning disabilities to complete the same assignments as other students" and are not intended to give students an unfair advantage, but rather they are meant to allow students with learning disabilities to learn and participate with everyone else (LD Online, 2007). Cognitive impairments, whether diagnosed or undiagnosed, affect both the people who have them as well as the people they live with, work with, and go to school with, especially those who teach them. The person may exhibit a sense of frustration, low self-esteem, stress, and depression due to the fear of failure, of pressure to work harder, try harder, and do better, and the fact that they are different from their peers. However, teachers may also experience similar feelings of frustration and anger caused by their inability to teach those who are not learning. Instead of approaching it with an open mind, they blame the students with the cognitive impairment for the difficulties they encounter (Helpguide, 2007c). It is important to acknowledge that students with cognitive impairments follow a different learning process than most students and that a few alterations to the curriculum can make a huge difference in their learning success. As stated before, the impacts of cognitive impairments vary, but it is important to recognize them so that proper measures can be taken. For instance, some students might experience problems with their short-term memory so their ability to process information may be limited, or they may have problems following and creating a sequence when trying to understand the structure of a lecture or trying to identify the relationship between two variables. Other challenges they may face include problems with 'search and locate' strategies, slow comprehension rate, inability to absorb large amounts of material, and heightened anxiety to perform well (ADCET, 2006).

There are numerous teaching and learning strategies that can be used to make sure programs are carried out smoothly and efficiently and are well suited for those with cognitive impairments. In the classroom, it is helpful to provide reading lists, course outlines, and a

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schedule of assignments early on so that those with learning disabilities have a clear understanding of what to expect and are able to schedule their time accordingly. It is important that students know what they are expected to learn and how they are expected to learn the material. Previewing new topics and reviewing old topics allows students to see how the new material fits in with the material already covered. Whenever a new topic or procedure is introduced, an explanation of the stages/directions both verbally and in written form will alleviate problems for students who may have trouble sequencing and comprehending information. Presenting information in as many forms as possible will help not only those with cognitive impairments, but also those with different learning styles. The use of handouts, worksheets, overhead projections, videos, sound clips, and 3-dimensional models is recommended. Different teaching methods can be used such as making lists, flow charts, concept maps, and providing hands on activities that incorporate as many mediums as possible. However, it is important to ensure that everything is neat and colorful to minimize confusion and to highlight the important facts. Also, study guides or summary outlines can be used to allow students to go back and review the key points. The use of assistive technology and recorders can be utilized so that students who have difficulty listening, writing, and comprehending information simultaneously can listen to the information over again. Students will have an easier time following the sequence within the material if they can take their time and work at their own pace. The most important thing is not to make the students "over-anxious about making mistakes, asking questions, getting through the work, or meeting learning goals" as this may discourage them from learning (ADCET, 2006).

Aside from what teachers can do to accommodate students with cognitive impairments, students can also follow certain guidelines to help them succeed. The following is a list of study tips that are recommended for children with cognitive impairments: underline or highlight important ideas; use notes or symbols within text; re-read if necessary; make use of word processing software and electronic dictionaries/thesauruses to help organize, edit, and spell check; use tape recorders to study from; use a calculator when allowed; try reading problems out loud and solving them out loud; schedule your time; try keeping a planner in order to stay organized; practice speaking ahead of time with a mirror, videotape, or in front of family/friends (NHCC, 2005). Students may also learn best when they are given the option of how they want to learn i.e. project work, problem-based activities, and resource-based activities. It may also help

if they can talk through the material with their peers or a tutor. Depending on the type and severity of the impairment, the student may benefit from having a tutor or a teacher's aide to assist them in assignments and activities. The teacher may even want to encourage self-help, discussion, or focus groups that will broaden the range of "approaches and attitudes from which to draw their own learning" experiences (ADCET, 2006).

In informal education at the zoo, the accommodations and methods listed above can be transformed to fit the environment. For instance, if the Zoos staff know that a group of school children will be coming on a certain date, they can prepare an agenda and send it to the school so the students will have an understanding of what they will be doing/learning while at the zoo. One of the most important things that can be done to ensure that every student has the same learning opportunity, whether they have a cognitive impairment or not, is for the staff to communicate with the school. Given proper communication, the school can inform the staff of any persons who need special attention or require any accommodations. The staff can then prepare their programs accordingly.

2.6 Universal Design

The Center for Universal Design defines the goal of Universal Design as being, "to simplify life for everyone by making products, communications, and the built environment more usable by as many people as possible at little or no extra cost. Universal Design benefits people of all ages and abilities" (CAST, 2007). Universal design focuses on inclusion and accessibility by calling for equity, flexibility, and simplicity in use, perceptible information, tolerance of errors, low physical strain, and size and space for approach and use.

While universal design is often initially connected with architecture and design, this concept carries through to education and learning as well. The Center for Applied Special Technology has developed a framework to create flexible goals, methods, and assessments for students with different learning abilities called Universal Design for Learning. The universality of these concepts does not mean that there is one single solution to accommodate every need imaginable, but rather a flexible structure to apply to each different situation.   Studies in the field of neuroscience have generated data to suggest that there are three networks that relate to the learning process: recognition (what), strategic (how), and effective (why). Universal design calls for multiple means of representation, expression, and engagement to connect with all three

networks on as many levels as possible (CAST, 2007). There are numerous indicators to consider while planning curriculum or any type of educational program. For example, class climate should be accepting and respectful, and assessment should utilize multiple methods and be adjustable for any special needs. It is also noted that accommodations for those with special needs often benefit all audiences through their simplicity and ease of accessibility.

2.7 Summary

In order to properly address the accessibility of Zoos Victoria programs, it is essential to fully understand the learning styles and needs of students with disabilities. Although legislation such as the Australian DDA exists, this legislation does not provide the means to implementation. Informal education focuses on ways to enhance learning for students with disabilities and offers a unique environment for the establishment of a framework that adheres to the principles of universal design. Not only must disability inclusion be addressed within the scope of this framework, but it is essential to ensure that students with disabilities are able to reach their full potential. With an understanding of these ideas and a setting that lends itself to multi-sensory and informal approaches to education, Zoos Victoria has the ability to reach the forefront of disability inclusion in Australia.

3. Methodology

The purpose of this project was to develop a framework for adapting existing educational programs at the zoo for students with disabilities. The main objective was for these programs to comply with the principles of universal design in accommodating for students with mobility, vision, hearing, and cognitive disabilities. In accomplishing this goal the project team produced a list of objectives and ways to complete these objectives.

The project team achieved the following objectives:

- Established a greater understanding of accessibility issues;
- Gained insight into different disabilities and their abilities and limitations;
- Determined how teachers accommodate for children with disabilities and learning differences;
- Discovered the variety of opportunities informal education has to offer;
- Helped Zoos Victoria adapt educational programs to comply with Australian legislation;
- Developed a framework to make the educational programs at Zoos Victoria more accessible to students with disabilities.

The project team achieved these objectives as follows:
- Completed an in-depth literature review;
- Interviewed teachers in the United States to see how accommodations are made for students with disabilities in a formal classroom setting;
- Interviewed education staff from zoos and museums in the United States to assess how their educational programs are structured, and what accommodations, if any, are made for students with disabilities;
- Interviewed Zoos Victoria staff members to understand the current programs and what adaptations, if any, have been made for children with disabilities;
- Assessed existing Zoos Victoria educational programs based on a select number of observations;
- Interviewed professionals who specialize or are knowledgeable in the areas regarding education and disabilities to gain a real world perspective;
- Analyzed the information gathered before proceeding with the creation of the framework;
- Created and presented a framework to provide recommendations for adapting educational programs at Zoos Victoria for students with disabilities.

Task	PQP	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Literature Review	■	■	■	■				
Interviews (US)	■							
Interviews (Aus)		■	■	■	■			
Observe and Evaluate Zoo's Current Programs		■	■	■	■			
Develop a Framework					■	■	■	
Assess the Framework					■	■	■	
Final Results							■	■

Table 2: Timeline of Project

3.1 Interviews

The project team conducted interviews in order to provide insight into firsthand experiences regarding students with disabilities. The goal was to assess how students with disabilities react and respond in formal and informal educational settings. To increase understanding of the topic at hand, the project team conducted interviews with practitioners from a variety of fields regarding education and disabilities, both in the United States and Australia. This allowed the project team to gain information from different sources in order to assess the problem from all angles.

The project team completed a literature review in preparation to conduct interviews. Interviews were scheduled with professionals of various disciplines. The professionals that were interviewed in the United States were suggested to the project team by faculty advisors and personal references. However, the interviews that were conducted in Australia were based on previous sources from the past Interactive Qualifying Project Report at CSIRO and the Zoos Victoria database (Simone et al., 2007). Additional research regarding interview sources was required to suit the needs specific to this project. It was necessary to compile a list of specialty schools, and locate specific people, including special education teachers, social workers,

administrative offices, organizations, and support groups. Lists of interview questions can be found in appendices B through J.

The project team held interviews in teams of two to four people. At least one team member had the responsibility of directing the interview, while the other team members served as scribes. The interviews were made both in person and over the phone based on availability and convenience. Phone interviews often were held by only two team members, whereas interviews with the zoo staff would frequently involve all four team members.

Teachers of public, private and specialty schools were interviewed to evaluate how students with disabilities learn in a formal setting.   Both types of schools gave insight into educational environments which are similar, yet different in some respects. Interviewing public and private school teachers helped the project team to understand not only how students with disabilities respond to a structured environment, but how they interact with their classmates who do not have disabilities. Specialty schools are dedicated to educating students with disabilities, and the teaching methods are generally organized to better meet individual needs. The project team determined the types of disabilities the specialty schools accommodate for, prior to setting up the interview. This ensured that the schools offered relevant information to areas of interest including hearing, vision, mobility, and cognitive impairments. The project team took the results of the teacher interviews and combined the techniques to work towards the principles of universal design.

The project team interviewed staff of zoos within the United States as well as the Zoos Victoria staff. The interviews helped to compare what measures the zoos are required to take in order to comply with current legislation. The interviews also helped to compare different methods, and educational programs offered by the zoos. Talking to staff from zoos within the United States made the project team aware of how their programs are structured and what accommodations are made. Larger zoos were of high interest because they typically offer broader programs to a more diverse audience, and therefore are more likely to have well-structured programs.

After interviews were conducted in the United States, the project team interviewed staff members at Zoos Victoria in Australia.   One topic of interest was to review the database created by the previous Interactive Qualifying Project, entitled *Visitation Data Analysis at Zoos Victoria*. The purpose of this was to obtain information about schools that have visited the zoo, and

whether the groups were from public or specialty schools (Bridgewater et al., 2007). This helped the project team to narrow down which schools to contact. The project team also reviewed the programs offered by the zoo and determined if any accommodations were made, and what actions Zoos Victoria had taken to comply with the current disability legislation and the VELS.

Once the interview process was completed, the project team compiled all of the information attained from the various people discussed above, including zoos staff, school educators, and practitioners from relevant fields.   This gave the project team the opportunity to gain first-hand information into educational programs, types of adaptations made, and all other relevant information discussed throughout this section. The interview results combined with the background information found in the Literature Review helped the project team to create the framework.

3.2 Assessment of Zoo Programs

In order to evaluate what changes needed to be made to the educational programs of the zoo, several existing programs were used.   When observing these programs, several questions were answered to analyze current accommodations made for students with disabilities. These questions also helped to highlight any particular areas that needed to be addressed. Grouping the questions by disability, such as visual, auditory, mobility, and cognitive, revealed any specific limitations on the accessibility that the program may have had, as well as allowed trends to appear through all of the observations. Examples such as the following were used:

- For what age range is the program intended?

- What size audience can it accommodate?

- Where does it take place?

- How many staff/teachers are involved in running the actual program?

- What preparations take place before the visiting group arrives?

    - On the part of the teacher?

    - On the part of the students?

    - On the part of the zoo staff?

- Describe the visual components of the program:

    - What information transfer occurs through visual channels?

    - Are there any points in which the students must respond based on a visual cue?

- Describe the audio components of the program:

- What information transfer occurs through audio channels?

- Are there any points when the students must listen and watch at the same time?

- Are there any points in which the students must respond based on an audio cue?

- Describe the components of the program which involve physical activity:

- Is there any information transfer that occurs only through physical movement?

- Describe the reading/writing components of the program:

- What follow up is done after the program's completion?

There were a few obstacles the project team had to work around in order to obtain certain information. The main problem was that most of the research was gathered over the months of January and February, which is during the summer. This meant that visitation rates were lower, and the types of visitations were directed more towards camp groups or other scouts as opposed to school groups. Thus, the project team did its best to assess the programs as often as possible for groups that most resembled school groups. Additional information concerning the content of the programs was gained through the zoo's database. The lesson plans available on this database were reviewed, and any potential activities or situations were noted so they may be considered in the creation of the framework. This gave a better idea of what the structured, themed programs were like, despite the fact they were not being held during the timeframe of the project.

Once the zoo programs were assessed, the project team evaluated the results to provide valuable information regarding the strengths and weaknesses of the educational programs with regards to the inclusion of students with disabilities. Concerning the zoo programs observed, barriers were identified and compiled in a checklist which can be found in Appendix P. The project team used the results in developing the framework.

3.3 Framework

The goal of the framework was to adapt informal learning programs at Zoos Victoria for students with disabilities. The framework was used to evaluate accessibility issues for learning programs and provide a universal design that can be applied to any program with regards to a certain type of disability. The disabilities that were addressed are broken down into four categories: mobility, hearing, vision, and learning. Each category provided a unique set of guidelines to most effectively adapt the programming at the zoo.

In developing the framework, it was important to gain a proper understanding of each particular disability. The literature review provided a solid background on the barriers to learning that these disabilities present. Further analysis came in the form of interviews with specialists and teachers who lent insight into what functions of the students are limited by these disabilities.

The next step in the development was to assess what accommodations were necessary for each category of disability. Again, much of the background research on ways to accommodate students with disabilities was performed in the literature review, but further knowledge was gained in the interview process as well. In most cases these accommodations remained specific to the type of disability that was being addressed. However, universal design principles also applied for accessibility issues that affected multiple types of disabilities.

Another aspect in the development of this framework was the level of assistance that students required. Certain disabilities necessitate the use of assistive technologies such as wheelchairs, hearing aids, etc. Thus the program was tailored appropriately to accommodate for these needs. Other resources included personal aides or interpreters for the deaf. The framework took into account the use of these resources.

After establishing the limitations presented by each disability and the accommodations needed, an assessment of the particular programs at the zoo was performed. This analysis focused on practical ways to adapt the programs for students with disabilities. The project team performed an analysis of specific programs to provide insight into what types of accommodations were accounted for in the development of the framework. This analysis examined what particular activities are performed by the students in each program, the ways in which information is accessed and communicated, and the methods of instruction used by the zoo staff. At this point the project team gathered the necessary data to develop its framework.

After this development was complete, the project team performed an evaluation of the framework using case studies. The program was analyzed within the framework and recommendations were made for adaptation. This analysis addressed a particular disability from each of the four categories to ensure that the appropriate range of impairments was assessed. In the end, the framework provided ways to adapt the environment and specific programming of the zoo to effectively enhance the education of students with mobility, hearing, vision, and cognitive disabilities.

4. Findings

        This section presents the findings resulting from interviews and program observations in Australia. The areas covered are education in Australia, education at the zoo, disability barriers, disability accommodations, technology, student and teacher evaluations, and observation of Zoos Victoria educational programming. The information obtained in these areas formed the basis for the development of the framework.

4.1 Interview Results

        Interviews conducted in the United States and Australia yielded very meaningful findings. The project team consulted 29 professionals. A total of 6 interviews were conducted in the United States and 19 interviews were conducted in Australia. People of interest were officers of the Victorian Department of Education, disability specialists, mainstream school teachers, specialty school teachers, and Zoos Victoria Educational Staff.

        Officers of the Victoria Department of Education were interviewed to gain insight into the educational systems in Australia. Disability specialists, mainstream school teachers, and specialty school teachers discussed the barriers that exist for students with disabilities and what practical accommodations are made to assist students. The project team also learned about certain technologies Zoos Victoria could incorporate into their educational strategies to enhance the accessibility of their programs. Additionally, the Zoos Victoria educational staff provided information about the programs and what adaptations are made for students with disabilities in order to aid the project team in assessing the programs.

        The results from the interviews are compiled in this section and act as supplementary material for the framework. The citations in this section of the project refer to the last names of the interviewees. The contact information for these individuals is found in Appendices K and L and the notes from the interviews are located in Appendices M and N.

4.1.1 Education in Australia

The educational system in Australia is broken up into three levels: primary education, secondary education, and tertiary education. Children from pre-school to Year 6 attend primary school in either a private school or public school. This education provides the basic foundation for further study.

Secondary school continues from Year 7 to Year 10, with the option of staying on to complete Years 11 and 12. If students choose to continue on to Years 11 and 12 they have the option of studying for their Victorian Certificate of Education (VCE) which will prepare them to continue on to the university level. For students who do not wish to attend a university or other form of higher education, they have the option of studying for the Victorian Certificate of Applied Learning (VCAL). This provides the students with a hands-on education in preparation for the pursuit of a particular career.

At the tertiary level of education students can choose to attend a university or a Technical and Further Education College (TAFE). At the university students typically study for their Bachelors Degree which takes 3-4 years to complete. TAFE colleges, in comparison, are typically 1-2 year programs and provide vocational training for students. (Zoo Educators, Bond)

Department of Education

The Department of Education is responsible for assisting schools in implementing government policies regarding education. This includes guidelines for programs and curriculum, and resources and support for students with disabilities. There are nine regions in Victoria and each region has its own department. However, the structure and policies do not vary significantly between any of the regions. The Department of Education deals with all government schools, primary and secondary. Zoos Victoria also receives funding from the Department of Education for their educational programming and reports on their operations (Bond).

Disability Legislation

The 1992 Disability Discrimination Act (DDA) essentially states that educational institutions are required to make every activity available to children with disabilities. In 2005, the education standards were clarified and this information was provided to all educational

institutions. The standards cover 5 areas: capacity to enroll, participation, curriculum, harassment/victimization, and access to student support services (Underwood).

In general the education standards focus on making sure that students with disabilities have equal access to programs and are able to participate. The individual needs of any child with a disability should be met by providing additional supports to make programs and curriculum accessible.

Education and Support for Students with Disabilities

There are two types of schools in Australia: mainstream schools and specialist schools. The parents of a child with a disability have the option of sending their child to either. For students with disabilities that attend mainstream schools, special accommodations are often made and many supports exist to help these students. Specialist schools generally cater to students with cognitive disabilities but there are numerous special schools for the deaf. Blind students are mostly mainstreamed, so specialty schools for the blind are not as prevalent in Australia.

The Department of Education provides numerous supports for students with disabilities. For mainstream schools, there are 5 levels of funding based on the severity of the disability. This funding ranges from $5000-$40,000 per year and is allocated to the schools to use in the most appropriate fashion. The ability to make independent decisions is typical of schools in Victoria. While the Department of Education does provide guidelines, ultimately curriculum, programs, and disability adaptations are left up to the preference of the particular school. This enables schools to best adapt their education to the needs of the students that attend (Bond).

In addition to funding, the Department of Education provides support services to schools that have students with disabilities. Speech therapists, guides, interpreters, etc. are all available to the schools. The time that these aides spend with the individual students depends on the severity of the student's condition. Deaf, blind, and mobility impaired students will typically work with an aide in the classroom to assist in the performance of activities and overall education (Bond, Eadon).

Visiting teachers are also provided to the schools to assist in the accommodations and recommendations for students with vision, hearing, and mobility impairments. These teachers lend insight into how curriculum and programming should be modified, what classroom changes should be made, as well as assisting the individual students in their education. In the same token,

psychologists are sometimes used by schools to support students with intellectual disabilities (Bond).

Individualized Learning Plans

The individualized learning plan (ILP) is used by the school to establish educational goals for students with disabilities and is equivalent to the individualized education plan (IEP) in the United States. The ILP focuses on ensuring that each student continues to make progress in learning, rather than setting deadlines for the student to achieve. The schools then report on the progress of the child to the Department of Education (Bond).

The actual development of the ILP is done by the parent support group (PSG) which consists of the parent of the student, the teacher, and the principal. This group is responsible for establishing appropriate goals for the student and evaluating the progress towards reaching those goals. The ILP will often incorporate other support services for the student such as teaching aides and assistive technologies. In addition, a statewide testing program exists to report on the progress of the student in achieving the goals as set by the PSG (Eadon, Bond).

Education at the Zoo

The educational programs at Zoos Victoria are written in compliance with VELS legislation and cover the whole spectrum of education from kindergarten to VCE. The concept of these programs is to connect students with wildlife and empower them so that they can make a difference. The early years focus on establishing that emotional connection of students to the animals by making the programs very interactive and tactile. In the middle years, the programs are designed to advance the students' knowledge about the animals. Finally, in the later years, the students continue to gain knowledge but with the focus on learning how to make a difference and what action they can take.

In general, the programs are 45 minutes long and combine elements of education and zoo experience. Providing a stimulating environment for the students through the use of multi-sensory activities as well as having the flexibility to adjust for different levels of understanding are important characteristics of zoo programming. Built in to this structure is an inherent ability to adapt for students with disabilities (Zoo Educators).

Disability Inclusion

Accommodations for students with disabilities are currently made on a case-by-case basis, completely dependent on the discretion of the zoo educator. The teacher of each school group that comes to the zoo is called prior to the program and asked if there are any students with disabilities in the class and what types of accommodations may be required for these students. It is then left up to the zoo educator to find appropriate ways to adapt the program.

Although most zoo educators have had some experience working with students with disabilities, few consider themselves adequately trained or prepared to educate these students. Most call upon their own personal experiences or ways that other educators have dealt with accommodating students with disabilities. According to the zoo educators, these accommodations are generally very effective, but all agree that a formal training session for teaching students with disabilities would greatly improve the situation.

The majority of cases involving students with disabilities occur within mainstream schools where a class may have one or two students with impairments. In these situations the zoo educator must find a way to adapt for the needs of these students while not affecting the overall structure and goal of the program for the other students in the classroom. The accommodations vary from case to case but most focus on a tactile approach to learning. The teachers will then direct their questioning and instruction to the students based on their different levels of understanding.

For specialty schools that come to the zoo, the fundamental nature of the programs can be adapted to fit the needs of the whole group. In these situations it is vital that the zoo educator gain an appropriate understanding of the severity of the disabilities and the intellectual capabilities of the students. An awareness of how the students may react will better inform the zoo educator on what adaptations must be made to the program (Zoo Educators).

4.1.2 Disability Barriers

In any educational program that is designed for a mainstream school class, barriers will inevitably arise for students with disabilities. These barriers will vary based on the activities of the program and the type of disability present. This section outlines some of the common barriers for students with mobility, hearing, vision, and cognitive impairments.

Barriers for Students with Mobility Impairments

　　Mobility impairments represent a wide spectrum of physical limitations. Thus, the capabilities of students will vary in different situations as well as between individuals. Many students with mobility impairments experience dexterity difficulties which produce numerous barriers to participating in daily activities.

　　One of the major barriers for students with mobility impairments is range of motion. Students may not be able to reach over a wall to pet an animal or throw food into the enclosures. Range of motion is especially compromised for students that require the assistance of a wheelchair. The armrests inhibit movement of the arms, and balance can be compromised by leaning forward. The perimeter of a wheelchair imposes restrictions of maneuverability. Also, the students may not have the strength or muscle coordination to navigate a wheelchair (Johanson, Maloney, Zoo Educators).

　　Limitations in motor skills pose many barriers for students as well. Restricted muscle control can frustrate a student and hinder one from partaking in certain activities. Students with limited fine motor skills may experience difficulty in gripping an object such as a writing utensil. Further difficulties include trying to coordinate muscles to write or speak. Additionally, limited gross motor skills may prevent students from raising their hands and participating (Johanson, Zoo Educators).

　　Tasks are particularly difficult in cases where students experience involuntary muscle spasms. Students with mobility impairments may not be able to handle an animal at the zoo if they have limited muscle control. Spasms can actually increase in times of excitement and could be dangerous for the students and the animals (Johanson).

　　Public institutions in Australia are required to follow specific standards in the Disability Discrimination Act when building structures. Premises must be wheelchair accessible. However, the building codes may not account for other elements of accessibility such as the field of vision for a person in a wheelchair. Displays at zoos generally cater to people who are standing. This poses a barrier for students with mobility impairments. A student's view may be obstructed by trees, walls, or fences. Also, railings may be unintentionally positioned in the field of vision and prevent accessibility (Johanson, Maloney).

Barriers for Deaf Students

Numerous barriers are present for deaf students in an educational setting. Students with little or no hearing can miss out on what is being said by those around them, so auditory access to verbal communication is limited or non-existent. When dealing with this through lip-reading or Auslan, various situational circumstances can become barriers, such as being unable to see the speaker due to seating arrangements or poor lighting. A speaker becomes nothing more than a silhouette against a bright window in a dark room. Deaf students may also have a hard time identifying the speaker if the speaker is not facing the student. Even then, only approximately 35% of information exchanged in a conversation can be picked up by lip-reading. The rest must be gained through context or additional clues (Maclean).

Those students using Auslan face additional problems in that they need to watch an interpreter rather than watching the speaker. It becomes difficult to access information through speaker's visual cues and demonstrations when the student needs to focus on the interpreter. Additionally, the student can become distracted from the discussion if other individuals begin other activities or otherwise interrupt the lesson. Accessing information from multiple sources at the same time can be a very challenging task, depending on the level of hearing. For people with residual hearing, background noises can be both distracting and inhibiting. It can detract from the listening experience by drawing attention away from either the speaker or the interpreter. Even simple actions such as a person walking across the room can be visually distracting as well. Background noises can also drown out and overpower a speaker's voice, especially depending on the locations of the speaker, the deaf student, and the background noise in relation to each other (Maclean, Andrew).

One of the major barriers for deaf students is the area of literacy and grammar. Auslan is a different language from English, and therefore English language skills are comparable to a second language for the deaf. Varying levels of oral communication may be used, but it is common for reading and writing skills of deaf students to be far behind those of their hearing classmates. A word in English may not translate directly to Auslan with the same connotation, so vocabulary often poses a problem. It is also possible for the word to be known and familiar in Auslan, but it is difficult to recognize that same word when it is written. This can lead to difficulties in reading. Resultantly, subtitles are not always a viable solution. Learning new vocabulary can be challenging, and often requires additional time for deaf students (Maclean, Andrew, Gauthier).

Etiquette is a common problem for people with full hearing when interacting with deaf students. It can come across as insulting and rude when someone speaks loudly and slowly rather than at a normal tone and pace. Also, singling out any particular student can often make him or her uncomfortable, especially if it is to highlight the fact that he or she is deaf. Misconceptions and assumptions about how to interact with deaf students can make for awkward situations, and it is often at the expense of the deaf person in the group. Contrastingly, ignoring any considerations for deaf students would be equally unkind. Such discomfort can be a barrier to education, as students can begin to distrust or resent any such educator, and therefore be reluctant to learn in that situation (Maclean).

Non-verbal sounds are very difficult to convey to deaf students. There are no words for the ferocity of a lion's roar or the melodious bird calls. While snapping fingers or clapping hands at least have a movement associated with them, a ringing bell is hard for a student without any hearing to appreciate. These noises can be very influential on a learning experience, especially within the context of the zoo, and therefore access to non-verbal sounds is a major barrier to be considered (Maclean, Andrew).

Barriers for Students with Vision Impairments

In an informal setting, such as the zoo, the barriers to students with vision impairments are significant. Much of the information obtained at the zoo is done through the ability to observe animals. In an educational program where animals are taken out for discussion, the visually impaired student will not be able to observe its movements, how it feeds, and other such activities. In addition, the animal characteristics such as shapes, colors, and textures are difficult to understand.

In any case where printed material is provided to students, the size of the text is vital for students with low vision. Without proper enlargement the student may not to be able to read materials such as instructions and worksheets. The color contrast of the material can also create a barrier to sight for some students. In addition, information that an educator writes on a whiteboard may be difficult for students to access.

Appropriate language is essential for students with vision impairments. Descriptors such as "over there" or "up here" are often accompanied with a hand gesture that a visually impaired student will not be able to observe. Students with vision impairments may also not be able to

understand complex analogies and descriptions of objects they cannot relate with. Another barrier regarding language is the ability of a student to identify the speaker. This can arise in question and answer formats where other students are required to answer questions. The visually impaired student may not know who the teacher is asking a question to unless that person is identified by name (Lewis).

When students are allowed to explore on their own, significant barriers can arise for students with vision impairments. Any obstacles that might be on the ground or protruding from a wall, could pose a threat to the student. Also, if there are a large number of other students exploring the same area, they can act as obstacles. Other barriers during exploring are displays and signage that provide information to the students. These displays must be in a form suitable for the use of students with vision impairments.

Other barriers that can arise with regards to the classroom environment relate to lighting and background noise. For students with low vision, the brightness of lights plays a significant role in their ability to observe. Also, glare from lights or from the sun can affect a student's ability to see an image. Background noise can cause students with vision impairments to be distracted and unable to focus on a lesson (Stinchcombe).

Barriers exist when students with vision impairments are asked to perform tasks involving movement or observing motion. Activities that involve targeting skills, such as moving an object from one location to another, are difficult. Observing these activities performed in a demonstration is also hard for these students (Stinchcombe).

Barriers for Students with Cognitive Impairments

Cognitive impairments cover a range of conditions including both learning and intellectual impairments. Learning impairments often refer to students who struggle with basic skills such as reading, writing, and socializing. This includes students with dyslexia, dysgraphia, and dyscalculia, but in most cases the disorder is left undiagnosed. Hyperactive Disorders such as ADD and ADHD are also conditions that affect the student's ability to learn. However, intellectual impairments are more profound and prevalent. Autism is one of the most common forms of intellectual impairments. It ranges from mild to severe, encompassing students with Asperger's as well as those with profound limitations. Some students may be very high functioning while others perform at levels much lower than their peers. As a result the barriers

these students encounter vary depending on the type and severity of the impairment (Adams, Halls).

Communication and Comprehension

Two of the major barriers for many students with cognitive impairments are communication and comprehension. For students who are verbal, some will simply repeat what they hear without actually comprehending the material. For instance, Autistic students often become very engrossed and focused on a certain topic and are able to retain large amounts of information. They may appear to have a very comprehensive knowledge but lack a true understanding of the subject. On the other hand, students who are nonverbal need visual supports as a means of communication. However, even though the students can obtain information visually, they often struggle to discern what is relevant, especially when presented with an overwhelming number of visual cues. For example, some of the students may look into an animal enclosure, but they may only see the cage or the plants, not the actual animal. Students with cognitive impairments also have a hard time imagining and understanding things with which they have limited experience (Dosser, Halls, Maloney).

Question and Answer portions of the programs can be exceptionally challenging for students with cognitive impairments depending on the situation. Many have difficulty understanding questions and formulating correct responses. The students may only give one-word answers or just repeat part of the question and often lack the ability to answer questions that include who, why, when, and where. On the other hand, some high functioning Asperger's students will be able to answer complex questions. Aside from the vocabulary, some students may not understand the structure or dynamics of question and answer sessions. They may struggle to follow a speaker and often cannot actively participate in a discussion (Adams, Dosser, Halls).

Performance

In almost any case, students with cognitive impairments benefit from following a schedule. It is beneficial to have a structure that breaks the activities and tasks down into steps. Students tend to have a problem deciding where to start, what they need, and how to act without any supervision or guidance. Students may also have habits or routines that are difficult to break. Something as simple as altering a bus route can cause significant problems. Students with Autism and other intellectual impairments often have difficulty recognizing changes and coping with them (Dosser, Halls).

Precautions taken with handling the animals depend on the individual student's needs. Some students may be anxious or scared, causing them to become distressed. Many simply lack the understanding of proper handling techniques and may accidentally hurt the animal. Students with Autism can be more problematic because not only do precautions need to be taken in order to keep the students and the animals safe, but they may have a harder time coping with exposure to a new or unknown animal (Halls).

Behavior

Oftentimes students with cognitive disabilities have stronger responses to sensory stimulation. Some students have a problem with certain types of lighting. Lights that are too bright or too dark as well as strobe or flashing lights can be distracting and bothersome. Some students find certain surfaces irritating, while others may be drawn to them. For example, some may be sensitive to the presence of sand in a classroom and will not want to sit on the ground. Others will be distracted by the sand and attempt to play with it. How the student responds depends on the situation. Sounds can also pose a problem for students with cognitive impairments. The type of noise that will cause an issue varies based on the individual. For instance, a student may react adversely to the sound of clapping, even if it is in the background (Dosser).

Sometimes having different staff members in the room can be disruptive to students with cognitive impairments. In this case the educator would need to rely on the teachers who understand the student's individual needs.

The goal for any student is to have him or her learn something from the zoo experience. Thus the program should be geared to the level of the students. However, it is difficult to

consolidate the needs and expectations of all the students, as their levels of understanding can vary significantly (Dosser).

4.1.3 Accommodations

A wide range of accommodations exists for students with disabilities. General accommodations can be made to improve the educational experience for all students. These accommodations incorporate principles of universal design in addressing issues that are common to students with all types of disabilities. Often specific adaptations are required for different disabilities. The needs of students with mobility, hearing, vision, and cognitive impairments will vary significantly and thus disability-specific accommodations must be made. Within a particular disability there can be a wide range of needs, thus programs should be adaptable on a case-by-case basis depending on the needs of the students with disabilities. This section breaks down some of the general accommodations as well as those relating to mobility, hearing, vision, and cognitive impairments.

General Accommodations

"The only common aspect of disabilities is that they are all different" (Johanson). The large range of disabilities often requires that adaptations be made on a case-by-case basis, depending on the needs of the individual. However, there are many general accommodations that can be made to ensure a better educational experience for students with disabilities. Often these accommodations will not only benefit the students with disabilities but improve the experience for the entire class.

Educational programs should attempt to use multi-sensory approaches to learning whenever possible to utilize a variety of senses for students with disabilities. Allowing students to have experiences by using their stronger senses will engage them and improve their capability to participate in the program.

One important area for accommodating students with disabilities is preparatory materials. For teachers of students with disabilities it may be necessary to convert the material that will be used in the educational program to an appropriate format. Providing this information to teachers before their participation in the program will ensure a better experience for the students. The teachers should also be notified about the material that will be discussed in a lecture. Given this

information, the teacher will be able to prepare the students before the visit. Often this will help the students pay attention to the speaker and increase their understanding of the subject (Lewis, Bond, Maclean, Johanson).

Often different goals are established for students with disabilities based on the severity of their condition. In an educational program it is important to prepare the material to cater to the needs of these individuals. Sometimes it may be necessary to simplify the material or change the amount covered to give the students more time to understand. Thus, understanding the most important concepts of the educational programs is essential for the educator to effectively communicate these ideas (Stinchcombe).

Communication with the teachers and aides of students with disabilities is important for the educator before participation in the program. The more information the educator can gain about the condition of the student will better inform the types of accommodations that are made. Specific questions about the needs of the student should be asked before the program. In the actual program, however, the educator should address the student with a disability when possible in order to engage him or her in the discussion. It is important to communicate directly with the student and only use the aide when the situation specifically calls for it (Maclean, Lewis).

Classroom setup and presentation styles are areas that the educator can make more accessible for students with disabilities. In general, when students are seated listening to the educator, they should be in a semi-circle so that all can observe. The educator should attempt to remain relatively stationary and not wander around the room. Most importantly if there are deaf students present who use lip-reading, the educator must be aware of facing the students at all times when speaking. Facing the class will also help project the voice better for all students to hear. Often it can be beneficial to provide preferential seating closer to the educator for the students with disabilities. Ensuring also that students have plenty of space to maneuver without any obstacles in their path is important (Maclean).

Providing a safe and comfortable environment is important for students with disabilities. When animals are brought out to be observed and petted, the handler must be aware of the type of reaction a student may have. This information can most often be obtained by asking the student if they are comfortable petting an animal. The educator should also start with an animal that is less likely to respond adversely to a reaction from a student. The educator can then judge the response of the student and determine whether to bring out another animal. In any program

where tools are used, it is important that these tools are safe for students. Glassware or anything that could break if dropped should be avoided and sharp tools should be labeled and used carefully. Making a safe environment will benefit not only students with disabilities but the welfare of all students (Zoo Educators).

Differentiated Instruction

Differentiated instruction accounts for different levels of understanding within a classroom. Although the students may be at the same level academically, intellectually the degree of comprehension can vary significantly. In general, it is necessary to prepare a lesson to account for three general tiers of understanding: above average students, average students, and below average students. In the case of a child with a disability it may be necessary for further adaptations. For example, if a child has a hyperactive disorder, a more intensive pace to the lesson may be required to keep the student active. Additionally, the instructor may need to assign special tasks to these students to keep them engaged (Erickson).

The Victorian Department of Education recognizes the need for educational programs to cater for diversity (Bond). One of the best ways to do this is to provide an interactive experience. In this way students are engaged at their own level of understanding and the teacher is still able to direct appropriate questions and instruction to the students. Differentiated instruction is particularly useful in classrooms where a physical or intellectual disability is present. However, the concept can apply to any educational setting with any group of students.

Accommodations for Students with Mobility Impairments

Many different accommodations need to be made for students with mobility impairments since limitations vary among students (Johanson). Therefore, accommodations should develop multi-sensory experiences to cater to students with different learning styles.

An important point to remember is that many students with mobility impairments develop their own strategies for adapting to situations. Educators should allow students the opportunity to complete a task without interfering. The more independence the student has, the more the student will learn and gain from the experience (Johanson, Simone et al.).

An aide will generally accompany a student with severe mobility impairments on an excursion. An aide can help the teacher to assess the capabilities of a student with mobility

impairments. Furthermore, if a student cannot physically write, the aide can record the student speaking, or take notes for the student (Eadon). Often the aide will "act as an extension of the student's body" (Simone et al.). In an activity such as feeling the scales of a reptile, the aide would assist the student by guiding the student's hand along the surface of the reptile. This allows the student to have a more meaningful and intimate experience (Johanson, Waldon).

An important concept to take into account when making accommodations for students with mobility impairments is that the accommodations should be adaptable. An educator should adjust to the comfort zone of a student. For example, students with cerebral palsy may be more comfortable sitting on a beanbag or on the ground. However, the opposite is true for students with other mobility impairments such as spinal cord injuries. In these cases students require restricted seating to maintain their posture. A classroom should be equipped with tables that are adjustable in height. Also the locations of the classrooms should be fully accessible and include ramps and an ample amount of space inside the classroom for students to move around (Johanson).

Another way to make students with mobility impairments more comfortable is to design exhibits at zoos and museums to be aesthetically pleasing as well as functionally pleasing. To achieve this, exhibits should be physically accessible from all directions. Students with mobility impairments may only have movement of one side of their body. Enough room should be provided for a wheelchair to approach from different angles. This will be especially beneficial for students who may experience difficulty turning their head. As Colin Johanson from COOL Mobility stated "A McDonald's drive-through is good for the driver, but not for the passenger" (Johanson). The removal of physical barriers will help all students get the most out of any experience.

Accommodations for Deaf Students

There is a wide array of ways to accommodate for deaf students in a learning environment. These can be looked at by breaking them down into three areas of accommodation: setting, information access, and personal interactions.

Setting

The setting can have a great influence on a deaf student's ability to access information and communicate. Sitting in a circle or a horse-shoe shape allows for students to see everyone in the room. This enables students to see who is talking and sets up the room so that all students are seated equally with regards to both the educator and the other students. And provided that there is not a pre-assigned seating order, it allows the student to find a location that best suits their needs. If a speaker is standing directly in front of a bright light, it can become difficult to see the speaker's face for lip-reading. Both lip-reading and using sign language would be challenging in a dark room. Keeping the room well lit greatly increases the amount of information that deaf students are able to gain from the program and is beneficial for all students, not only those who are deaf (Maclean, Andrew, Gauthier).

The acoustics of a room can play a very significant role in accommodating for deaf students. Ensuring that a room does not have a severe echo can help in allowing students with residual hearing to hear clearly by minimizing unnecessary sound. Similarly, limiting the amount of verbal communication that takes place outdoors would be very helpful as well. Outdoors there is a greater amount of ambient noise that can make it difficult to hear a speaker (Maclean).

Information Access

Providing tactile and visual objects to convey meaning or information is a useful tool in accommodating for deaf students. A multi-sensory experience is seen to be effective in education for all students, and tactile and visual elements would be highly effective for deaf students. Accessing an experience through other senses can make it more meaningful and helps to create a stronger connection and link to the subject being studied. For example, rather than simply talking about different animal coverings, having a sample of a fur and a scaly skin to pass around for students to touch would provide a tactile-visual example of the concept being learned. It is important to note, however, that subtitles may not be the best way to convert an audio-based experience into a visual one, due to a weakness in language skills (Maclean).

In order to accommodate for grammar and literacy differences in deaf students, it is often useful to provide vocabulary or lesson plans beforehand. This will allow students to become more familiar with the terms not only in a written context but also conversationally. Familiarity

with the vocabulary is immensely helpful for deaf students who lip-read and often need to rely on context to gain the most meaning from what is being said. Rather than struggling to keep up with the conversation, they can take in more of the visual and situational details that often add to the educational experience (Maclean, Andrew).

Personal Interactions

When it comes to personal interactions with deaf students, the best way to think of it would be that there should be no accommodations, but rather that deaf students should be treated like every other student in the room. Teachers of the Deaf that were interviewed recommended that educators do not address the interpreter, do not speak slowly or loudly, and do not single out deaf students. Treating the whole class equally makes everyone more comfortable, which can have a profound effect on the learning experience. Building trust by asking questions directly to the students and maintaining eye contact can make students more likely to absorb the lessons. Working in smaller groups is also beneficial for deaf students in that it is both easier and more comfortable to communicate within a smaller group (Maclean).

With regards to interpreters and aides, students who are deaf will often have the personnel with them, and it is not necessary for the program to provide them. There are key differences between interpreters and aides that should be distinguished so that educators can appropriately gauge the adult's role within the classroom. Interpreters are highly trained professionals whose role is to facilitate communication by signing everything that is said. They do not opinionate what is being said nor do they assist in any tasks or activities in any capacity. An aide, on the other hand, is rarely needed by a deaf student unless there are physical or cognitive disabilities present. An aide would focus on behavioral aspects and would take on more of a helping role (Maclean).

Accommodations for Students with Vision Impairments

There are many accommodations that can be made to improve the educational experience for students with vision impairments. Many of these accommodations focus on ways to utilize the other senses; hearing, touch, smell, and taste. A multi-sensory approach to learning will stimulate the student in a variety of ways that can improve the learning process. In addition, it is possible to make specific adaptations to assist students with low vision. All of these

accommodations are important in providing the most suitable environment for the education of students with vision impairments.

One of the most important ways for students with vision impairments to access information is through touch. It is used as a way for the students to "see" the object, by enabling them to feel its characteristics. When an animal is brought out for discussion, the visually impaired student will gain the most by being allowed to feel the animal. Thus, animals who respond well to touch should be used in these lessons. Although most students with vision impairments use touch in this way, some students are sensitive to touch. For example, a student might not like to use his or her fingertips to touch but is comfortable using the palm of the hand. An awareness of and sensitivity to the reactions of the students with vision impairments to touch is important (Stinchcombe).

Providing material to the teachers prior to participation in a program is particularly important for those that have students with low vision. Often the material will need to be adapted to fit the needs of the students. Any handouts or worksheets that will be used in the program should be given to the teacher in advance to be prepared in the proper format. Having this information available online to be downloaded by the teacher would be of great use. It is not only important that the teacher be able to properly prepare the students for the lesson but also that the students be able to participate in the activities of the program.

Braille can be used for any written handouts that will be given to the students. Although Braille is only used by a small percentage of the visually impaired population it is still considered to be an important form of communication (Lewis). A more important modification that can be made is to make sure that print is significantly large for students with vision impairments. The standard font size is 18 bold Arial. Also, using bright colors and sharp contrasts will help the students read the material. When possible, having the information in audio or electronic formats will make for much easier access (Stinchcombe).

Magnification is also an important tool. Students will often use monoculars or magnifying glasses to get a better look at an object. Although most students will bring their own magnification devices with them, it is beneficial to have some available. Video magnifiers are a great method of enlarging the size of an object. For example, if the educator is talking about the characteristics of an animal, the video magnifier can display the image in great detail for the student to see. This will enable the more active participation in the program (Lewis).

Tactile diagrams are often used and can be very useful in the education of a students with vision impairments. Tactile diagrams are basically models that provide a representation of the characteristics of something. Although tactile diagrams tend to be simple in nature, they can give students a sense of the shape, feel, or size of something. Most tactile diagrams use either Piaf paper or thermoform. Thermoform is a vacuum forming process where plastic is softened by heating and shrunk to a mold. The images are displayed much like a sculpture. Piaf paper is a special kind of paper that uses heat sensitivity to raise images. Both types of tactile diagrams can be effective tools for learning (Stinchcombe).

The environment surrounding a student can significantly impact his or her ability to learn. In general, students with low vision will benefit from a well lit room. However, this is not always the case. Some students actually see better with dimmer lighting. Having the ability to adjust the lights to fit the needs of the student is important. Also, using blinds or shades to cut down glare is helpful (Stinchcombe, Lewis). Another issue that can affect students with vision impairments is the presence of background noise. These students are often easily distracted by noises, so cutting down on background sounds during the educator's lecture is important. The seating arrangement of a classroom is also important. Some students do not concentrate well when sitting on the floor but respond better when in a chair and at a table. In an educational program where the students are required to sit on the floor, chairs should be available for students as an option (Stinchcombe).

Using appropriate language for students with vision impairments is essential. The language should be easy to understand and proper descriptors should be used to identify locations. When describing something it is important to relate it to a familiar object. For example, saying "as big as a car" will give the student an understanding of its size. Although the students may not have an understanding of different colors, the educator should still refer to colors so that they know how to communicate to others (Stinchcombe).

Students with vision impairments that are brought into an unfamiliar environment will most often have an aide with them. This aide will act as the "eyes" for the student, guiding them and explaining the surroundings. However, experiencing the new place through the eyes of a fellow student can prove very beneficial, as students often see things in a different way than adults (Stinchcombe). Pairing a visually impaired student with one of his or her classmates is generally effective and is especially useful when an aide is not present.

One of the most important accommodations that can be made is simply to allow more time. While sighted students can obtain information about something by observing it, students with vision impairments require time to touch the object to gain the same understanding. In an educational program, the educator may not be able to extend the time for the student. In this case, it is best to reduce the amount of information for that student so that he or she has more time to obtain and absorb the information. Sometimes it may be necessary to establish what things will be of most value and focus on effectively communicating these key ideas (Stinchcombe, Lewis).

Accommodations for Students with Cognitive Impairments

There is a wide range of accommodations that can be made for students with cognitive impairments. These can be viewed as four major themes of accommodation: communication, comprehension, behavior, and performance.

Communication and Comprehension

For students with learning and intellectual impairments it helps to use simple language, concepts, and interesting facts. If the educator speaks slowly and clearly, the students will be better able to obtain and process the information. Using vocabulary that the students will understand is important. Terms such as "more" and "finished" are concrete words used on a daily basis that imply a very basic task. It may even be useful to provide tapes for students to listen to while they are walking around and observing the animals. Students would then have the option of replaying information and working at their own pace. In terms of communicating with students who have limited to no language skills, using signing, symbols, and electronics will not only make it easier for the educator to communicate with the students, but will also help the students retain the information. Since strong visuals are a very important means of representing information, it may be useful to have pictures of the animals with signs/symbols on the back available. Pictorial representations of the rules and any additional information can be provided to help the students follow along with the rest of the class. Photos and information could also be sent to the school in advance so that the teacher could make any required adjustments to better prepare the students (Adams, Erickson, Zoo Educators).

Since structure and visual supports are so important, students in a formal classroom setting typically have boards with Velcro pictures to communicate objectives. For example, a

cup may signify a drink or a lunch box may signify lunch. Given that it takes longer for these students to process the information, these visuals help to connect what is being said to what is being done. This is especially useful for students who are nonverbal. These students often carry a "pix folder" with them that contains different words and images. It may be beneficial for the zoo to provide different images for the students to use or give teachers a lanyard with pictures of animals so the students can identify the animals they want to see (Dosser, Halls).

It is important to make the lesson age-appropriate but still relevant. Since the intellectual levels of the students will vary, it is beneficial for the educator to know what age level the students are functioning at prior to making any alterations to the curriculum. For question and answer portions of the lesson, it is useful to ask direct questions and to give the students enough time to respond. It helps to vary the level of difficulty of the questions in order to meet each students learning potential. For instance, if a student with a cognitive impairment is integrated in a mainstream group, the educator can ask that student a very basic question to keep the student focused and involved. More challenging question can then be directed to the rest of the group (Dosser, Zoo Educators).

However, depending on the type and severity of the impairment, some students may have a hard time responding to the questions so it is important to incorporate as many sensing and tactile experiences as possible. The educator can use different biofacts such as eggs and feathers or incorporate activities involving clay, playdough, or other mediums so the students can make connections between the objects and what is being said. Educators should also avoid saying too much at one time because it is harder for the students to retain the information. This will not only help students with cognitive impairments, but also students with hyperactive disorders who cannot sit and listen for an extended period of time (Adams, Weaver).

Behavior

For students with ADD and ADHD it is important to keep them active and involved. Giving them a special task such as holding an egg or petting fur will make it easier for them to sit through the lesson. Questions can then be directed to them regarding the object they are holding. It also helps to incorporate a variety of activities within the program. By having the students walk around, explore, and interact with the animals, it is more likely that they will pay attention for a longer period of time. Another way to maintain the students' attention is to provide chairs for the students to sit in. In most cases the students are able to sit on the floor, but having chairs helps prevent them from crawling around and fidgeting (Erickson, Dosser, Finlay).

In terms of educating students with Autism and other cognitive impairments, it is important for the educator to act positively. For instance, if a student does not want to pet a snake, they should have the option of doing something less threatening. In this way, the student will still be participating, but will have some control over the situation.

Often students with cognitive impairments have certain expectations of things, especially when they are following a schedule. Because of this it can be very disappointing when students go to the zoo to see a specific animal, such as an elephant, but do not have the opportunity. In some cases the students can become distressed enough to throw a tantrum. The problem is that they cannot rationalize why the animal is not there. Thus, it might be helpful if schools could enquire ahead of time about the animals in the program in order to better prepare the students and avoid any behavioral problems.

Another way to prevent these types of problems is to tell social stories which provide assurance. At various points, the educator can also reassure the students by saying "It's ok." With regards to the different activities and general classroom setup, it helps to cover things with a sheet so as not to be a distraction to the students. This is especially true for students with Autism. "If they can't see it, then it doesn't exist." However, it is important to know that if something is being taken away from them, then it needs to go either in the "finish box" or on a shelf. Otherwise the student will believe that the object is gone forever (Dosser).

Performance

Students with Autism and other cognitive impairments benefit from having a schedule available for their use so that they know what is expected of them. These schedules should be broken down into basic steps and tasks using visuals. Once an activity is completed it is necessary to place that picture into the "finish box" so the students know it is time to move on to the next activity. The "finish box" is a universal symbol from the Boardmaker Program (see Technology for Students with Cognitive Impairments) that is easily recognized by many students. For activities that require many tasks, it is essential to guide the students through each step. Students with cognitive impairments often have difficulty performing an activity independently because they struggle to identify the necessary approach to complete the task (Dosser, Halls).

In most cases students with moderate to severe cognitive impairments will have an aide with them. Both the teachers and aides should know how to respond to any disruptions, but in some cases they lack access to items and equipment that would normally be used in a formal classroom setting. Supplying blankets and calming visuals help to relax the students. Also it can be useful to assign a designated area where a student can withdraw from the group. Other examples of calming materials include trampolines, bouncing balls, and beanbag chairs. In all situations it is important to maintain a safe and secure environment. Locks, gates, and handles are all elements of a classroom that should be secured. Knowing that the students are safe will alleviate the pressure on the teachers (Adams, Dosser).

Before bringing out any animals, the educator should address concerns to the teacher or aide. Students with cognitive impairments typically respond well to petting animals, but in some instances they often have additional disabilities that may affect their motor skills and their ability to rationalize. Any precautions with the animals are based on the individual student's abilities and needs. Some students may be anxious or scared while others may be very excited, but in either case the student may not understand how to interact with the animals. The educator can use visuals to familiarize the student with the animal before bringing it out. This will help to ensure that the student is comfortable enough to handle the animal (Adams, Dosser).

Since students with cognitive impairments struggle with communicating and accessing information, the rate of their success is based on their individual goals. For example, it may be a great success if an autistic student can sit still and relax for the entire length of the program. It

can be particularly beneficial to incorporate games that test their knowledge and understanding of the material. In all cases, the amount a student can learn about the animals depends on the severity of his or her impairment. However, the techniques described in this section can be used to improve the education of students with cognitive impairments (Dosser, Gordon).

4.1.4 Technology

Many different types of assistive technologies exist for the various disabilities. These technologies help to improve the capability of a student to access information and to communicate with others. This section provides only a small sample of the many technologies that are available but covers some of the main devices used by teachers and specialty schools to assist students with disabilities.

Technology for Students with Mobility Impairments

Many assistive technologies have been developed to incorporate the range of challenges encountered by students with mobility impairments. Different technologies have been developed to support individual needs. Wheelchairs, leg braces, and other types of walking aids are of great importance to students with physical impairments.

Students may also have trouble communicating due to their mobility impairments. Assistive technologies facilitate communication through computer access. More advanced computers are equipped with touch screens and alternate keyboards for students who have restricted motor functions (Johanson).

Special assistive technologies called input devices have been developed so that students with limited motor skills and range of motion have the ability to operate computers. Pointers are based on head movement and are used to type on a keyboard. The pointer may be attached to a mouth guard or fastened to headgear depending on which works best for the individual student.

Speech recognition software is generally used by students who cannot communicate through writing. The students convey messages through a microphone and the software transfers the words onto the computer screen. This specialized software is recommended for students with clear speech and breath stamina. Another device that requires breath control is called a sip and puff switch. Students use variations in breath to navigate a wheelchair or a computer (Simone et al., University of Washington 2004)

A switch is a common alternative to a keyboard. The switch is a very versatile technology that helps students to communicate with virtually any extremity of the body. A student can activate a switch "with a kick, swipe of the hand, sip and puff by the mouth, head movement, eye blink, or touch" (University of Washington 2004). The switch also works in

conjunction with special computer software to enable a student to manipulate a computer (Simone et al).

Technology for Deaf Students

Technology to accommodate for deaf students is often provided by the students themselves. Hearing aids and cochlear implants improve the quality of hearing for that student and are used for all purposes of day-to-day living, not just education. During an educational program, FM systems can be used to transmit the educator's voice directly to the student. Educators would simply need to wear the headset or microphone provided by the student, and then proceed through the program as normal. These technologies would allow deaf students to hear more of what the educator was saying, and therefore enhance their educational experience (Maclean, Lowry).

In order to access non-verbal sounds, a potential solution for students with some residual hearing would be to have an audio recording of animal noises available on noise-cancelling headphones. This would eliminate all background noises and could have volume control for varying levels of hearing. Students with residual hearing would be able to gain more from this experience than if trying to hear a distant roar from a lion at the far corner of an enclosure while crowds of excited students chat noisily. Alternatively, the rumbling roar of a lion can be converted mechanically into vibrations so that students can feel the sounds they cannot hear. For simpler non-verbal sounds such as a ring of a bell, a flashing light or vibrating mechanism can be used. Variations of either light or vibration can be used to represent varying tone, pitch, or volume. (Maclean, Andrew, Maloney).

Technology for Students with Vision Impairments

The range of assistive technologies for the visually impaired has increased greatly in recent years. There are many devices that can be used to improve communication and functions. One such device is known as the Talking Tactile Table (T3) which was produced by the Royal National College for the Blind (RNC) in England. T3 enables the user to convert tactile images on a screen into audio feedback. The user can purchase a wide variety of programs that come on self-installing CDs. In addition, the user can make original tactile diagrams by using the T3

Authoring Tool. The T3 connects through a standard PC or laptop computer (Stinchcombe, RNC).

Another resource for the visually impaired is Digital Accessible Information System (DAISY). DAISY is a format for preparing audio information, such as books, on CDs. This system is designed specifically for people who are not capable of reading print and offers a superior reading experience through human voice production and an easily accessible format. DAISY books are much easier to use for a visually impaired person than the standard cassettes or books on CD (Stinchcombe, Daisy Consortium).

Portable Braille writing devices are used to type and record information in Braille. The PAC Mate, made by Freedom Scientific, is one such machine and is capable of storing information and refreshing its display. It will also connect to a computer and is compatible with Windows operating systems and software applications. These products, however, tend to be very expensive. The PAC Mate alone can cost upwards of $12,000 (Stinchcombe, Freedom Scientific).

Another important technology for improving the education of a visually impaired student is the video magnifier. One such product is called the SmartView Xtend and is produced by Humanware. This device enables the user to place print, objects, photos, etc. underneath a magnifier which then broadcasts the image onto a screen. The user can then adjust the focus and the amount of magnification (Lewis, Humanware).

These are just some of the many devices available to people with visual impairments. There are also many tools to assist with measuring and calculations. Examples of these are talking clocks, thermometers, calculators, rulers, and measuring tapes. Other technologies include downloadable information for mobile phone use, special podcasting, literacy software, and many others. All these devices can be great tools for the education of students with vision impairments (Stinchcombe, Lewis).

Technology for Students with Cognitive Impairments

There are two commonly used types of software for students with cognitive impairments; Boardmaker and Makaton. Both have the same fundamental principles of providing alternate forms of communication and learning techniques, but their styles and techniques vary. "The programs are intended to provide a visual representation of language which increases

understanding and makes expressive communication easier" (The Makaton Charity). Using these programs requires training and expertise. Although it may not be practical for educators at an informal education setting to receive this training, acquiring a basic knowledge of the program is beneficial. The educator can then provide a detailed description of the material to the teacher of a student with cognitive impairments so that it can be converted into the appropriate format.

Boardmaker is a universal program designed by Mayer Johnson that has a graphics database consisting of over 4,500 Picture Communication Symbols (PCS). The program has several features that allow the teachers or educators to personalize their pictures and images they wish to use in the class. These features include changing the size, spacing, and color of an image, and also the option of making worksheets, picture instruction sheets, schedules, and custom activities. (Mayer-Johnson, LLC) In a formal classroom setting, teachers use Boardmaker images for everyday activities. Since most students with cognitive impairments need visual supports, almost everything in the class is labeled with a picture, and any activities, schedules, or instructions are all organized with picture references (Adams, Dosser, Halls).

The other program, Makaton, is also a universal program that is recognized by 40 countries worldwide. The difference between Makaton and Boardmaker is that Makaton uses both symbols and signing. The program was first developed from British Sign Language and created by matching the signs with the most frequently used words. Similarly, the symbols were created to support written word just as signs support speech (The Makaton Charity).

There are various forms of these programs and additional instruments that can be made available to schools and organizations. Boardmaker Plus! adds voice, sound, animation, and video options that can be used with Boardmaker. Speaking Dynamically Pro, which is also compatible with Boardmaker, adds word prediction, abbreviation expansion, and human-sounding voices. There is also additional literacy software that can be used to support students with cognitive impairments such as dyslexia (Mayer-Johnson, LLC). All of these programs and instruments are useful tools for educators.

4.1.5 Evaluations

Success is a difficult concept to measure. Interviews yielded the broadest range of responses with regards to what each person felt was an adequate gauge for evaluating success. It could be anything from a smile to another person joining the fight against global warming. Some viewed it through the evaluations of the students; others saw it as an evaluation of the educators themselves. In any case, evaluation of an educational program is a key step in assessing what changes, if any, need to be made.

Student Evaluations

In some programs, an activity is used as a probe to gauge the student's level of understanding before beginning the actual lesson. This could be something as simple as asking them to sort a pile of animal coverings into different groups or even just asking a few questions relating to the topic being covered. By discovering what level the students are already at, the educator can be sure to keep the lesson at an appropriate level; not too simple or too advanced. After the completion of the lesson, a wrap up activity or additional questions can often show whether or not the students retained the information they had just learned, as seen through the use of new vocabulary or concepts.

Apart from activities that assess knowledge, evaluating the success of a program can be broken down into three categories: attitude, skill, and behavior. Attitude assessments are most often used during full day programs, since it is difficult to adjust a student's attitude and opinions within a 45 minute lesson. This can be done through questions before and after the day's activities, to see whether or not a student's views on a topic have shifted. Skill assessments are more formal assessments that have a clear yes or no result. Either a child has learned the skill or he or she has not, and this is most often gauged through tasks and student sheets by seeing if they have the right answers. Behavior assessments are very complex, and refer to how a student leaves the program and how excited they are about a concept. Behaviors can be looked at on a one-time or repetitive basis. One-time behaviors can be assessed at the zoo, such as giving the class a nest box to take home and put up in the yard and then calling to ask if they actually put it up. This behavior is a positive change for that environment, and reflects well on that class of students and the success of the program, but it is an activity that realistically can only be done once. Repetitive behaviors are harder to measure. It is impossible to know if educating a class

about energy conservation will affect their behavior enough to make them turn the light off every time they leave the room. The goal of the programs is to create a connection with the animals, build an understanding, and effect changes in behavior to help conserve the natural world. Assessing behavioral changes induced by programs is essential for gauging the educational success of the zoo (Lowry).

On a more informal level, there are a variety of ways to note the success of an educational program. Interestingly, the most common response to indicate a successful program was a smile. This simple facial expression is very universal in meaning, and is both easily recognizable as well as highly rewarding for the educator. It was also found that the standard for success varies according to the student, especially when it comes to students with disabilities. For some students, a success may be as simple as sitting still for the whole 45 minutes and petting an animal fur, without even engaging in the interactive aspects of the program. Many of the zoo educators use student participation as a meter for the quality of the program, as engagement shows both an interest and an understanding of the topic (All Teachers and Zoo Educators).

Educator Evaluations

With regards to assessing the actual programs, Zoos Victoria uses an evaluation form. It is given to the teacher with each school group that visits for an educational program, and the teachers are asked to either drop it off at the end of the day or to mail it back to the zoo location where the program took place. It covers topics including customer service, online program materials, relevance to VELS, student engagement, and any room for improvement. The form is very easy to fill out, with a number rating system as well as room for comments. However, the return rate on these forms is very low, and does not yield nearly as many responses as would be needed for any kind of analysis (Pritchard).

4.2 Observation of Zoos Victoria Educational Programs

In order to evaluate the Zoos Victoria Discovery and Learning Programs, the project team observed a range of educational programs at Melbourne, Healesville, and Werribee Zoo. The programs varied in themes and discussions, but offered similar learning experiences. A great deal of information was gained from examining the different programs.

In entirety seven programs were observed from several different educators. Three programs were observed at Melbourne, one program at Healesville, and three programs at Werribee. Notes on the programs observed are found in Appendix O. The table below lists the program type observed, and also illustrates the location of the program, name of the presenter, name of the observer, and the grade or age group of the students.

Program Type	Location	Presenter	Observer	Grade/Age
General Lesson	Melbourne	Shelley Waldon	Ben and Nicole	Grade 4-6
General Lesson	Melbourne	Mark Langdon	Justine and Sara	Grade 1-3
ESL- General Lesson	Healesville	Hillary Tabrett	Ben and Justine	Uni. Students
General Lesson	Melbourne	Shelley Waldon	Justine and Sara	Age Varied
Fur, Feathers, Scales, Skins	Werribee	Kylie Gordon	Sara	Age 8 and younger
General Lesson	Werribee	Rachel Lowry	Justine	Age 9-12
Vet Check- All Day Holiday Program	Werribee	Jason Shadie	Nicole	Age 5-12

Table 3: Observations of Zoos Victoria Educational Programs

4.2.1 General Program Structure

The structure of the educational programs was similar throughout the three locations. The educators would arrange to meet the students outside of the Discovery and Learning classrooms. When the students arrived, the educator would give quick instructions and safety rules before heading towards the classrooms.

The classrooms are designed in such a way as to give the students an immersion experience. The instructor has the option of either going straight to the classrooms, or taking some time to walk alongside the classrooms and view the animal enclosures. The classrooms are offset from the main walkways used by the general public and differ from typical classrooms. Each room is designed to convey a theme. Almost everything in the room is set up to match that theme, including bio-facts, animals, and even the illustrations on the walls.

There were two types of programs the project team observed; General Lessons, which included the Holiday Lessons, and specific lessons held for school groups. The General Lessons were designed to give the students a fun, hands-on experience while the other lessons were more structured. The majority of the programs observed were general lessons since the project was conducted over the summer.

In the general lessons, the educator reviewed what the students should expect prior to entering the room. Once all of the students were inside the classroom the educator allowed them to explore the room for the first few minutes then had them regroup and form a circle on the floor. The educator started off the lesson by bringing out animal skins, bio-facts, or other mediums. The objects stated above were passed around the circle to engage the students and assess how they would handle a live animal.

The other type of program observed was the themed program. Only two of these were actually observed, and they focused on educating the students about a specific topic such as animal coverings or becoming a veterinarian. These types of lessons are much more common during the school year, when the topics can coincide with teachers' plan for the students. In order to gain a better understanding of these programs, the lesson plans for the Melbourne programs were reviewed. They incorporated a wider range of activities for the students, which highlighted other potential barriers for students with disabilities. Notes from these lessons can be found in Appendix Q.

The structure of the lessons was very relaxed. The educators incorporated activities in between the question and answer portions. While the students interacted the educator gave information, asked questions, and answered any questions from the students. Then the educator prepared to bring out a live animal by reiterating that the students were safe and giving proper instructions on how to handle the animal. Again, the educator described the animal, and brought the animal around one by one to create a personal experience. At the end of each program the students shared the information they learned. The number and type of animals depended on the group and timeframe of the session.

4.2.2 Barrier Checklist

Concerning the zoo programs observed, barriers were identified and compiled in a checklist. The initial checklist was refined and transformed into a comprehensive barrier checklist. The barrier checklist provided further analysis of the zoo's educational programs. Barriers were determined by looking at tasks students had to complete and projecting what would make these tasks difficult for students with disabilities. New tasks and barriers were identified after each program was observed. The barrier checklist was divided into sections of mobility, hearing, vision, and cognitive disabilities. For example, the task of feeding a meerkat would present a barrier for students with mobility impairments, or trying to locate a camouflaged owl would be difficult for student with vision impairments. These results worked as the foundation for developing the framework.

A comprehensive list of barriers can be found in Appendix P.   The checklist identifies the type of disability affected, the task, the barrier(s) associated with this task, and possible solutions. An excerpt from the Auditory Barrier Checklist is provided below.

Auditory Barrier Checklist

Task	Barrier	Possible Solutions
Hear educator's instructions	Can't hear instructions properly	Written instructions Audio enhancement
	Construction noises make it difficult to hear	Give instructions indoors or in a different location
	Other students are noisy	Use the rhino nose activity to keep all students quiet

Figure 2: Excerpt from Auditory Barrier Checklist

4.2.3 Accommodations Made in Zoos Victoria Programs

After observing a range of programs, one of the first conclusions the project team made was that the educational programs at Zoos Victoria already cater well to students with disabilities. The classrooms are physically accessible and contain ramps and stairways leading into them. Once inside, the rooms are spacious and open; all the animal enclosures are located along the walls and any bio-facts used are set off to the side. The classes are very interactive and multi-sensory. Students get to move around, see and touch the animals, and have fun and personal encounters. This includes everything from touching a green tree frog, to petting a snake, finding the free-ranged reptiles, and feeding the meerkats.

There were a few clever techniques the educators used when trying to control the class as a whole. For example, Rachel Lowry from Werribee Open Range Zoo had the students touch their eyes and ears so she would know that they were both looking at and listening to her. Similarly, at the very beginning of the lesson she asked the students what sound a giraffe makes, the trick being that the giraffe does not make any noise, so from then on any time she asked the students to be as loud as a giraffe she was really asking the students to be silent.

In terms of teaching techniques that directly help students with disabilities, the educators kept explanations clear and concise. They always gave a quick overview of what the students would be doing and what they should expect once they entered the classroom. At the beginning of each lesson the educators passed around animal furs and other bio-facts to determine which animals the class would be able to handle so that neither the students nor the animals would be in danger. Also, the educator gave instructions of how to handle the animals and gave reassurance that they were not venomous or dangerous before bringing them out. However, the educator made note of any students who did not want to touch the animals. In one case Shelley Waldon from the Melbourne Zoo interlocked her hand with a young girl's hand and guided her to touch the snake. The child was too frightened to do it by herself, but with a little bit of encouragement and support she was able to overcome her fear. In another case she specifically asked two students with Asperger's to help her hold the snake as she brought it around the room. This allowed the students to build a stronger bond with the animal and yield a greater emotional response.

The project team also noted that some of the accommodations made for students with disabilities are similar to how educators approach ESL classes where the students do not fully

understand the English Language. For example, the project team sat in on a lesson at Healesville for ESL University students where Hillary, the educator, had to keep everything very simple and straight forward. The language and the activities the students participated in were simple, and the goal was to have them leave with a very basic understanding of the material covered. There were even times where she needed to give further explanation of certain words and write them on a whiteboard so that the students could both see the word and hear the description in order to understand its meaning.

Additionally, the educator needs to be able to make accommodations as situations present themselves. Despite the zoo's efforts to obtain information from schools before the group arrives, the educator is not always aware of the students' needs. For instance, Shelley Waldon gave a lesson to a group of students who had a variety of disabilities, but the extent and severity of the disabilities were less known. At one point she was bringing an animal around the group while talking to the students, encouraging them, and giving them positive reinforcement. As she made her way around the circle one of the parents informed her that one of the students was deaf, so rather than talking to that student, she used hand motions and body language to communicate.

As for question and answer portions of the lesson, the educators repeated what the students were saying so that everyone could hear and waited until everyone was quiet and paying attention before giving any information. The difficulty of the questions depended on the student's preparation and knowledge of the material, but in any case the type of questions could be adapted so that all students would have the opportunity to answer. At the end of each lesson, the educators restated information and repeated questions to reiterate the material covered and test what the students had actually learned.

The observations gathered by the project team aided in the compilation of the barrier checklist and helped the project team discover how Zoos Victoria already accommodates for students with disabilities. With this knowledge and understanding the project team was able to make recommendations of how to restructure the programs so that they not only meet the needs of students with disabilities but work towards the goal of universal design.

5. Introduction to PAR

The Program Accessibility Reference, PAR, was adapted from the barrier checklist into the form of a matrix to provide a model for adapting programs to accommodate students with disabilities. PAR was broken into five sections: universal design, mobility, auditory, vision, and cognitive. The universal design section provides recommendations to improve the quality of educational programs for all students. The four disability-specific sections of PAR contain a description of the spectrum for the disability, tasks that were identified as barriers, and solutions for these tasks.

This information was compiled into a matrix for each disability to connect the appropriate accommodations with each of the tasks identified as a barrier. The spectrum for each disability is indicated across the top row. The tasks are then listed down the left hand column. Within each cell of the matrix a solution code is contained and corresponds to a specific adaptation. The second row of the matrix contains solutions for "All Tasks." It is important to note that these accommodations are useful in every aspect of an educational program. In cells that do not contain specific solution codes, the reader should refer to the "All Tasks" row to find the required adaptation.

For easier use of this matrix, hyperlinks have been established to link the spectrum, tasks, and solutions to the matrix. Selecting one of these components of the matrix will take the reader to a more detailed description. To quickly return to the matrix, the reader can then select the heading of any spectrum, task, or solution.

5.1 Universal Design PAR

Universal design in an informal education setting focuses on ways to create an equal experience for all students. Although the range of disabilities is large and the accommodations for each disability can vary significantly, there are many principles of universal design that can be applied to improve the education of all students. These accommodations can affect the general structure of a program or setup of a classroom. However, most of the recommendations refer to ways that educators can develop their teaching techniques to provide a better educational experience for all students. This section lists a number of universal design accommodations and details on their implementation and impact.

Universal design accommodations
1. Apply Multi-sensory Approaches to Learning
2. Provide Preparatory Materials
3. Establish Appropriate Goals for the Programs
4. Communicate with Teachers and Aides
5. Set Up Classroom to Facilitate Learning
6. Use Proper Presentation Style
7. Enable Students to Work in Groups
8. Provide a Safe Learning Environment
9. Allow More Time

1. Apply Multi-sensory Approaches to Learning

Multi-sensory approaches to learning allow students with disabilities to use a variety of senses to access information. Programs should be structured to incorporate the stronger senses of the students in the lesson. In this way, information is transferred through alternate mediums, enabling the student to gain a better understanding of the material. Looking at ways to change traditional program structure to provide a more multi-sensory approach will engage students with disabilities by catering to their individual strengths.

2. Provide Preparatory Materials

Often the ability of students to learn in an educational program is greatly increased by providing preparatory materials for them to study prior to participation. By introducing the students to the subjects before the program, they are much more informed and apt to comprehend the lessons. The repetition of information that this creates makes it much more likely for the students to retain knowledge. In addition, providing the materials to teachers of students with disabilities enables them to adapt the format for the needs of the student.

3. Establish Appropriate Goals for the Program

Establishing the main goals of a program enables the educator to focus on the most effective ways to communicate these objectives. In general, students learn at different levels within the same classroom, and this is particularly true of students with disabilities. Thus, it may be necessary to simplify the material for certain students and focus on achieving the main goals of the program. This may require the removal of extraneous activities or information that will take up time and potentially overwhelm the student. On the other hand, some advanced students will benefit from a faster learning pace. So having the potential for advancement within a program could be considered.

4. Communicate with Teachers and Aides

Because the range of disabilities is so large, it is essential for the educator to communicate with the teachers and aides of the students with disabilities. Having more knowledge of the condition of the student will better inform the educator as to what types of accommodations should be made. Communication with the teachers and aides should take place prior to participation in the program. During the actual lecture, the educator should attempt to engage the student as much as possible and only refer to the aide when the situation specifically dictates it.

5. Set Up Classrooms to Facilitate Learning

The way that a classroom is set up can greatly affect students with disabilities. In general, when students are seated listening to the educator, they should be in a semi-circle so that all can observe. Sitting on the floor may affect the ability of some students to concentrate, so chairs should be available for use. Preferential seating should also be provided to students with disabilities to enable them a better vantage point to observe the educator. It is important to ensure that students have plenty of space to maneuver without any obstacles in their path.

6. Use Proper Presentation Style

The way that an educator presents a lecture can impact the ability of a student with a disability to access the information. When speaking to a class, the educator should attempt to remain stationary and avoid wandering around the room. This will make it less distracting for the students. If there are deaf students present who use lip-reading, the educator must be aware of facing the students at all times when speaking. Facing the class will also help project the voice better for all students to hear.

7. Enable Students to Work in Groups

Giving students with disabilities the opportunity to work with their classmates in a group can help their learning. Other group members may be able to assist with the completion of tasks or involvement in activities. It is important that the students with disabilities are able to utilize their strengths but are not held back from learning by a particularly difficult task. When students with disabilities interact with their classmates as opposed to a teacher or an aide, they are receiving information from someone their own age. Often this perspective can be very beneficial in their education.

8. Provide a Safe Learning Environment

In any educational setting the safety of students is paramount. When animals are brought out for observation and petting, the educator must be aware of how students may react. Using animals that are less likely to respond adversely to reactions from students is important. When tools are used in an educational program, it is important that these tools are properly labeled and safe for students. Glassware or anything that could break if dropped should be avoided.

9. Allow More Time

Students with disabilities may require more time to complete activities, perform tasks, or comprehend material than other members of the class. The educator may need to allow them extra time to be sure that they do not feel rushed and can learn in their own ways. Repetition is sometimes necessary for these students to retain information, thus the educator may need to extend the lecture on a particular subject. Tactile experiences are very important for students with disabilities and, in general, this type of learning will require more time. If it is not possible to allocate more time to an activity, the educator should consider reducing information or simplifying the activity.

5.2 Mobility PAR

5.2.1 Mobility Spectrum

The complexity of the human body lends itself to numerous situations in which mobility impairments can affect ones day-to-day life. Mobility impairments encompass a wide spectrum, and levels of severity vary from case to case. Conditions may be present at birth while others result from various diseases or injuries. Mobility impairments can range from temporary to permanent. The most common causes of mobility impairments among students are broken bones, paralysis, cerebral palsy, muscular dystrophy, and spinal cord injury. These impairments may impact a student's ability to complete tasks and fully participate in the learning process.

In order to assess barriers and apply appropriate accommodations, the spectrum of mobility impairments has been broken down into four principal categories. The categories are: limited fine motor skills, limited gross motor skills, limited range of motion and limited strength. An explanation of the limitations is discussed below.

Limited Fine Motor Skills

Students with limited fine motor skills experience various limitations in dexterity. Students may find it challenging to complete tasks involving the coordination of small muscles. Limited fine motor skills generally affect the function of muscles in the fingers, hands, and wrists.

Limited Gross Motor Skills

Limited Gross Motor Skills affects the control of large muscle activity. Students with limited gross motor skills may experience difficulty in activities such as sitting, standing, and walking.

Limited Strength

Students with mobility impairments experience varying degrees of strength. Even an activity that requires the slightest amount of physical exertion can be challenging for students and cause fatigue.

Limited Range of Motion

Students with limited range of motion generally find it challenging to coordinate limbs such as their arms and legs. These students may often have trouble accessing objects out of their reach.

5.2.2 Mobility Tasks/Barriers

Activities and tasks that can be challenging for students with mobility impairments were identified based on program observations and research. These tasks were then grouped and organized into categories so they could be coordinated with appropriate accommodations and solutions. These generalized tasks are described below with further details and examples.

Tasks:

- Navigation
- Reaching
- Communication
- Writing
- Lifting and Supporting an Object
- Throwing
- Using Printed Material
- Pushing Buttons
- Targeting

Task Descriptions:

Navigation

Navigation presents significant barriers for students with disabilities. Some students may be incapable of walking, or become fatigued by moving around too much. Furthermore, aids such as wheelchairs impose restrictions of maneuverability. Examples of tasks where navigation may be difficult are:

- *Exploring a room*
- *Navigating a path*
- *Assembling in a circle*

Reaching

In many cases, students with mobility impairments experience restrictions of reach. It may be uncomfortable for students to lift and extend their limbs to obtain an object. Limited range of motion hinders students from reaching over barriers as well.

A unique aspect of the educational programs is that the students have the opportunity to engage with live animals. Students with disabilities may not be able to pet animal skins or live animals due to limitations of reach.

Examples where barriers may arise are:

- *Feeding an animal*
- *Petting an animal*
- *Collecting samples*
- *Accessing objects at different heights*

Communication

Difficulty communicating is a prevalent barrier for students with mobility impairments. In some instances students cannot manipulate their muscles to speak clearly. It is important to ensure that students have alternate ways to communicate during activities including:

- *Question and answer sessions*
- *Group work*

Writing

Writing is a form of communication which poses significant barriers for students with mobility impairments. Writing requires a great level of dexterity. Students may experience difficulty in gripping a writing utensil as well as coordinating muscles to write. Activities which require writing include:

- *Taking notes*
- *Filling out worksheets*
- *Recording observations*
- *Marking down measurements or calculations*
- *Completing evaluations*
- *Tracing*
- *Drawing images*

Lifting and Supporting an Object

Lifting an object may be difficult for students with disability impairments as they may have trouble extending limbs and exerting the strength to hold an object. Supporting an object can also be a problem for students with mobility impairments because it requires a significant amount of strength. A student may experience fatigue if an object is too heavy. Examples where this issue may arise include:

- *Lifting animals*
- *Lifting bio-facts*
- *Raising any object*
- *Assisting the instructor in holding an animal*

Throwing

Throwing requires a great level of muscle control, strength, and range of motion. Partaking in a task such as throwing mealworms to the monkeys may be too strenuous of an activity for students with mobility impairments.

Using Printed Material

Students with mobility impairments may not be able to access information on printed material. Barriers posed include lifting the printed material and hardship in coordinating muscles to turn the pages. Examples of printed materials that need to be accessible include:

- *Activity sheets/worksheets*
- *Supplementary books*

Pushing Buttons

The task of pushing buttons poses barriers for students with mobility impairments. If a device contains numerous buttons, a student may not be able to select the intended button due to reduced fine motor skills. Difficulties include manipulating objects such as:

- *Calculators*
- *Keyboards*

Targeting

Targeting requires students to move objects from one location to another. Students with mobility impairments may experience difficulties in targeting due to limitations in strength and motor skills. Furthermore students may not be able to aim effectively due to poor hand-eye coordination. Activities that involve targeting are:

- *Petting an animal*
- *Feeding an animal*
- *Assembling puzzles or other objects*

5.2.3 Mobility PAR Accommodations

Mobility PAR

Spectrum / Task	Limited Fine Motor Skills	Limited Gross Motor Skills	Limited Strength	Limited Range of Motion
All Tasks	*M3, M7, M8, M10*	*M7, M8, M10*	*M7, M8, M10*	*M7, M8, M10*
Navigation	M1	M1	M1	M1
Reaching	M2	M2, M3	M2	M2
Communication	M2, M4, M5	M2,M4,M5	M2, M4, M5	M2, M4, M5
Writing	M4, M5	M4,M5	M5	M5
Lifting and Supporting	M9, M12	M9	M9	See All Tasks
Throwing	M9, M12	M9	M9	See All Tasks
Using Printed Material	M2, M5, M6	M2, M5, M6	M2, M5, M6, M9	M2, M5
Pushing Buttons	M5, M11	M5	M5	M5
Targeting	M11	See All Tasks	M9	See All Tasks

Figure 3: Mobility PAR Matrix

Mobility Accommodations List:

M1: Use a Physically Accessible Location

M2: Provide Preferential Seating

M3: Perform Warm-Up Exercises

M4: Utilize Alternate Forms of Conveying Information

M5: Implement Computer/Assistive Technology

M6: Adapt Printed Material

M7: Work in Teams

M8: Perform Activities with an Aide

M9: Use Lightweight Objects

M10: Ensure Equipment is Located within Reach

M11: Enlarge Size

M12: Enhance Grip

The following is a detailed list of solutions describing the accommodation. The italicized suggestions are ways to put these recommendations into action.

M1 Use a Physically Accessible Location

- *Use physically accessible classrooms*

Paths and classrooms should be physically accessible to ease navigation for students with mobility impairments. The distance of travel should be taken into account when choosing a classroom. Also, adequate space to explore the classrooms will enable students to maneuver without having to avoid obstacles or barriers.

M2 Provide Preferential Seating

- *Allow students to choose seats*
- *Provide the option of sitting at a table or on the floor*

For students with mobility impairments, preferential seating is a very important factor. Students with limitations in mobility should be able to choose a seat first, since relocating would be difficult once settled. Students will be able to further engage in a lesson if they are allowed to choose a comfortable seating location.

M3 Perform Warm-Up Exercises

- *Perform warm-up exercises that imitate the motions that will be necessary to complete the projected tasks*

It is important to incorporate warm-up exercises in order for students with mobility impairments to utilize fine and gross motor skills. Warm-up exercises will help students to relax and loosen their muscles. The exercises should imitate the motions that will be necessary to complete the projected tasks. For example, an instructor may ask the students to use two fingers to pet their arms, mimicking petting a live animal. Practicing activities which involves hand manipulation will be especially beneficial for the students.

Warm-up activities will also help the educators to assess the level of the students. If a child is rough with an object such as an animal skin, the instructor may choose to introduce an animal with tough skin or a hard shell.

M4 Utilize Alternate Forms of Conveying Information

- *Use a scribe*
- *Use picture books or flashcards*

The task of writing creates a physical barrier for many students with mobility impairments. Therefore, alternate ways to convey information need to be utilized. For example, some students may not have the strength or motor skills to raise their hand; consequently other body parts can be used as signals. The educators should communicate with teachers and/or students to find out which methods work best.

When written assessments are required, students with physical limitations can orally communicate to a scribe. Additionally, if students cannot manipulate their muscles to sketch pictures they could identify an animal from a picture book or flashcards.

M5 Implement Computer/Assistive Technology

- *Make materials available in electronic format*
- *Use the student's assistive devices*

The option to access materials in electronic format would make information more accessible to students with mobility impairments. A computer may be easier for some students to manipulate rather than printed material. Devices such as touch screens would be great resources to have available.

Special assistive technologies have been developed so that students with mobility impairments have the ability to operate computers. Often, students will bring their own assistive technologies. Input devices, such as pointers, aid students with limited motor functions to type on keyboards or turn pages. The pointer may be attached to a mouth guard or fastened to headgear. The need for assistive technologies is based on the individual student.

M6 Adapt Printed Material

- *Print material on sturdy paper*
- *Attach tabs to aid turning of pages*

Printed materials can be prepared and adapted to be more accessible for students with mobility impairments. Instead of printing worksheets on standard printing paper, activities should be printed on sturdy paper, similar to resume paper or card stock. Also, attaching labeled tabs to the pages of activity books will help the students to turn the pages and quickly navigate to the pages of interest.

M7 Work in Teams

- *Divide class into small groups for activities*

Working in teams is a great advantage for students with mobility impairments. Teamwork requires the sharing of ideas and combination of strengths. Classmates can assist students with physical limitations to complete tasks that pose physical barriers.

M8 Perform Activities with an Aide

- *Guide a student's hand to pet an animal*

An aide can facilitate tasks for students with physical impairments through co-activity. In an activity such as feeling the scales of a reptile, the aide would assist the student by guiding his or her hand along the surface of the reptile. This allows the student to have a more intimate and meaningful experience.

M9 Use Lightweight Objects

- *Use stuffed animals*
- *Use plastic models*

Students with mobility impairments may have limitations in strength, so lightweight objects should be provided as an alternative. For example, a medium such as an animal skull is relatively dense. If the skull is modeled in plastic, a student with limited motor functions may have an easier time handling the object. Another alternative could be using a stuffed toy to simulate a live animal.

M10 Ensure Equipment is Located within Reach

The comfortable operating range varies from student to student. Generally students with mobility impairments have a limited field of reach. In order to accommodate for various capabilities, the objects used in the sessions should be positioned in horizontal and vertical working reach. Any unnecessary barriers that would restrict access to objects should be identified and removed.

M11 Enlarge Size

- *Use Enlarged buttons*
  - *Keyboards*
  - *Calculators*

Providing equipment with enlarged buttons will make it easier for students with limited fine motor skills to manipulate objects. Many students with mobility impairments find it difficult to coordinate small muscles in their hands to select intended keys. The problem is due to the fact that standard buttons are too small and too close together. The ability of a student to target specific buttons will improve if items such as calculators or keyboards have augmented buttons.

M12 Enhance Grip

Surface enhanced grip is an essential adaptation for classrooms. Simple accommodations such as putting a rubber grip on a writing utensil will help students with physical limitations to grasp the item. Non-slip mats on tables will improve traction and prevent slippage.

5.3 Auditory PAR

5.3.1 Auditory Spectrum

Hearing abilities cover a very wide range for deaf students. From complete absence of hearing to only a slight loss, there are numerous ways in which deafness can be exhibited. In order to look at accommodations for all deaf students, this spectrum was broken down into four categories. These categories cover the means of communication as well as the amount of hearing. Some deaf students can communicate orally, while others prefer to use a manual method such as Auslan or Makaton. Therefore, the following four categories were used:

- Oral-Residual Hearing
- Manual-Residual Hearing
- Oral-No hearing
- Manual-No hearing.

Hearing:

"Residual Hearing"

Students with residual hearing are able to receive some form of auditory information. Students with residual hearing can have difficulty hearing quiet sounds or sounds with a particular pitch. They are often assisted by hearing aids or similar technologies.

"No hearing"

Students who are completely deaf do not receive any auditory information. As a result, these students rely on lip-reading and signing to communicate.

Communication:

"Manual"

Students who utilize manual communication rely on signing to converse with those around them. This may be through formal sign language such as Auslan or Makaton, or may be through simpler gestures. These students may physically be able to verbalize orally, but prefer manual communication.

"Oral"

Most students with residual hearing as well as some with no hearing can communicate with spoken language, and prefer oral communication over manual communication.

5.3.2 Auditory Tasks/Barriers

Activities and tasks that can be challenging for deaf students were identified based on program observations and research. These tasks were then grouped and organized into categories so they could be coordinated with appropriate accommodations and solutions. These generalized tasks are described below with further details and examples.

Tasks:

- Access Oral Information
- Access Nonverbal Sounds
- Reading and Writing
- Comparisons of Sounds
- Comprehension on the Lesson
- Identifying a Speaker
- Communicating with Others

Task Descriptions:

Access Oral Information

Deaf students may not be able to access verbal communication as well as other students. It may be a matter of too much background noise or not enough volume. There are also instances where the pitch or tone of a voice makes it difficult to hear. Listening may be a barrier for deaf students during:

- *Oral instructions from the educator*
- *Lesson lectures from the educator*
- *Questions and answers from other students*
- *Films*

Access Nonverbal Sounds

Nonverbal sounds are difficult to express in terms of words or signing. In the informal setting of the zoo, such noises add significantly to the experience. These sounds help to reinforce the lesson, and would be difficult to appreciate for deaf students. The following sounds would be included as nonverbal sounds:

- *Beeps or bells*
- *Animal calls*
- *Environmental sounds (water running, grass rustling, etc.)*

Reading and Writing

Reading and writing may pose a barrier for deaf students because their experience with the English language is often lagging behind their hearing classmates. English is a second language for students who use a form of signing to communicate, so activities involving reading and writing can be difficult. These activities may include:

- *Using worksheets*
- *Reading signs*
- *Taking notes*
- *Reading subtitles*

Comparisons of Sounds

Deaf students may have difficulty making comparisons and judgments about sounds. For example, if asked to compare one bird call to another, a deaf student may not be able to participate depending on his or her level of hearing. Such comparisons would include:

- *Differences in animal calls*
- *Variations in environmental sounds*
- *Asking students to be as quiet as a _____ (giraffe, mouse, anything quiet) in order to keep the class quiet*

Comprehension of the Lesson

Comprehension may become an issue for deaf students if they are unfamiliar with the vocabulary. Simply because they see a sign does not mean they know and understand its meaning. Similar problems arise with reading and writing. It is often important to ensure the comprehension of the following items during an educational program:

- *Goals of the activity or program*
- *New and abstract vocabulary*

Identifying a Speaker

It is important for deaf students to be able to identify a speaker so they may lip-read, sign, or even just listen more closely to that individual. Verbal information can become hindered if a deaf student cannot see or locate who is speaking. The following situations may lead to this problem:

- *Poor lighting in the room*
- *Seating arrangements that block the view of some individual's faces*
- *Allowing students to just shout out answers rather than taking turns to speak*

Communicating with Others

Other individuals in the classroom, educators and other students included, need to be able to communicate with the deaf student in order for the educational program to be engaging. Therefore, the deaf students need to be able to express themselves in such a way that they can interact with those around them, which may be a barrier if they:

- *Use sign language*
- *Cannot speak clearly*
- *Use written language*
- *Are not comfortable with using the above methods*

5.3.3 Auditory PAR Accommodations

Auditory PAR

Spectrum / Task	Residual Hearing- Oral	No Hearing- Oral	Residual Hearing- Manual	No Hearing- Manual
All Tasks	*A1, A2, A6, A7, A9*	*A1, A2, A5, A6*	*A1, A2, A5, A6, A7, A9, A10*	*A1, A2, A5, A6, A10, A11*
Access oral information	A5	A8, A9, A11	See All Tasks	A8
Nonverbal sounds	See All Tasks	A8	See All Tasks	A8
Reading and Writing	A3, A4, A5	A3, A4	A3, A4	A3, A4
Comparisons of sounds	See All Tasks	A3, A4, A8, A10	See All Tasks	A3, A4, A8
Comprehension of the lesson	A3, A4, A8, A11	A3, A4, A8, A11	A3, A4, A8, A11	A3, A4, A8
Identifying a Speaker	A3	A3, A6	A3	A3, A9
Communicating With Others	A3	A3, A9	A3	A3, A9

Figure 4: Auditory PAR Matrix

Auditory Accommodations List:

A1: Enhance with Visual and Tactile Elements

A2: Ensure Classroom Setting is Appropriate

A3: Work in Small Groups

A4: Use Alternate Means of Assessment

A5: Provide Vocabulary and Terms in Advance

A6: Direct Speech to Students, Facing Them

A7: Amplify Sounds

A8: Provide Detailed Descriptions

A9: Minimize Background Noise

A10: Use Sign Language

A11: Convert Oral Information into Written Format

The following is a detailed list of solutions describing the accommodation. The italicized suggestions are ways to put these recommendations into action.

A1 Enhance With Visual and Tactile Elements

- *Provide photographs, posters, and images relevant to the program*
- *Include diagrams or images of concepts that are difficult to put into words*
- *Have sounds represented by a vibration or a flashing light*

Visual elements of a program can be enhanced or emphasized to reinforce certain facets of the lesson. Providing posters and photos of the animals or diagrams of the concepts being discussed will allow deaf students to have a better understanding of the topic. It is important to note, however, that deaf students may not focus on the visuals if someone is speaking or signing, instead focusing on what is being said.

Mechanically converting sounds to either light or vibrations would create either a visual or tactile representation of an auditory experience. It could not only indicate the presence or absence of sound, but also represent the volume or pitch by varying the brightness or intensity of the light.

A2 Ensure Classroom Setting Is Appropriate

- *Students sit in a semi-circle around the educator*

- *Allow student to choose their seat*

- *Keep rooms well lit*

Giving the student his or her choice of seat will allow them to find a location that best suits their needs in terms of lighting and visibility. This may be best worked out with the teacher as well, as the educator may need to use discretion so that the entire class does not misinterpret this into a seating-optional situation. If an interpreter is accompanying the student, then they can be included in this consideration.

Sitting in a semi-circle allows all students to see each other as well as the educator. This enables deaf students to better identify who is speaking and ensure that students are able to lip-read. Additionally, all students have equal chances to ask or answer questions, which may become useful when deaf students are more likely to let others speak up.

Keeping the room well lit helps deaf students in multiple ways. The deaf students can have an easier time seeing the speaker or interpreter if he or she is not standing directly in front of a bright light or in a very dark part of the room. That allows the students to read lips more easily or to see the signs from the interpreter better. Since deaf students rely on visuals more heavily, lighting can improve the contrast and quality of the images they view, whether it is a video, a poster, a diagram, or a photo.

A3 Work in Small Groups

- *Reduce the number of students by splitting the class*

- *Divide the class into small groups for activities*

Whether it is a single deaf student in a mainstream setting or an entire class of deaf students, group work can be used to accomplish a variety of tasks and increase learning. Each student can contribute different knowledge and skills, and deaf students may have an easier time communicating with a smaller group of people as opposed to a full sized class. Group work also allows each student to contribute individual abilities and to make up for any deficiencies.

A4 Use Alternate Means of Assessment

- *Use pictorial representations or visual cues*
- *Make assignments a group effort instead of individual*
- *Ask questions orally when appropriate*

For any situations where either auditory-based information or literacy skills are used to evaluate a student's knowledge, an alternative method should be examined. Both of these techniques can be used by deaf students with residual hearing and oral communication, but can be extremely challenging for a deaf student with no hearing and only manual communication. It is not fair to exclude deaf students when evaluating a class during the educational program, so either using a different mode or providing options of modes of assessment would be more accommodating.

A5 Provide Vocabulary and Terms in Advance

- *Transcribe the script for any films or videos*
- *Provide unfamiliar concepts and terms to school prior to the visit to the zoo*

When learning a new concept or topic, it can be beneficial for deaf students to receive new vocabulary and terms in advance. This will give them the chance to learn the sign language as well as the meaning for them, so they are prepared to recognize and use the words during the discussion throughout the program. Similarly, deaf students who utilize lip-reading can benefit greatly by familiarizing themselves with the terms in advance, since lip-reading often requires context clues and comfortable knowledge of the words in order to access all of the information being conveyed.

A6 Direct Speech to Students, Facing Them

- *Speak to the student's face rather than to an interpreter*
- *Do not turn and move about while talking*

Students who lip-read need to be able to see the person speaking to them in order to properly read their lips. Not only does this facilitate access to what is being said, but it also engages the students. By engaging the students directly, it builds a trust that allows the deaf students to be more comfortable communicating their questions and comments to the educator.

A7 Amplify Sounds

- *Use Microphones and FM systems to direct auditory input to the student*
- *Have recordings of sounds such as animal calls available on noise-cancelling headphones with adjustable volume*

Students with residual hearing may only need an increase in volume in order to hear what is being said. The speaker's voice, the animal's call, and the sounds of the environment are all auditory elements that can be amplified to give deaf students a better opportunity to hear them.

A8 Provide Detailed Descriptions

- *Use full description of sounds including volume, duration, pitch, and what it is similar to*

When describing a sound that the student cannot hear, it is helpful to use the most detailed description possible. Additionally, students with both residual and no hearing would benefit from synonyms and context clues to establish a meaning for an unfamiliar word.

A9 Minimize Background Noise

- *Wait until the class is quiet to speak*
- *Reduce the echo in the classroom*

Waiting until the class is quiet to speak incorporates many levels of accommodation. Students talking over each other create unnecessary noise that can be hard to distinguish from the speaker's voice. Also, a deaf student would have an easier time knowing which individual is speaking when there is only one set of lips moving. Similarly, it would be easier for an interpreter to sign only one speaker's words as opposed to a whole crowd. The teaching process is easier when the educator has the attention of the entire class. The deaf student would have an easier time communicating with his or her peers if it was quiet in the room.

Reducing background noises and echoes will allow a deaf student to focus in on the speaker's words if they have any residual hearing. The acoustics of a room can influence the deaf student's ability to hear what is being said, and being sensitive to this will aid in the learning process for all students in the class.

A10 Use Sign Language

Students may both send and receive information through sign languages, such as Auslan and Makaton. This may involve the use of a third party interpreter. The interpreter translates what is said into sign language, as well as vice versa. It is important for the educators to know to speak at a normal pace, not to slow down, and to speak at a normal volume. Additionally, it is polite to address the student rather than the interpreter.

A11 Convert Oral Information into Written Format

- *Have instructions available in text*
- *Have lessons transcribed and available during the program*

Changing information from oral into a written or visual format allows deaf students to have access to all of the words as a backup rather than having to rely solely on lip-reading or sign language. This enables them to focus on other visual aspects during the lecture and not just the speaker.

5.4 Vision PAR

5.4.1 Vision Spectrum

The amount or severity of vision loss can vary significantly among students. While the majority of students with vision impairments have some residual vision, the spectrum ranges to complete blindness. In order to fully address the most common forms of vision impairments the spectrum has been broken down into four categories: Color-blind, Limited Field of Vision, Low Vision, and Blind. A more detailed description of each category is provided below:

Color-blind:

Color-blindness is a general term that can refer to a large number of deficiencies. Color-blindness can range from complete inability to perceive colors to difficulty distinguishing between two colors. The most common form of color-blindness involves problems differentiating between red and green. Total inability to see colors is extremely rare. Color-blindness is most common in males, affecting approximately 1 in 20.

Limited Field of Vision:

Certain vision impairments, such as Retinitis Pigmentosa (RP), involve the loss of peripheral vision. A person is considered legally blind when their field of vision is diminished to less than 20 degrees. In comparison, full field of vision is approximately 180 degrees. In general, a student with peripheral vision loss is able to see clearly within his or her field of vision.

Low Vision:

The majority of students with vision impairments fall into the category of low vision. These students have some residual vision and are able to see images with proper magnification. These students may be able to distinguish an object but often will not be able to see smaller details.

Blind:

A small percentage of students have total blindness. These students have no residual vision and rely entirely on their other senses, in particular hearing and touch, for obtaining information. These senses are often more enhanced than those of the average person due to a blind student's complete reliance on and use of them.

5.4.2 Vision Tasks/Barriers

Activities and tasks that can be challenging for students with vision impairments were identified based on program observations and research. These tasks were then grouped and organized into categories so they could be coordinated with appropriate accommodations and solutions. These generalized tasks are described below with further details and examples.

Tasks:

- Reading Text
- Viewing Images and Objects
- Observing Motion
- Writing
- Measuring
- Targeting
- Observing Comparisons
- Navigation
- Reading Digital Screens
- Communication with Others
- Identifying a Speaker

Task Descriptions:

Reading Text

Reading text poses problems for students with vision impairments because it may not be in an accessible format. Text may either be too small, not bold enough, or not in Braille. Examples of types of texts that need to be accessible include:

- *Worksheets*
- *Written instructions*
- *Labels*
- *Text on whiteboard or blackboard*
- *Text on a screen*
- *Information at animal displays*

Viewing Images and Objects

Images refer to 2-dimensional representations and may be difficult to view for students with vision impairments. Students with vision impairments rely heavily on touch as their way of "seeing" something so objects at a distance or 2-dimensional images will often prove inaccessible. Examples of such images and objects include:

- *Photos*
- *Posters*
- *Diagrams*
- *Animals in an enclosure*
- *Images on a screen*

Observing Movements

Observing the motion of either individuals or objects could pose a barrier. In the zoo setting, animal movement is often observed. Also, motions that the educator or classmates make can be difficult to see and interpret. Examples of motions that may be inaccessible include:

- *Animal movements*
- *Gestures from educator*
- *Classmates raising hands for questions*

Writing

Writing is important in most educational settings and poses a significant barrier. Blind students and students with very low vision will have great difficulty seeing the paper to write on. Examples of types of writing students may use include:

- *Taking notes*
- *Filling out worksheets*
- *Completing evaluations*
- *Tracing*
- *Drawing images*
- *Marking down measurements or calculations*

Measuring

Any measuring that is done using scales without digital outputs can be difficult. Most of the devices the student would use for measuring display numbers in a way that is inaccessible. Examples of types of measuring devices include:

- *Rulers*
- *Protractors*
- *Thermometers*
- *Measuring cups*

Targeting

Targeting refers to tasks that require students to move objects from one location to another. This type of activity involves aiming and thus may be difficult for students with vision impairments as they may not be able to see the target. Examples of targeting include:

- *Moving objects from one place to another*
- *Putting together a puzzle*
- *Assembling*
- *Feeding an animal*

Observing Comparisons

Comparing two things or observing how something changes can pose a barrier. Observing the relationship between two objects can be difficult, even when the student is able to touch the object. Observing small changes can also be a barrier because the student may not be able to see the level of detail, and it may also not be communicable through touch. Examples of where this may arise include:

- *Comparing two animals*
- *Observing changes on an animal*
- *Locating camouflaged animals*
- *Identifying changes in color*

Navigation

When students with vision impairments are required to move around in a classroom or other environment barriers can arise. There may be obstacles on the floor or protruding from a wall in the path the student takes. Other students or persons can also act as barriers as they are moving around the visually impaired student. Examples of when this issue may be prevalent include:

- *Exploring a room*
- *Navigating a path*
- *Finding a seat*

Reading Digital Screens

Reading outputs on a digital screen creates a significant barrier for students with vision impairments. In many cases, the instrument with the digital screen will not be capable of enlargement making it inaccessible to blind students and students with low vision. Commonly used instruments with a digital screen include:

- *Calculators*
- *Scales*
- *Watches*

Communication with Others

Students with vision impairments may have problems communicating with others. Most of the time this will not be a language issue but an understanding of how to give an explanation or a description. This can arise in question and answer sessions within a program.

Identifying a Speaker

Students with vision impairments may have difficulty identifying who is talking or who is being asked a question. In cases where the conversation shifts between multiple people it is important that the student be aware of who is speaking.

5.4.3 Vision PAR Accommodations

Vision PAR

Task \ Spectrum	Color-blind	Limited Field of Vision	Low Vision	Blind
All Tasks	*V8, V10, V17*	*V10, V11, V17*	*V6, V8, V9, V10, V12, V17*	*V10, V17*
Reading Text	See All Tasks	See All Tasks	V5, V13, V16	V5, V7, V14, V16
Viewing Images	V15	V15	V1, V2, V13, V15	V1, V2, V15
Observing Movements	See All Tasks	See All Tasks	V1, V2	V1, V2
Writing	See All Tasks	See All Tasks	V5	V5, V7
Measuring	See All Tasks	See All Tasks	V4	V4
Targeting	See All Tasks	See All Tasks	V3, V18	V3, V18
Observing Comparisons	See All Tasks	See All Tasks	V1, V3	V1, V3
Navigation	V15	V15	V15, V18	V15, V18
Reading Digital Screens	See All Tasks	See All Tasks	V4	V4
Communication with Others	See All Tasks	See All Tasks	V3	V3
Identifying a Speaker	See All Tasks	See All Tasks	V3	V3

Figure 5: Vision PAR Matrix

Vision Accommodations List:

V1: Provide Access through Touch

V2: Provide Access through Sound/Smell/Taste

V3: Use Descriptive Language

V4: Use Devices with Verbal Output

V5: Display in Audio Format

V6: Enlarge Text Size

V7: Use Braille

V8: Increase Color Contrast

V9: Adjust Lighting

V10: Minimize Background Noise

V11: Ensure Task is in Visual Field

V12: Magnify Objects and Images

V13: Use Video Magnifiers

V14: Use Screen Readers

V15: Ensure the Use of Proper Signs and Indicators

V16: Simplify

V17: Work in Teams

V18: Provide Guides

The following is a detailed list of solutions describing the accommodation. The italicized suggestions are ways to put these recommendations into action.

V1 Provide Access through Touch

- *Allow students to feel something that is being discussed whenever possible.*

- *Use tactile diagrams*

- *Perform activities that have tactile elements*

- *Use representations of objects that the student can touch*

One of the primary means of accessing information for students with vision impairments is through the use of touch. Often these students will have a heightened sensitivity to texture and are able to gain a great understanding of an object through tactile experiences. Providing objects that the student is able to touch in the course of a lecture as opposed to photos or descriptions

will greatly aid the student's learning. When animals are involved in a discussion it is always beneficial to allow the student to feel the animal if it is safe to do so. If the educator is talking about animal skins or scales, providing examples of these to the student is important.

In the case where a real animal or object is not able to be used, tactile diagrams and models can act as a good supplement. Piaf paper and thermoform paper are both used to raise images to create a tactile experience for the students. Thermoform is heated to conform to the surface of an object and then retains the shape and texture of that object. Piaf paper uses heat sensitivity to raise images so as to display them in a tactile manner. Both techniques can be effective to represent images in a way that utilizes the important sense of touch.

V2 Provide Access through Sound/Smell/Taste

- *Perform activities that utilize other senses besides sight and touch*
- *Incorporate sounds that convey meaning for the student*
- *Incorporate smelling and tasting into an activity if it is safe*

In addition to touch, it is important to utilize the other senses through a multi-sensory approach to learning. Students with vision impairments are capable of accessing much information through sounds, smells, and tastes. Matching a particular sound to an animal or other object is very useful. A non-verbal sound accompanying a change can act as a way to signal to the student that something has occurred. In the same way, when a student is able to smell an animal or taste plants and herbs, he or she gains a better understanding of the lesson and is able to retain more information.

V3 Use Descriptive Language

- *Provide descriptions that relate to the experience of the student*
- *Use proper descriptors to identify locations*

Proper language is essential for communicating ideas to students with vision impairments. These students often will not be able to relate to the size of an object so comparing it to something they understand is useful. For example, an educator could say that an animal is "as small as a finger." While the student may not be able to understand colors, the educator should still use them in descriptions so that the student knows how to communicate with others on the subject. In general, the language should be easy to understand and proper descriptors should be used to identify locations. Phrases such as "over there" are usually accompanied with by a gesture and are not helpful to students with vision impairments.

V4 Use Devices with Verbal Output

- *Talking clocks, thermometers, scales, calculators, and tape measures*

There are many devices with verbal outputs that exist to assist students with vision impairments in the performance of activities such as measuring and keeping time. Examples of these devices are talking clocks, thermometers, calculators, and tape measures. This technology can be used for students who are not capable of reading displays on digital screens or other measuring instruments.

V5 Display in Audio Format

- *Communicate instructions through audio tapes*

- *Provide information about displays*

- *Allow students to record thoughts instead of writing*

Audio recordings can be useful in communicating instructions or conveying information to students. Converting to an audio format can be extremely useful when text is inaccessible. This will give the student the freedom to rewind the tape to review material. In the zoo setting, audio recording can be used for animal noises at the displays. Additionally, recordings can contain information that the student can access when he or she is at a particular display or animal enclosure. Lastly, students can use audio tapes to record their thoughts and notes when writing would prove difficult.

V6 Enlarge Text Size

- *Use a larger font size (Arial 18 Bold is standard)*

Students with low vision will have difficulty reading text unless it is in a sufficient format. The standard font is Arial 18 Bold. This may not be sufficient for some students, as it depends on the severity of the impairment. Printed materials, such as instructions and worksheets, as well as text that are in an electronic format should be enlarged whenever possible.

V7 Use Braille

- *Convert printed materials to Braille*

- *Label displays with Braille*

Braille is another way of formatting text to make it accessible for blind students. Although Braille is only used by a small percentage of students, it is still considered an important tool. Printed material should be provided to teachers well in advance in case it needs to be converted to Braille. Braille can also be used on measuring devices to designate numbers and lengths. Various services, such as the Statewide Vision Resource Centre and Vision Australia, will convert information into Braille.

V8 Increase Color Contrast

- *Use contrasting colors in visual displays*

- *Avoid using colors that students can have difficulty distinguishing*

Students with vision impairments can have difficulty reading text or viewing objects without much color contrast. For text, it is useful to use a light background and a dark, bolded text. When displaying objects, it is best to show them against a contrasting background so that the image will stand out better. Using colors that a color-blind student may have difficulty distinguish between, such as red and green, should also be avoided. In the case where an animal changes color, the educator can provide other illustrations of this process to assist the student.

V9 Adjust Lighting

- *Make sure that lights are adjustable based on the needs of the students*

- *Use blinds and shades to cut down on glare*

Proper lighting is essential for students with vision impairments. In general most students will benefit from a well lit room. However, there are instances where a darker environment is more suitable, so it is important that the lights are able to be adjusted. Also glare from the sun or another source can affect the student's ability to see, so blinds and shades on lights are very useful.

V10 Minimize Background Noise

- *Minimize distracting background noises that do not add to the lecture*

Students with vision impairments can be affected significantly by the presence of background noise. These students are often easily distracted by noises, so the environment for a lecture should be relatively free of these outside sounds. Noises that accompany the presentation of an animal are generally useful for the education of the student. However, the constant sound of running water in the background during a lecture would act as a distraction.

V11 Ensure Task is in Visual Field

- *Perform demonstrations and activities in the student's visual field*

- *Place objects in the student's visual field*

- *Do not place objects large distances apart while referring to both*

For a student with limited field of vision, it is important that the lecturer is in the student's visual field when presenting an object or giving a demonstration. Objects may need to be adjusted to fit within the visual field. Establishing a particular student's range of vision is necessary before performing activities or displaying objects. This range can vary significantly among students with vision impairments. Objects that are separated by a distance may need to be brought closer together to fit within student's field of vision.

V12 Magnify Objects and Images

- *Provide students with monoculars or magnifying glasses*

- *Enlarge the size of pictures*

- *Enlarge the size of objects*

Magnification often improves the ability of a student with low vision to view images. Monoculars and magnifying glasses are tools that can be used by the student to see small objects. When pictures or diagrams are used, these should be enlarged for easier viewing. If the educator is giving a demonstration of something that may be difficult to see, providing models or photos will help the learning process.

V13 Use Video Magnifiers

- *Use video magnifiers to enlarge the size of text and objects by displaying them on a screen*

Video magnifiers can be used to display images in much greater detail. Text or objects can be placed on the device and magnified on the screen in front. The student is able to adjust the amount of enlargement as well as color contrasts and lighting.

V14 Use Screen Readers

- *Put written materials in an electronic format and use screen readers to translate this into spoken language*

Screen readers are technologies that translate electronic text into spoken language. This software is accessible through a computer. Other forms of preparing audio information exist, such as DAISY, to make books on CDs more accessible for students with vision impairments.

V15 Ensure the Use of Proper Signs and Indicators

- *Mark paths and dark rooms*
- *Label displays, diagrams, and pictures*
- *Raise text on displays and signage*

It is important that proper signs and indicators are used for students with vision impairments. Paths should have proper markings to guide the student. If the student is in a dark room, reflective markings or path lights should be used. Displays, diagrams, and other forms of conveying information should also be labeled in such a way as to provide a simple explanation for the student. Raising text on signs and displays can be used as an alternative to Braille and provides an accessible format for students with vision impairments.

V16 Simplify

- *Simplify written materials*
- *Simplify visual displays and diagrams*

Students with vision impairments often require extra time to access information. Thus written materials such as instructions or worksheets should be simplified and concise so as not to hinder the student's learning with extraneous information. Simple diagrams and explanatory pictures can also be used as an easier way of conveying information.

V17 Work in Teams

- *Group students with vision impairments with classmates to perform activities*

Students with vision impairments will often benefit from working with their classmates. Other members of the class can act as guides and assist in the completion of tasks. Some ways that other students can help would include reading text, giving further explanations, or describing objects and situations. Although classmates are not trained assistants and may struggle with providing understandable descriptions, it can be useful to give the student with a visual impairment a perspective from someone his or her own age.

V18 Provide Guides

- *Provide students with guides to assist with navigation and targeting activities*

Some activities that students with vision impairments may be asked to perform would require the use of a guide. When the student is navigating around a room to explore different animal enclosures, the presence of a guide would make this much more feasible. Guides would also be useful during activities that involve targeting and aiming such as feeding an animal.

5.5 Cognitive PAR

5.5.1 Cognitive Spectrum

Given the wide variety of cognitive impairments that range from mild to severe, there is also a large spectrum of the student's abilities. This spectrum ranges from low functioning to high functioning students. In order to make the most appropriate accommodations for all types of cognitive impairments, the spectrum has been broken into sections based on the student's skills and abilities. The spectrum has been divided into four parts: behavioral difficulties, comprehension difficulties, communication difficulties, and performance difficulties.

Behavioral Difficulties:

Students with behavioral problems may have trouble coping with certain situations and may lash out or throw a fit. Others struggle with social cues and may appear socially awkward, such as students with Asperger's. Putting them in new surroundings or exposing them to new things can be very problematic.

Comprehension Difficulties:

Oftentimes students with cognitive impairments have a hard time taking in much information at one time and are usually unable to fully understand what is being said. Also, students with cognitive impairments lack the ability to rationalize and make connections.

Communication Difficulties:

Students with cognitive impairments may have trouble communicating with both the educator and their peers. They may have a hard time asking and answering questions properly and in some cases students do not really know how to carry a conversation or participate in a discussion. Instead they may just repeat what they hear without having an understanding of it. Other students may be non-verbal and lack knowledge of the English language, so visuals act as an alternative form of communication to help present information to the students.

Performance Difficulties:

Many students with cognitive impairments have trouble organizing and completing tasks independently. Even tasks involving reading, writing, and spelling can be overwhelming. For this reason schedules are often used so the students can follow the procedure step-by-step and know exactly what is expected of them.

5.5.2 Cognitive Tasks/Barriers

Activities and tasks that can be challenging for students with cognitive impairments were identified based on program observations and research. These tasks were then grouped and organized into categories so they could be coordinated with appropriate accommodations and solutions. These generalized tasks are described below with further details and examples.

Tasks:

- Creativity
- Paying Attention
- Conversing
- Following Directions and Instructions
- Questions and Answers
- Understanding and Retention of Material
- Making Comparisons
- Navigating
- Interacting with the Animals
- Sitting
- Reading and Writing

Task Descriptions:

Creativity

Creativity includes tasks that require the students to use their imagination and envision different things. In some cases students may be asked to imagine something they have never seen or been exposed to before. Creativity is also a basic skill used in various activities. Tasks that require creativity include:

- *Telling or listening to stories*
- *Drawing or coloring pictures*
- *Creating enrichment devices*
- *Designing animal enclosures*
- *Pretending to be an animal*

Paying Attention

Not all students have the ability to sit for long periods of time and absorb information. Students with low attention spans have difficulty staying focused and on task. They may have a tendency to get up and wander away from the group or block out what the educator is saying. They may also become fidgety and restless. Situations that require the student's attention include:

- *Question and answer sessions*
- *Listening to the instructor*
- *Being aware of the surroundings*

Conversing

Communication is a problem for students who may not understand the English language or who struggle to understand new vocabulary. It also becomes a problem for students who are non-verbal and can only communicate using visuals. This can result from the teacher speaking too fast or not being direct.

Following Directions and Instructions

Directions require the students to understand what is being asked of them. Unless the directions are clear and broken down step-by-step, some students may not be able to complete the task. Some directions may be important to the student's safety. Thus it is important to have alternate ways to communicate this information to students who struggle with comprehension. In these cases students may then have a problem deciding where to start, what they need, and

how to act without any further guidance. Possible directions the students may be asked to follow include:

- *Actions in the classroom*
- *Completing an activity involving discovery and assessment*
- *How to handle the animals*

Question and Answers

Question and answer portions of a program require the students to pay attention to the educator, understand what the question is asking, and formulate an appropriate response within a short period of time. The difficulty of the questions may not be suitable for students with cognitive impairments and may greatly reduce their ability to participate.

Understanding and Retention of the Material

Some topics or concepts are too complex for students to understand. If too much information is given at one time the students may not be able to process everything all at once. Even trying to discern relevant information can be challenging, especially when the student is exposed to something for the first time. In some cases, students with cognitive impairments are able to retain information but do not actually understand the material. For many students it is beneficial to have visual reinforcements to help them relate what is being said with what they are supposed to do. Possible situations that require the students' understanding includes:

- *Information regarding the animals and their habitats*
- *Safety precautions*
- *Descriptions of activities*
- *Purpose of activities*

Making Comparisons

In order to make comparisons, students need to be knowledgeable on at least two different subjects and have the ability to determine similarities and differences between them. This requires students to pay attention during the program and have an understanding of what is being said. Instances that may require the students to make comparisons include:

- *Comparing two animals or different species*
- *Comparing different environments and habitats*
- *Examining different x-rays*

Navigating

Navigation requires students to focus on and perform certain tasks independently. Navigation is hard for students who are easily distracted and have short attention spans. In these cases students may wander off from the group or may quickly lose interest in something. Situation that may require navigation includes:

- *Reaching out and touching an animal*
- *Walking around the room and exploring*
- *Moving or assembling objects*

Interacting with the Animals

Students with cognitive impairments often lack the ability to rationalize and may harm the animals unintentionally if left unmonitored. If students are not paying attention they may miss the instructions about safely handling the animals. Students with behavioral problems may get frightened and throw a fit. This could be problematic when handling animals that require students to be calm and quiet.

Sitting

When sitting on the floor, students may be tempted to crawl around and wander away from the group. Object within arms reach can be a distraction to the students. As for students who communicate and learn using visuals, there may be obstructions that prohibit them from seeing. Also, some autistic students are very sensitive to different surfaces and may not like to sit on the floor or touch certain surfaces that are unfamiliar or uncomfortable.

Reading and Writing

Reading and writing poses a problem for students who lack the understanding of the English language or who have trouble organizing their thoughts and expressing them in words. New vocabulary and complex concepts make it difficult for students to interpret and retain the information. Activities that may require reading and writing include:

- *Using worksheets*
- *Reading signs*
- *Taking notes*
- *Captions and description*

5.5.3 Cognitive PAR Accommodations

Cognitive PAR

Task \ Spectrum	Behavioral Difficulties	Comprehension Difficulties	Communication Difficulties	Performance Difficulties
All Tasks	*C5, C6, C9,C10, C11*	*C1, C2, C3, C4, C8*	*C1, C3, C5, C7*	*C3, C5, C6, C8*
Creativity	See All Tasks	C5, C6	C6	C4
Paying Attention	C3, C4	C1	See All Tasks	See All Tasks
Conversing	C9	See All Tasks	See All Tasks	C1
Following Directions and Instructions	C9	See All Tasks	See All Tasks	C1
Understanding and Retention of Material	C4	C5, C6, C7	C2	C2
Making Comparisons	See All Tasks	C6	See All Tasks	See All Tasks
Navigating	See All Tasks	C5, C6	See All Tasks	See All Tasks
Interacting with the Animals	See All Tasks	C5	See All Tasks	C9
Sitting	See All Tasks	See All Tasks	See All Tasks	See All Tasks
Reading and Writing	See All Tasks	See All Tasks	See All Tasks	See All Tasks

Figure 6: Cognitive PAR Matrix

Cognitive Accommodations List:

C1: Speak Slowly and Clearly

C2: Vary the Level of Difficulty

C3: Enhance with Visual Elements

C4: Enhance with Tactile and Multi-Sensory Elements

C5: Perform Activities with an Aide

C6: Work in Small Groups

C7: Provide Vocabulary and Terms in Advance

C8: Follow a Schedule

C9: Have a Positive Attitude and Atmosphere

C10: Use Behavioral Equipment

C11: Ensure Classroom Setting Is Appropriate

The following is a detailed list of solutions describing the accommodation. The italicized suggestions are ways to put these recommendations into action.

C1 Speak Slowly and Clearly

- *Use basic vocabulary*
- *Simplify the language and concepts*
- *Avoid saying too much at one time*

Using basic vocabulary will help to eliminate any confusion regarding instruction and activities. Terms such as "more" and "finished" are easy for students to recognize and follow. By speaking slowly and clearly, students will be able to understand and process more information, especially if the educator avoids saying too much at one time.

C2 Vary the Level of Difficulty

- *Ask questions to meet each students learning potential*
- *Give students enough time to respond*
- *Make sure the program is compatible with the students' intellectual capabilities*

Educators should be aware that all students function at different levels. Some students are more intellectually capable than others, so it is important to cater to a range of understanding. The material and concepts covered should be neither too difficult nor too easy. The educator should evaluate the student's knowledge and understanding of the material and make any

necessary changes to the curriculum at the beginning of the lesson. During question and answer portions of the program the educator can ask the students either basic questions or complex questions depending on their capabilities. This method is especially useful when there is only one student with a cognitive impairment integrated into a mainstream school.

C3 Enhance with Visual Elements

- *Provide information and resources compatible with programs such as Boardmaker and Makaton*
- *Provide photographs, posters, and images relevant to the program*
- *Include images of concepts that are difficult to put into words or understand*

One of the most important ways the educator can better accommodate for students with cognitive impairments is to use visuals. Visuals are an important means of communication and help the students connect what is being said to what they are supposed to do. Oftentimes students use boards with Velcro pictures to make a list of what they want to do. This is especially important for students who are non-verbal. Boardmaker and Makaton are two of the common programs that provide universal pictures and symbols for schools or other administrators to use. It may be beneficial for the zoo to provide different images for students or have access to programs such as Boardmaker and Makaton so that students can identify the animals they want to see and activities they want to do.

C4 Enhance with Tactile and Multi-Sensory Elements

- *Use objects and biofacts relating to the topic*

Allowing the students to walk around, explore, and interact with the animals will help to keep them interested and focused. This caters well to students with hyperactive disorders who have trouble sitting for an extended period of time. If the students are able to see and hold different biofacts such as eggs, feathers, and furs, then the students are more likely to sit and pay attention. However, such objects could act as distractions, so it is important to ask questions relevant to the object to keep the students focused. Biofacts are also beneficial to students who have difficulty interpreting what is being said. By hearing the educator, seeing the object, and being able to touch it, the student is more likely to learn the information.

C5 Perform Activities with an Aide

- *Assist students with petting the animals*
- *Help students complete activities*

- *Monitor the students*

An aide can help the students to interact with the animals and participate in the activities in a safe, efficient manner. Some students with cognitive impairments lack the ability to rationalize. Thus it is important to test how the students will react and respond to the animals before bringing them out. Some students may be too rough to handle the animals, in which case it may be better to let them touch the furs or skins. Other students may lack the coordination or may not understand how to touch the animals and would benefit from having an aide guide their hand. Activities that require assembly, movements, or following directions would benefit from the presence of an aide.

C6 Work in Small Groups

- *Group students with people they are familiar and comfortable with*

Students with cognitive impairments can benefit from working in small groups. Their peers will know them better than the educators and are often able to assist the students in completing the assignments or activities. It is important to place the students with people with whom they are familiar and comfortable. This will help the program run smoothly. Groups are also good for sharing information and ideas and enabling students with cognitive impairments to access alternate information.

C7 Provide Vocabulary and Terms in Advance

- *Provide unfamiliar concepts and terms to schools prior to the visit to the zoo*

Students with cognitive impairments require adequate time to learn new material. By providing information in advance, teachers can spend more time with the students and ensure that they have a basic understanding of the material before visiting the zoo. For students who communicate with visual references, such as those from Boardmaker, teachers will be able to prepare documents and images that the students can use once they arrive at the zoo. In doing so, students will have an easier time recognizing what the educator is discussing throughout the program.

C8 Follow a Schedule and Provide Structure

- *Provide an outlined schedule including times and locations*
- *Tell students when an activity begins and ends*
- *Break tasks into small steps that are easy to follow*

Many students with cognitive impairments are accustomed to following a set schedule on a daily basis. Having structure and a plan of action allows the students to stay on task and know what is expected of them. These schedules should be broken down into basic steps and tasks with visual representations. Some students with cognitive impairments, such as students with Autism, have a difficulty following directions and completing tasks independently. Thus it is beneficial to break everything down to its simplest form. Once an activity is completed, the educator should clarify that the activity has finished and that they will be moving on to something else. With the Boardmaker program, teachers place the pictures from the schedule into the "finish box" so that students know that the activity is finished. The "finish box" is a universal symbol that students will recognize and understand.

C9 Have a Positive Attitude and Atmosphere

- *Provide reassurance*
- *Tell social stories*
- *Ensure the students are safe around the animals*

Having a positive attitude and reassuring the students that "It's ok" will help to keep the students calm and relaxed. Students are often nervous to touch some of the animals, but will be more likely to participate if the educator encourages them to interact with the animals and ensures them that they are safe. In some cases it helps to perform the activity along with the student. For instance, the educator can link hands with the student and touch the animal so that the student is not alone. In other cases, students may need to be prepped with social stories as an assurance. For example, some students may always be told not to go near snakes. So teachers can tell a story to reiterate that students should only approach snakes that the zoo educator brings around.

C10 Use Behavioral Equipment

- *Provide equipment to help calm the students: bean bag, big ball, trampoline, blankets*
- *Provide chairs*
- *Designate a quiet space*
- *Provide manipulatives*

Having certain items and equipment available for school groups to use can help eliminate problems involving students who may be disruptive to the rest of the class. Items such as blankets and calming visuals will help relax the students. Bouncing balls that the students can sit

and bounce on or small trampolines that students can use if they throw a fit will help to calm students down when they become distressed. It may even help to have a designated area where students can withdraw so as not disturb the rest of the group. Sometimes just giving the students something to hold and play with, such as play dough, will make it easier for them to sit through the lesson. Also, even though most students with cognitive impairments are capable of sitting on the floor, they will be less tempted to wander off and become distracted if they are sitting in chairs. Thus alternative seating arrangements may be beneficial.

C11 Ensure Classroom Setting Is Appropriate

- *Use sheets to keep things covered that may act as a distraction*
- *Make sure the surroundings are secure: locks, gates, handles*

To keep students focused it helps to cover things with sheets. If it is out of sight, then it is out of mind. This is typically true for all students, especially those with cognitive impairments, hyperactive disorders, and Autism. However, there are always some students who become distracted and tend to wander off from the group. In these cases it helps to have tall, discrete fences surrounding the classrooms and locks that are out of reach.

6. PAR Evaluation

Fur, Feathers, Scales, and Skins (FFSS) is an educational program available at all three Zoos Victoria locations for children aged 5 to 10. The program is run in a similar manner at all three zoo locations with only slight variations. This program was observed by the team at Werribee and is described in Appendix O.   In general the program begins by bringing students around to animal enclosures outside of the classroom. The students are then brought inside and allowed to explore the classroom before sitting. A student volunteer then sorts a pile of animal coverings into groups, which eventually leads to discussion about animals and their different types of coverings. Several animals are brought around the classroom, accompanied by more discussion. After the conclusion of the program, students are brought to the sinks outside to wash their hands. A full version of the Melbourne lesson plan for FFSS is available in Appendix R. As a part of the case study, this program will be considered from the point of view of four hypothetical students with disabilities, and the program will be structured as it had been observed in Werribee (Appendix O).

6.1 Implementing Universal Design

The Zoos Victoria staff seeks to make their educational programs more accessible for students with disabilities. In addition to changes that are made on a case-by-case basis, general accommodations exist to improve the overall structure of the programs. The concept of universal design aims to enhance the accessibility of any situation, regardless of the disability. By making the program universally accessible, the quality of the program improves for all participants. All nine of the accommodations listed under the Universal Design PAR can be applied to the program, and examples of how to accomplish this are listed below.

Universal Design 1- Apply multi-sensory approaches to learning

Varying the senses used by students during the program can be accomplished in many ways. Playing a recording of environmental sounds while students wander the room, such as animal calls, rain, wind, or waves crashing, can add to the discovery experience. Supporting the classroom discussion with visual images can reinforce the topics for many students. Increasing the number of tactile objects the students are allowed to experience will strengthen the level of engagement for every class.

Universal Design 5- Classroom setup:

The current layout of the classroom includes some large rocks or wooden stumps around the room, in addition to plants and enclosures for the animals. Pushing stumps or rocks to the far perimeter or completely out of the room reduces the risk of any student tripping over them.

Universal Design 7- Enable students to work in groups:

Rather than having one student separate the pile of animal coverings by type on their own, allowing them to have a partner would make the task more manageable without detracting from the educational value of the activity.

By implementing these changes, the program becomes accessible for a wider range of students. Students with vision impairments can hear the environmental sounds and won't need to fear stumbling over a displaced rock. Deaf students will receive additional visual information from the images during the discussion, as well as benefiting from the tactile experiences. Students with mobility impairments can navigate the clean and organized classroom and can have a partner help them physically sort the animal coverings into groups. Students with cognitive impairments can have their attention held by the tactile objects and will be able to comprehend the lesson with the help of the visuals provided during the discussion.

Even still, these changes do not accommodate entirely for all students with disabilities. A student with visual impairments may not be able to see the animal coverings that another student is sorting. A deaf student may not hear the child sitting behind him ask a question. The student with mobility impairments may not be able to grasp the materials. A student with cognitive impairments may not be able to appropriately verbalize her question for the educator. These students would benefit from additional accommodations made on a case-by-case basis. This can be achieved by the zoo educator utilizing the disability-specific PAR before the student's arrival at the zoo. This allows the educator to implement the adaptations both before and during the lesson.

The following four students are hypothetical visitors to the zoo. Each has a specific disability and this case study will look at the accommodations made for them within the FFSS program. The details of the student's impairment will be given in addition to the barriers the FFSS program will present even after the universal design changes. The appropriate solutions

and recommendations based on PAR will be provided with examples of how they can be implemented.

Case Study 1: Sue- Mobility

Case Study 2: Thomas- Auditory

Case Study 3: Ian- Vision

Case Study 4: Jodi- Cognitive

6.1.1 Case Study 1: Sue – Mobility

Sue is a 9 year-old student with a condition known as cerebral palsy. She attends a mainstream school in Melbourne, Australia. Sue and her classmates will be participating in the Furs, Feathers, Scales, and Skins program at Werribee. Her teacher has informed the zoo educator of Sue's limitations during the pre-visit phone call. The teacher also affirmed that Sue uses a power wheelchair and that an aide will accompany her on the field trip.

Cerebral Palsy is a permanent physical condition caused by damage to the brain. Symptoms of cerebral palsy may range in severity. Sue has spastic cerebral palsy which limits her fine and gross motor skills. Her muscles are usually stiff and difficult to control. She finds it especially challenging to coordinate the muscles in her hands to write. An aide assists Sue to complete activities that are not physically accessible.

Within the Fur, Feathers, Scales, and Skins program, Sue would experience several challenges. Navigating the grounds around the discovery and learning classroom, as well as within the classroom itself may become difficult with a wheelchair. Feeding the meerkats involves a certain level of muscle control. While she can raise her hand to ask questions during the lesson, she may not be able to sort the piles of animal coverings on the floor in the middle of the room. These are just some of the situations in which Sue's Cerebral Palsy may affect her experience during the zoo's educational program.

The zoo educator has already made sure that the selected program incorporates the principles of universal design. The next step is to reference PAR for specific adaptations that will make the program more accessible to Sue. For individuals in the limited fine and gross motor skills categories, such as Sue, the Mobility PAR recommends the following accommodations and provides the following suggestions for all tasks. For the purpose of this

case study, the abbreviated version of these solutions is provided below, since these will be incorporated into the entire program:

M3 Perform Warm-Up Exercises
- *Perform warm-up exercises that imitate the motions that will be necessary to complete the projected tasks*

M7 Work in Teams
- *Divide class into small groups for activities*

M8 Perform Activities with an Aide
- *Guide a student's hand to pet an animal*

M10 Ensure Equipment is Located within Reach

Additional accommodations can be made for Sue based on the activities of the FFSS program. In order to navigate the area outside the classroom to view the meerkats, using a physically accessible location would be an important accommodation (M1). This would cue the educator to clear the dirt paths from obstructions such as branches and rocks. It would also be implemented by using one of the classrooms with a ramp. While outside, the educator has the students feed the meerkat mealworms. This requires that Sue can hold a small mealworm in her hand and throw it into the cage. This would be categorized as Throwing under the Mobility PAR. The most useful accommodation for this activity would be performing activities with an aide (M8). The aide would be the most helpful individual for guiding Sue's hand and arm to get the mealworm into the meerkat enclosure.

Within the classroom the educator would need to make sure that all logs and rocks were cleared out of the way so Sue and her aide can navigate the wheelchair throughout the entire room. This way, Sue can wander the room with her classmates at the beginning of the program. When it comes time for the students to sit in a circle, the Auditory PAR recommends providing preferential seating (M2). Sue will be able to position her wheelchair to best suit her.

One activity of the program is to have a student volunteer sort the pile of animal coverings into different types. Since Sue should have an equal opportunity for this experience, the educator needs to look at all of the motions that go into this activity. Sue would need to be able to drive her wheelchair over to the pile of coverings, so the path should be cleared still (M1). To sort the coverings, Sue needs to be able to reach them, grasp them, and move them. Under the mobility PAR, these would be the tasks of Reaching, Lifting and Supporting, and Targeting. Of the additional solutions provided for these tasks, only M2 can be put into use here. The coverings already are lightweight (M9), and it would be impractical to enlarge their size

(M11) or enhance the grip on them (M12). This just leaves the option of providing preferential seating (M2). This can be done while ensuring equipment is located within reach (M10). These accommodations would suggest providing a small table to put these coverings on so Sue can reach them from her wheelchair. If her wheelchair comes with a laptray, the skins could also be placed on her laptray for easier access. Another accommodation that will be particularly useful in this situation would be working in teams (M7). By working with another student, Sue can contribute her ideas and still have someone to help physically move the objects.

Communication would not be a barrier for Sue because she can speak clearly and can raise her hand enough to participate in the discussion during the lesson. She can both ask and answer the questions of the educator, and therefore would not need additional accommodations. Similarly, writing, using printed material, and pushing buttons are not activities found in the FFSS program, and therefore do not need to be accommodated for.

When it comes time to pet the animals that are brought around by the educator, M8 and M10 are the most useful accommodations. Performing activities with an aide (M8) will allow the Sue to pet the live animal with her aide guiding her hand. This optimizes the safety for both Sue and the animal, when petting the wrong area of the animal or petting it too hard would be harmful. M10 would simply ensure that the animal is brought close enough for Sue to pet it.

6.1.2 Case Study 2: Thomas – Auditory

Thomas is an 8 year old boy with a small amount of residual hearing who can communicate both manually as well as orally. He can read lips, and prefers to speak orally during classes in his mainstream school, which would place him in the "residual hearing- oral" category in the Auditory PAR. He uses a hearing aid to supplement his residual hearing, but still cannot hear everything in his surroundings. He is visiting the Healesville Sanctuary with his classmates, all of whom have normal hearing, are familiar with Thomas's lip-reading, and know some small amount of sign language. Prior to arriving at the zoo, his teacher spoke on the phone with the zoo educator to provide information regarding Thomas's level of hearing and his ability to read lips.

During the FFSS program, he would face several challenges. When feeding the meerkats, the students receive instruction from the teacher who stands behind them. Thomas may have difficulty hearing these instructions. Similarly, when the educator informs the class about

wandering around the room, Thomas's taller classmates may block his view and prevent him from lip-reading. If Thomas happens to be picked to sort the animal coverings, it would be difficult for him to receive help from the educator and the other students since he is in the center of the group facing the pile. During the question and answer sessions, Thomas may not hear the proper answer because his classmates shout it out all at the same time. These are just some of the barriers that Thomas would face during the FFSS program at the Melbourne Zoo.

In order to accommodate for Thomas, the educator at the zoo used the Auditory PAR. He falls under the category of Residual Hearing-Oral, so the solutions that should be used for all activities are A1, A2, A6, A7, and A9. For the purpose of this case study, the abbreviated version of these solutions is provided below, since these will be incorporated into the entire program.

A1 Enhance With Visual and Tactile Elements
- *Provide photographs, posters, and images relevant to the program*
- *Include diagrams or images of concepts that are difficult to put into words*
- *Have sounds represented by a vibration or a flashing light*

A2 Ensure Classroom Setting Is Appropriate
- *Students sit in a circle around the educator*
- *Allow student to choose their seat*
- *Keep rooms well lit*

A6 Direct Speech to Students, Facing Them
- *Speak to the student's face rather than to an interpreter*
- *Do not turn and move about while talking*

A7 Amplify sounds
- *Microphones and FM systems can direct auditory input directly to the student*
- *Have recordings of sounds such as animal calls available on noise-cancelling headphones with adjustable volume*

A9 Minimize Background Noise
- *Wait until class is quiet to speak*
- *Reduce the echo in the classroom*

Additional accommodations can be made for Thomas based on the activities performed during the program. To help in accessing all of the oral information during the program, it would be beneficial to use A5: Provide Vocabulary and Terms in Advance. By doing so, Thomas and his teacher can go over new vocabulary before they arrive at the zoo, so he will be able to recognize the words both through lip-reading and signing. His ability to access the oral information will also be greatly aided by the educator's use of an FM system to send the oral

information directly to Thomas's hearing aid (A7). Additionally, his ability to lip-read will improve when the educator speaks directly to him (A6).

Continuing on with the PAR, the educator can recognize that there are unlikely to be any issues with accessing nonverbal sounds, reading and writing, or comparisons of sounds. These tasks do not present themselves during FFSS.

Comprehension of the lesson is a task that can be adapted for Thomas. A3 of the Auditory PAR suggests working in groups. This restates the principle found under universal design, because it can be useful in a different context for deaf students. For Thomas's situation, he would benefit from working with another student if asked to sort the pile of animal coverings. A partner would not only help in the activity, but could also inform Thomas of comments directed to him. It is important to note that out of the four solutions offered in this cell of the Auditory PAR matrix, A3 offers the only relevant help.

Identifying a speaker and communicating with others are all tasks that are covered by the solutions previously put into place for the program. The discussions of animals and their coverings, in conjunction with question and answer sessions with the students, can be greatly facilitated by ensuring that the classroom is set up appropriately, that the sounds are amplified, and that background noise is minimized. By waiting for the other students in the class to be quiet, the educator can ensure that Thomas is hearing only what the educator says. In utilizing the accommodations suggested by the Auditory PAR, Thomas's experience at the zoo is as multi-sensory and educational as that of his hearing classmates.

6.1.3 Case Study 3: Ian – Vision

Ian is a 10 year old boy who suffers from Stargardt's disease, a genetic condition present at birth. Stargardt's affects Ian's ability to see clearly, causing blurred vision and a central blind spot. Ian also struggles to perceive colors and has difficulty adapting to changes in lighting. He does not read Braille, but rather uses magnification and appropriate color contrast to read texts and view images. Like most students with vision impairments, Ian attends a mainstream school. His class is taking a trip to the zoo to participate in the Furs, Feathers, Scales, and Skins program. Prior to the visit, a zoo educator spoke on the phone with Ian's teacher and learned of his condition.

In the FFSS program, Ian would need to overcome several barriers to fully appreciate the program. Viewing the animals both inside and outside the classroom would be challenging, and wandering around the classroom would not be as dynamic for Ian if he could not see the creative set-up of the themed classroom. Distinguishing the differences in the examples of animal coverings may become difficult if he can not see the colors or identify the textures based on just looking at them.

Ian's visual impairments span across multiple categories in the spectrum covered in the Vision PAR. His difficulty with color contrast would place him under Color-blind, and his blurred vision and blind spot would put him under Low Vision and Limited Field of Vision respectively. This creates a full list of accommodations that should be made for all tasks. These accommodations and their suggested methods of implementation are as follows:

V6 Enlarge Text Size
- *Use a larger font size (Arial 18 Bold is standard)*

V8 Increase Color Contrast
- *Use contrasting colors in visual displays*
- *Avoid using colors that students can have difficulty distinguishing*

V9 Adjust Lighting
- *Make sure that lights are adjustable based on the needs of the students*
- *Use blinds and shades to cut down on glare*

V10 Minimize Background Noise
- *Minimize distracting background noises that do not add to the lecture*

V11 Ensure Task is in Visual Field
- *Perform demonstrations and activities in the student's visual field*
- *Place objects in the student's visual field*
- *Do not place objects large distances apart while referring to both*

V12 Magnify Objects and Images
- *Provide students with monoculars or magnifying glasses*
- *Enlarge the size of pictures*
- *Enlarge the size of objects*

V17 Work in Teams
- *Group students with vision impairments with classmates to perform activities*

Ian's ability to participate in the educational program improves greatly with the implementation of these accommodations. It is important to note that, based on the format of this program, some of the accommodations may be unnecessary. V6, for example, would not apply since there is no text involved during the program. The other accommodations listed above come into use in a variety of places in the FFSS program.

While Ian may not struggle with feeding the meerkats outside the classroom, he would experience difficulty when adapting from the bright outdoors to the relative darkness of the classroom. By using adjustable lighting (V9), the educator may be able to brighten or dim the lighting so Ian has an easier time adjusting. The Universal Design principle of providing a safe place of learning will have ensured that Ian can safely wander around the classroom without worrying about obstacles or dangers. However, providing guides (V18) will assist Ian to access all of the information in the room, as the guide can inform him of what is being observed in the animal enclosures and other displays. Also ensuring the use of proper signs and indicators (V15) can be applied to make information on the displays accessible.

When asking a volunteer to sort the pile of animal coverings into different groups, the Vision PAR recommends providing access through touch (V1) and using descriptive language (V3) in addition to the accommodations listed above. The ability to access through touch is already included in the activity as Ian will be able to feel the textures of the different animal coverings. By using more detailed descriptions, the educator can cue Ian to what he is identifying about the coverings. This is important because the coverings are meant to be sorted by qualities such as how they feel, not just how they look, which caters to Ian's abilities. Working in teams (V17) will benefit Ian greatly because it combines the strengths and weaknesses of multiple students, keeping the activity educational without being too challenging for Ian.

Ian would not have a problem participating in the discussion throughout the program. When it came time to pet the animals brought around the class by the educator, Ian would not have difficulty petting the animal as long as the educator held it close enough. This is addressed by ensuring the task takes place within the visual field (V11).

6.1.4 Case Study 4: Jodi – Cognitive

Jodi is a 7 year old girl with a moderate case of Autism. She attends a mainstream school located in a small suburb close to Melbourne. Her intellectual ability is lower than the rest of her classmates, and she struggles with verbal communication. She has difficulty completing tasks individually but works well with other students. Occasionally she throws a fit and needs to withdraw from the classroom. This usually happens when she hears loud noises or when people touch her. Jodi and her classmates will be visiting the Melbourne Zoo and participating in one of their educational programs. During the pre-visit phone call, the teacher informed the zoo of Jodi's condition and let them know that an aide will be accompanying her.

Several elements of the FFSS program would be challenging for Jodi. Her abilities would place her under the Behavioral, Comprehension, Communication, and Performance Difficulties categories. The nature of her disability puts her in all four categories, since it affects a wide range of her abilities. She may not comprehend the entire lesson, and may have trouble with the question and answer sessions with the educator and other students. If asked to complete the covering-sorting activity, she may have difficulty working on her own. She may find the loud noises of the animals outside the classroom disturbing. There are numerous ways to accommodate for Jodi, even after the suggestions put forth by the Universal Design PAR.

The Cognitive PAR is split up by a student's difficulties, but since Jodi falls under all four, the entire range of solutions should be used in all instances:

C1 Speak Slowly and Clearly
- *Use basic vocabulary*
- *Simplify the language and concepts*
- *Avoid saying too much at one time*

C2 Vary the Level of Difficulty
- *Ask questions to meet each students learning potential*
- *Give students enough time to respond*
- *Make sure the program is compatible with the students intellectual capabilities*

C3 Enhance with Visual Elements
- *Provide information and resources compatible with programs such as Boardmaker and Makaton*
- *Provide photographs, posters, and images relevant to the program*
- *Include images of concepts that are difficult to put in words or understand*

C4 Enhance with Tactile and Multi-Sensory Elements
- *Use objects and biofacts relating to the topic*

C5 Perform Activities with an Aide
- *Guide students hand when petting the animals*
- *Help students complete activities*
- *Monitor the students*

C6 Work in Groups
- *Group students with people they are familiar and comfortable with*

C7 Provide Vocabulary and Terms in Advance
- *Provide unfamiliar concepts and terms to schools prior to the visit to the zoo*

C8 Follow a Schedule and Provide Structure
- *Provide an outlined schedule including times and locations*
- *Tell students when an activity begins and ends*
- *Break tasks into small steps that are easy to follow*

C9 Have a Positive Attitude and Atmosphere
- *Provide Reassurance*
- *Tell social stories*
- *Ensure the students are safe around the animals*

C10 Use Behavioral Equipment
- *Provide equipments to help calm the students: bean bag, big ball, trampoline, blankets*
- *Provide chairs*

C11 Ensure Classroom Setting Is Appropriate
- *Use sheets to keep things covered that may pose as a distraction*
- *Make sure the surroundings are secure: locks, gates, handles*

These accommodations can be put into use in numerous instances during the program. When first beginning the program, Jodi would have no issue with throwing a mealworm into the meerkat enclosure. While outside, though, loud animal noises from nearby enclosures may be upsetting to Jodi, so having a positive attitude (C9) would help keep her at ease. Upon entering the classroom, it would then be useful to explain the schedule at the beginning of the lesson (C8), to give Jodi an idea of what to expect during the rest of the program. While giving the lesson, it would be useful for the educator to speak slowly and clearly (C1) and to maintain the positive attitude by providing reassurances (C9) to facilitate her understanding of what is being said, as well as being kept calm throughout. Making sure the surroundings are secure (C11) would prove beneficial when allowing the students to wander the room, because Jodi could become overwhelmed or may attempt to leave the classroom. When the students are asked to be seated, Jodi should be offered a chair to sit in (C10), which would aid in keeping Jodi calm and focused.

For the activity where a volunteer sorts the animal coverings by type, Jodi would benefit from having another student to work with (C6). The additional student would help Jodi stay

focused and comprehend the lesson. If Jodi has difficulty at any point in the activity, the aide is on hand to assist (C5). For the lecturing and discussion by the educator, Jodi's comprehension would be aided by educator adjusting the level of difficulty to cater to Jodi as well as her classmates (C2). As the educator covers each topic relating to the animal coverings, it would be beneficial to include images and tactile representations to reinforce what she is learning (C3 and C4). Question and answer sessions would be difficult for Jodi, due to her communication difficulties, so vocabulary and new terms should be provided to Jodi and her teachers before they arrive at the zoo (C7). Ideally, if she is familiar with the terminology she will have an easier time conversing.

Petting the animals with the educator is an experience that would result in a strong response from Jodi, and therefore having her aide assist her (C5) and having the zoo educator reassuring her while interacting with the animal (C9) would be important. Allowing the aide to guide her hands on the animal will be helpful, since Jodi can become distressed by other people touching her. The aide, however, will be trained to handle her responses.

6.2 Case Study Conclusion

The versatility and effectiveness of PAR becomes clear when looking at the changes made for these four students. Each student now has access to the education that would have previously been hindered as a result of their disability. Equal educational opportunities for all students are now a more attainable goal, thanks to the adaptations made by PAR. The Universal Design accommodations improved the quality of the program for all students, not just those with disabilities, as seen in changes such as providing a multi-sensory approach to learning and providing preparatory materials before their arrival at the zoo. Each of the disability specific PARs in this case study was used to cater specifically for one student in a mainstream setting. As the case study highlighted, not all accommodations are practical or relevant for every program, and it is important to keep in mind that these are not the only ways in which to accommodate. However, Sue, Thomas, Ian, and Jodi exemplify the ways in which PAR can be put to use in adapting the Zoos Victoria educational programs for students with disabilities.

7. Conclusion

The project team has successfully achieved its primary objective of creating a framework to make Zoos Victoria educational programs more accessible for students with disabilities. In raising awareness of accessibility issues, the framework can aid Zoos Victoria staff in restructuring and designing their programs to accommodate for students with mobility, hearing, vision, and cognitive impairments. Research was conducted through literature reviews, interviews, and observations of Zoos Victoria educational programs. The information gathered was integrated and developed into the paramount deliverable, known as the Program Accessibility Reference (PAR).

The first stages of the project involved researching relevant topics to construct a literature review. The literature review provided in-depth background information and encompassed all significant topics regarding students with disabilities. Once the literature review was complete, the project team conducted interviews with mainstream school educators and disability specialists from the United States and Australia. The purpose of the interviews was to gain first hand insight into what methods and accommodations are most successful to maximize the learning potential for students with disabilities.

An extremely important element of the project was the observation of Zoos Victoria educational programs. The results from the observations helped the project team to assess the existing programs. Interviews were also conducted with zoo educators to gain a complete understanding about the structure of the programs and suggestions for adaptations. All of this information assisted the project team to identify which activities would prove difficult for students with mobility, vision, hearing, and cognitive impairments. The information was compiled into a barrier checklist. The barrier checklist was later expanded upon to create the framework.

PAR is the synthesis of all the information acquired throughout the duration of the project. The primary section of PAR addresses principles of universal design that should be implemented into all programs to improve the learning environment for all students. Additionally, PAR is comprised of disability-specific sections broken down into the categories of mobility, vision, hearing, and cognitive impairments. Each section of PAR defines the disability spectrum, identifies the tasks that may present barriers for students with disabilities, and suggests accommodations to enhance accessibility.

In order to evaluate PAR, hypothetical case studies were established. The project team selected a program and applied the principles of universal design. After the programs conformed to universal design, PAR was used to accommodate for the additional needs of four hypothetical students. The supposed situations were an example of how PAR should be applied to make adaptations to the educational programs.

The application of PAR is not solely for Zoos Victoria. As a model for inclusive program design and accommodation, PAR can be utilized by other organizations with similar informal education programs. Education providers will be able to measure the accessibility of existing educational programs against PAR. The primary question to be considered is "Are the programs up to PAR?"   If not, PAR provides an outline of various accommodations for students with disabilities. PAR accounts for the wide spectrum of mobility, vision, hearing, and cognitive impairments.

A main goal of the Zoos Victoria mission is to inspire students to make a difference in the world. Zoos Victoria embodies this message by striving to create programs which will cater to students of all capabilities. The principles of universal design and disability specific accommodations will ensure that Zoos Victoria complies with recent legislation of the Disability Discrimination Act. Moreover, Zoos Victoria is extremely interested in making accommodations to the educational programs so that all students are granted equal opportunities to engage in the learning process.

Zoos Victoria is taking a step in the right direction towards becoming a leader in inclusive education. The implementation of PAR will place their educational programs at the forefront of making accommodations for students with disabilities in Australia. Zoos Victoria will be able to share the accomplishments of PAR and serve as an example to other education providers. This proactive approach will help to raise awareness of disability inclusion and provoke action towards change.

8. Recommendations

A variety of recommendations for making Zoos Victoria educational programs more accessible for students with disabilities were developed based on research conducted in Australia and the US. The recommendations suggest additional adaptations to be made so that students can fully engage in an interactive learning experience. The overall effectiveness of the programs will improve with the implementation of PAR.

Implementation of PAR

The first step to making the educational programs more accessible is through the implementation of PAR. PAR was designed to accommodate for students with disabilities on a case-by-case basis and should be applied to programs attended by students from both mainstream and specialty schools. The project team suggests that PAR be distributed to zoo educators across the three zoo locations. The zoo educators should review all the programs and incorporate the universal design changes permanently. Then, they should follow the framework and make necessary accommodations for students with specific disabilities. The project team proposes that zoos educators observe and document accessibility issues to evaluate the effectiveness of PAR. Zoo educators should analyze the programs prior to and after implementation of the framework in order to assess the efficacy of the adaptations. While there is no standard for evaluating these programs, the levels of engagement are often a good measure of success. These pilot studies will highlight how PAR has further enhanced the accessibility of the educational programs.

As a supplement to PAR, each lesson plan should list which tasks may pose barriers for students with disabilities. This will help the educators to quickly identify accessibility issues present in specific programs. After viewing the list of tasks, the educators should refer to PAR for suggested solutions and necessary accommodations for a student with a disability.

Annual Training

The project team highly recommends that the Zoos Victoria Education staff receive annual training regarding teaching students with disabilities. After conducting several interviews and observations, it was evident that a majority of the zoo educators did not feel entirely comfortable teaching students with disabilities. The level of comfort varied between educators based on experience.

A formal training should take place to educate the entire staff. It is proposed that the training session occur annually to build experience and serve as a refresher course. A more

thorough education would be beneficial for new staff in order to ensure that they are as adept at educating students with disabilities as their colleagues. Zoos Victoria could visit specialty schools and disability support organizations or invite special education teachers to present informational sessions. The zoo educators would gain more knowledge of various techniques and procedures to implement into their lesson plans. The training programs offer simulation activities such as blindfolding the participants and asking them to complete specific tasks. These simulation experiences would enable the educators to understand firsthand what barriers exist for students with disabilities. They would assess the difficulties and strategies encountered during the experience. With this new understanding, zoo educators could adapt their programs to cater to different capabilities.

Many disability support organizations offer free training to education providers, including zoos. For example Statewide Vision Resource and the Northern School for Autism both offer trainings sessions at their campuses. Contact information for these and similar organizations can be found in Appendix N. The training session would be especially valuable to educators because it would contribute to their ongoing professional development. The educators and students would mutually benefit from the training experience.

Questions for Pre-Visit Phone Call

The project team recommends that the zoo educators should ask specific questions concerning visiting students with disabilities in the preliminary phone call. If an educator uses a list of specific questions, then she or he will receive more detailed information in order to adequately prepare for the visiting group. Additionally, the educator could adapt the program to fit the individual needs of the students.

The primary inquiry should investigate whether or not there are students with disabilities in the class. If there are not students with disabilities it would not be necessary to continue to ask questions regarding disabilities. However, the educator should still inquire if any special accommodations should be made for individual students.

The project team has developed a set of suggested questions presented below:
- Are there students with disabilities in your class?
- What type of disabilities, and what are the main limitations?
- What types of tasks are difficult for the student(s)?

- What adaptations do you make for the student(s) in the classroom?
- Will the student(s) be accompanied by a teacher-aide?
- Will the student(s) bring personal assistive aids to the zoo?
    - Should Zoos Victoria provide any particular aids?
- Is there anything the zoo can do to facilitate the student(s) visit?
- Do you have any other relevant information that could help Zoos Victoria to adequately prepare for the visit?
- Do you require any pre-visit materials? (In addition to the materials that are already available on the website)

The zoo educators could use these questions as a guideline, or create their own set of questions as long as accessibility concepts are discussed. The educators should also stress the completion of pre-visit activities so the students are prepared to answer questions and participate in the programs.

Evaluation Forms

It is necessary to expand the Zoos Victoria Discovery and Learning Evaluation sheet to assess the experience with the Discovery and Learning educational programs. A section should be added to address teacher satisfaction of accessibility accommodations made on a case-by-case basis.

Since the evaluation sheets are the primary means of assessing the educational programs, Zoos Victoria would benefit from a higher return rate. The project team recommends that the forms are added to the Zoos Victoria website. The option of completing the evaluation form online may be easier for the teachers to access and could increase the number of responses.

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Appendix A: Zoos Victoria Description

Background Zoos Victoria

Zoos Victoria was established on October 6th 1857. It is comprised of three campuses. The campuses include the Melbourne Zoo, the Healesville Sanctuary, and Werribee Open Range Zoo. Combined, the zoos employ over 500 staff.

The present administration is the Zoological Parks and Gardens Board. The Board has been proactive in implementing tangible vision. The purpose of Zoos Victoria is "To lead, inspire and empower everyone to connect with wildlife, build knowledge, develop skills and take informed action to conserve the natural world" (Zoos Victoria, 1998). Zoos Victoria helps to educate the community through unique experiences. Objectives for the advancement of knowledge are outlined in the Zoos Victoria Education Policy.

Zoos Victoria achieves these objectives as follows:

- Capturing the imagination and emotions of visitors;
- Creating inspiring, challenging, innovative and enjoyable learning experiences on site, off-site, and online;
- Developing multi-sensory experiences that cater for the different backgrounds and learning styles of our visitors;
- Providing appropriate experiences that connect people with animals and plans;
- Utilizing expertise of all staff to develop exciting and meaningful experiences;
- Engaging our community through unique interpretive activities such as behind the scenes tours and animal encounters.

 (Zoos Victoria, 1998).

The educational programs at Zoos Victoria have received high accolades for their success in educating students about wildlife. The Discovery and Learning programs are showcased in the Department of Education knowledge bank to assist teachers with ideas and lesson plans (Wilson). The Discovery and Learning Programs have also been awarded the Educational Award for the years of 2005-2007 by the Australasian Regional Association of Zoological Park and Aquaria (ARAZPA). ARAZPA is a network of zoos and aquariums across Australia, New Zealand, and the South Pacific (Zoo Educators). The ARAZPA educational award was presented to Zoos Victoria "[to] recognize outstanding achievement in educational program

design in an ARAZPA institution. Educational programs will be judged on ability to promote awareness of conservation issues, show innovation, and measure success" (ARAZPA, 2007). The Educational Award was granted to the Werribee Open Range Zoo program "Trees Paws and Claws" (2007), the Healesville Sanctuary program "Vet for a Day" (2006), and the Melbourne Zoo program "Waterway Community Conservation program" (2005) (Zoo Educators). Zoos Victoria is committed to educating the community through continuous advancement of their educational programs.

Melbourne Zoo

The Melbourne Zoo is renowned worldwide. It was the first zoo in Australia, and is therefore one of the most established. It also ranks as the eleventh oldest zoo in the world. The location contributes to the zoo's popularity. It is conveniently located four kilometers away from the heart of Melbourne. Exhibits are filled with over 300 species from all over the world (Zoos Victoria, 1998).

Werribee Zoological Park

The Werribee Zoological Park was the second campus added to Zoos Victoria. The Board founded the park in 1975, yet the park did not open until 1983. The Werribee Zoological Park is located 30 minutes outside of Melbourne. The zoo is focused on conservation actions and recovery programs of endangered species. A savannah inspired theme can be found throughout the park. Visitors can go on a safari ride to see many species of African animals grazing in their natural habitats (Zoos Victoria, 1998).

Healesville Sanctuary

The Healesville Sanctuary was the last campus to open in 1995. The Sanctuary offers a similar, though unique experience. Like the other campuses, hands-on programs are an integral part of the Sanctuary. However, Healesville Sanctuary is the only campus that contains a hospital for wildlife. The veterinarians educate visitors and encourage them to view surgeries and participate in the diagnosis and treatments of sick and abandoned animals (Zoos Victoria, 1998).

Appendix B: General Interview Agenda

- Introduce Project

- Find out what their role in the educational system is:

    o What are your responsibilities?

    o What age groups do you work with?

    o What is your past experience with education?

- Have you ever worked with students with disabilities?

    o If so, what accommodations did you make for them in general?

    o Were they standard modifications or were they made on a case-by-case basis?

    o Did the modifications encompass a broad range of disability inclusion or each disability separately?

    o If not, have you ever thought about any modifications that you would make?

- How do you determine what adaptations will work for certain students?

    o Are the accommodations successful?

    o How do you measure the effectiveness of the accommodations?

    o Are the students getting the most out of their education?

    o Do you have any examples of this?

- How do you evaluate the success of the programs/effectiveness of the adaptations?

- Are there any 'general' modifications made for students with disabilities across the board? (universal design)

- Do you have any suggestions for us as we proceed with this project?

Appendix C: Zoo Interview Questions (United States)

- What types of educational programs do you have?
  - What aspects of the programs would be challenging for students with vision, hearing, mobility and learning disabilities?
- What types of disabilities are accommodated for?
- How are adaptations made for students with disabilities?
  - What methods do you use in general?
  - What specific adaptations are made for each disability?
  - Do the students comprehend the key concepts?
  - What good or bad experiences have you had?
- Are you aware of any legal obligations as education providers? What legislation/standards must be met with regard to disabilities?
- Specialty school participation
  - Are the educators notified in advance when students with special needs attend their programs? Have you noted any problems or opportunities related to students with disabilities?

Appendix D: Mainstream School Interview Agenda

- Introduce project

- Inquire if there are students with disabilities at the school

  o If they do not accommodate for students with disabilities, ask for a referral and thank them for their time.

  o If they do accommodate for students with disabilities proceed with interview questions

- Interview Questions

  o Which disabilities?

  o What is your role in the educational system?

    ▪ If they do not deal directly with the students with disabilities, ask who from the school does

  o Are your modifications general or are they made on a case-by-case basis?

  o How do you determine what adaptations will work for certain students?

  o How do you measure the success of the programs?

  o Have you participated in the Zoos Victoria educational programs?

    ▪ What type of educational program did you participate in?

    ▪ What size group attended?

    ▪ Did you perform any pre-visit activities to prepare for the visit?

    ▪ Did you perform any post-visit activities to review the material from the visit?

    ▪ How successful was the programming for students with disabilities in particular?

    ▪ What were the most effective elements of the programs?

    ▪ Are there any things that could be changed at the zoo or in the educational programming to make them more accessible for students with disabilities?

  o Do you have any suggestions for us as we continue with our project?

Appendix E: Specialist School Interview Agenda

- Introduce project

- What disabilities does your school accommodate for?

- What is your role in the educational system?

- Are your modifications general or are they made on a case-by-case basis?

- How do you determine what adaptations will work for certain students?

- What is the best approach to educating a student with a particular disability?

    o Do you use multi-sensory approaches to learning?

    o Any particular modifications you recommend in an informal learning setting?

    o What types of tasks are difficult for students with this disability?

    o What barriers to their education exist?

    o What types of aids are used for these students?

- How do you measure the success of the programs?

- Have you participated in the Zoos Victoria educational programs?

    o What type of educational program did you participate in?

    o What size group attended?

    o Did you perform any pre-visit activities to prepare for the visit?

    o Did you perform any post-visit activities to review the material from the visit?

    o How successful was the programming for students with disabilities in particular?

    o What were the most effective elements of the programs?

    o Are there any things that could be changed at the zoo or in the educational
      programming to make them more accessible for students with disabilities?

- Do you have any suggestions for us as we continue with our project?

    o Additional people to contact?

Appendix F: Administrator Interview Agenda

- Introduce Project

- What is your role in the educational system?

    o What are your responsibilities?

- What disabilities does your institution accommodate for?

- What is the legislation regarding disability inclusion?

    o What adaptations do you make to comply with this legislation?

    o Are the accommodations made in general or on a case-by-case basis?

- How do you evaluate the success of the adaptations?

- Do you have any recommendations for our project?

Appendix G: Victoria Department of Education Officer Interview Agenda

- Introduce Project

- What are the responsibilities of the Victorian Department of Education?

- What institutions are required to accommodate for disabilities?

- Can you briefly describe legislation relating to education and disabilities?

    o What are institutions such as the zoo required to do to comply with this legislation?

- What frameworks currently exist in the educational system to support students with disabilities?

- What is the ILP?

- How do you measure the success of education for students with disabilities?

- Do you have any recommendations for our project?

Appendix H: Zoos Victoria Educator Interview Agenda

- Introduce Project

- What is your role in education at the zoo?

- What types of educational programs?

  - o What aspects of the programs would be challenging for students with vision, hearing, mobility, and learning disabilities?

- What types of disabilities are accommodated for?

- How are adaptations made for students with disabilities?

  - o Are the adaptations general or are they made on a case-by-case basis?

  - o What have been your experiences?

  - o Did students comprehend the key concepts?

- Do you use differentiated instruction to account for different levels of understanding?

- How do you measure the success of your programs?

- Are you aware of any legal obligations as education providers?

- Have you noted any particular problems or potential opportunities related to students with disabilities?

- Do you have any recommendations for our project?

Appendix I: Zoos Victoria Administrator Interview Agenda

- Introduce Project

- What is your experience in zoo educational programming?

- What are the goals of the educational programs at Zoos Victoria?

    o   How do the goals or activities vary between locations?

    o   Overall how well do you feel the Zoos Victoria educational programs adapt for the concept of universal design?

    o   What improvements could be made?

- What are the strengths of the educational programs at the three zoos?

- What are the weaknesses of the educational programs at the three zoos?

- From your experience what principles of universal design can be applied to zoos?

- What recommendations do you have for our project?

Appendix J: Disability Specific Interview Questions

Mobility:

- Introduce project

- What is your job?

- Could you describe the range of mobility impairments?

- How can a mobility impairment affect a person's gross motor skills?

  o Fine motor skills?

  o Range of motion?

  o Performing particular tasks? (E.g. writing, grasping, petting, holding animals…)

- What types of technology are available?

- What general adaptations can be made for mobility impairments?

- What specific adaptations can be made based on the severity of the impairment?

- How can adaptations be made in a group setting where only one student has an impairment?

- What are the most successful ways of communicating with and educating students with mobility impairments?

- Do you have any specific strategies for the zoo educators to use during their educational programs when students with mobility impairments are in the group?

Hearing:

- Introduce Project

- What is your job?

- Could you describe the range or different types of hearing impairments?

- What are the main forms of communication for people with hearing impairments, and do they vary according to the range of hearing impairments?

- How do partially deaf students manage within group work settings, if they are relying on the educator's audio enhancement?

  - Is group work feasible, given a group consisting entirely of deaf students?

  - How do deaf students typically react or respond during question and answer sessions?

- If an aide or interpreter is present, what is their responsibility?

- What are the most successful means of receiving information for deaf students?

- What are the most successful means of conveying information for deaf students?

  - How is language communicated? English vs. Auslan

- What are common problems encountered when teaching deaf students? And what are the solutions?

- How does background noise affect deaf students?

- How do students access non-verbal sounds?

- Would the time restraint of 45 minutes in each program affect how deaf students experience the program?

- In preparation for their educational programs, the zoo provides activities and information to the school groups before their visit. What, if anything, would be helpful for deaf students?

- Are there any major differences in the education of deaf students when it is one student in a mainstream setting versus an entire group of deaf students within a specialty school?

- Do you have any specific strategies for the zoo educators to use during their educational programs when deaf students are in the group? Any ways in which program aspects or teaching styles can be adapted?

Vision:

- Introduce Project

- What is your role in education?

- Could you describe the range of vision loss?

    - Field of vision

- How do blind students access information through touch?

    - Braille?

- How do blind students access information through other senses?

- What specific tasks are difficult for blind students?

- How does magnification work for a student with partial vision?

- What impact does color blindness have on the education of a student?

- What is the best way to communicate with blind students?

    - What kind of language should be used when describing the appearance of something?

- What are some of the various means of transferring information to blind students?

- What types of technologies are available?

- How do blind students interact in a group setting?

- Would the time restraint of 45 minutes in each program at the zoo affect how blind students experience the program?

- Would the education differ for a group that is composed of only one or two blind students as opposed to a whole group of blind students?

- Are there any other problems that a blind student would encounter in an educational program at the zoo?

- Do you have any recommendations for zoo educators in teaching blind students?

- Do you have any other recommendations for our project?

Autistic Specialty School Interview Questions

- Introduce project

- What is your job/role?

- What age group do you work with?

- Could you describe the range or different types of Autism?

    o Autism Spectrum Disorder and Asperger's

- Is Autism usually linked with other learning impairments? If so, what kinds? Can you explain?

[Note: Depending on the response…go in to more specific questions about learning impairments]

- What are common problems encountered when teaching students who are Autistic?

- What are the solutions? How do you measure the success?

- Are there any specific tasks that may be difficult?

- How do Autistic students typically react or respond during question and answer sessions?

- Are there aides present? If so, what are their roles/responsibilities?

- Are there any items or devices that can assist in the education of students with Autism and/or learning impairments?

- What is the most successful means of communicating with and educating students who are Autistic and/or have learning impairments?

- Have you participated in the Zoos Victoria Educational Programs?

    o If so, what type of program did you participate in, who participated, and what age group?

    o If not, have you participated in any other programs similar to what the zoo offers?

    o Was there anything that you particularly liked or disliked about the program?

- In preparation for their educational programs, the zoo provides activities and information to the school groups before their visit. What, if anything, would be helpful for students with Autism and/or other learning impairments?

- What information, if any, would be beneficial for the zoo staff to know or acquire prior to the group arriving?

- Are there any major differences in the education of students with Autism and/or learning impairments when they are integrated in a mainstream school versus being in a specialty school?
- What precautions, if any, should be taken when allowing the students to interact with the animals? Are there any challenges they may face?
  - Petting, touching, motor skills, what is their reaction, textures, smells
- Do you have any specific strategies/adaptations for the zoo educators to use during their educational programs when students with Autism and/or learning impairments are in the group?
- Any other suggestions/recommendations for us?

Learning Impairment Interview Questions

- Introduce project

- Do you have any experience working with students with learning impairments?

- Could you describe the range or different types of learning impairments?

    o dyslexia, dyscalculia, and dysgraphia

- How frequently do you see students with these impairments?

- Are they usually paired with other disabilities? If so which ones?

- How does being in a mainstream school differ from being in specialty school for students with learning impairments?

- What are common problems encountered when teaching students with learning impairments?

- What are the solutions? How do you measure the success?

- Are there any items or devices that can assist in the education of students with learning impairments?

- What are the most successful ways of communicating with and educating students with learning impairments?

- Are there any specific strategies or techniques that the zoo educators could use during their educational programs when students with learning impairments are in the group?

- What information, if any, would be beneficial for the Zoo Staff to know or acquire prior to the group arriving?

- Do you have any other suggestions as we continue our project?

Questions Regarding ADD/ADHD

- Introduce project

- Do you have any experience working with students with ADD/ADHD?

- How do ADD and ADHD differ?

- Can you describe the range of severity
    - predominantly inattentive, predominantly hyperactive-impulsive, and combined: inattentive and hyperactive-impulsive

- How frequently do you encounter students with ADD/ADHD?

- Is it usually paired with other disabilities? If so what are they?

- What are common problems encountered when teaching students with ADD/ADHD?

- What are the solutions? How do you measure the success?

- Are there any items or devices that can assist in the education of students with ADD/ADHD?

- What are the most successful ways of communicating with and educating students with ADD/ADHD?

- Are there any specific strategies or techniques that the zoo educators could use during their educational programs when students with ADD/ADHD are in the group?

- What information, if any, would be beneficial for the Zoo Staff to know or acquire prior to the group arriving?

- Do you have any other suggestions as we continue our project?

Appendix K: United States Interview Contact Information

Elizabeth Berg and Stephanie Florio
Position: Zoo program leaders
Date: 22/10/07
Location: Roger Williams Park Zoo
Interviewer(s): Ben Gilde, Sara Kosmaczewski, Justine Ziobron
Contact Information: EBerg@rwpzoo.org and SFlorio@rwpzoo.org

Janice Gobert
Position: Psychology professor at WPI
Date: 20/11/07
Location: Fuller, WPI
Interviewer(s): Sara Kosmaczewski and Justine Ziobron
Contact Information: jgobert@wpi.edu

JoAnn Van Dyke
Position: Director of Academic and Residential Disabilities Services
Date: 04/12/07
Location: Daniels, WPI
Interviewer(s): Ben Gilde, Sara Kosmaczewski, Nicole Maglione, Justine Ziobron
Contact Information: jvandyke@wpi.edu or 1-508-831-5235

Henry Robinson
Position: Teacher Educator from the Boston Museum of Science
Date: 05/12/07
Location: Phone Interview
Interviewer(s): Sara Kosmaczewski, Justine Ziobron
Contact Information: Hrobinson@mos.org or 1-617-589-0361

Paula Erickson
Position: Cognitive Disabilities
Date: 06/12/2007
Location: Phone Interview
Interviewer(s): Ben Gilde
Contact Information: 1-978-249-4163

Anna Gauthier
Position: Interpreter, Teacher of the Deaf
Date: 10/12/07
Location: Borders Bookstore Shrewsbury, MA
Interviewer(s): Ben Gilde, Nicole Maglione
Contact Information: 1-508-249-4163

Appendix L: Australia Interview Contact Information

Shelley Waldon
Position: Zoos Victoria Education Officer
Date: 15/01/08
Location: Zoos Victoria
Interviewer(s): Ben Gilde, Sara Kosmaczewski, Nicole Maglione, Justine Ziobron
Contact Information: 03 9318 7045

Jim Bond, Victorian Department of Education
Position: Manager of Student Learning Programs, Grampian Region
Date: 15/01/2008
Location: Phone Interview
Interviewer(s): Ben Gilde, Justine Ziobron
Contact Information: 03 5337 8484

Dianne Gordon
Position: Healesville Team Leader
Date: 16/01/08
Location: Healesville Sanctuary
Interviewer(s): Ben Gilde, Sara Kosmaczewski, Nicole Maglione, Justine Ziobron
Contact Information: 03 9459 0481

Yvette Finlay
Position: Education Officer
Date: 17/01/08
Location: Melbourne Zoo
Interviewer(s): Ben Gilde, Sara Kosmaczewski, Nicole Maglione, Justine Ziobron
Contact Information: 03 9332 3011

Libby Weaver
Position: Education Officer and Librarian
Date: 17/01/08
Location: Melbourne Zoo
Interviewer(s): Ben Gilde, Sara Kosmaczewski, Nicole Maglione, Justine Ziobron
Contact Information: 03 9497 3019

Mark Langdon
Position: Education Officer at Melbourne Zoo
Date: 18/01/08
Location: Melbourne Zoo
Interviewer(s): Ben Gilde, Sara Kosmaczewski, Nicole Maglione, Justine Ziobron
Contact Information: 03 9689 8993

Angela Maclean
Position: Educator and Interpreter for the Deaf

Date: 22/1/08
Location: Melbourne Zoo
Interviewer(s): Sara Kosmaczewski, Justine Ziobron
Contact Information: 04 0333 9447

Andrew Walshe
Position: Teacher of the Deaf
Date: 22/1/08
Location: Melbourne Zoo
Interviewer(s): Sara Kosmaczewski, Justine Ziobron
Contact Information: N/A

Andrew Eadon
Position: Mainstream School Teacher
Date: 22/01/08
Location: Melbourne Zoo
Interviewer(s): Ben Gilde, Nicole Maglione
Contact Information: aeadon@zoo.org.au

Dan Maloney
Position: General Curator Zoos Victoria
Date: 22/01/08
Location: Melbourne Zoo
Interviewer(s): Ben Gilde, Nicole Maglione
Contact Information: dmaloney@zoo.org.au or 03 9285 9328

Rachel Lowry
Position: Team Leader Werribee Open Range Zoo
Date: 23/01/08
Location: Werribee Open Range Zoo
Interviewer(s): Sara Kosmaczewski, Nicole Maglione, Justine Ziobron
Contact Information: rlowry@zoo.org.au or 03 9731 9635

Karen Underwood
Position: Disabilities Coordinator from the Department of Education
Date: 29/01/08
Location: Phone Interview
Interviewer(s): Ben Gilde, Sara Kosmaczewski
Contact Information: underwood.karen.k@edumail.vic.gov.au

Colin Johanson
Position: Designer and Director for COOL Mobility
Date: 29/01/08
Location: Phone Interview
Interviewer(s): Ben Gilde, Nicole Maglione
Contact Information: colin@coolmobility.com.au or 03 9399 8000

Liz Dosser
Position: Leading Teacher at Northern School for Autism
Date: 05/02/08
Location: Northern School for Autism, Broadmeadows
Interviewer(s): Sara Kosmaczewski, Justine Ziobron
Contact Information: 03 9309 6258

Meghan Adams
Position: Assistant Principle at Broadmeadows Special Development School
Date: 05/02/08
Location: Broadmeadows Special Development School
Interviewer(s): Sara Kosmaczewski, Justine Ziobron
Contact Information: 03 9302 1244

Julie Halls
Position: Assistant Principal at Western School for Autism
Date: 06/02/08
Location: Phone Interview
Interviewer(s): Sara Kosmaczewski, Justine Ziobron
Contact Information: halls.julie.j@edumail.vic.gov.au or 03 9337 9175

Garry Stinchcombe, Gail Stinchcombe, Michael Donnelly
Position: Employees of Vision Australia
Date: 06/02/08
Location: Burwood Education Centre
Interviewer(s): Ben Gilde, Nicole Maglione
Contact Information: 1300 847 466

Deb Lewis, Lyn Robinson, Marion Blazé
Position: Education Officers of Statewide Vision Resource Center
Date: 06/02/08
Location: Statewide Vision Resource Center
Interviewer(s): Ben Gilde, Nicole Maglione
Contact Information: 03 9841 0242

Appendix M: United States Interview Results

Elizabeth Berg and Stephanie Florio
Position: Zoo program leaders
Date: 22/10/07
Location: Roger Williams Park Zoo
Interviewer(s): Ben Gilde, Sara Kosmaczewski, Justine Ziobron
Contact Information: EBerg@rwpzoo.org and SFlorio@rwpzoo.org

- Works with animals
- Uses senses, more tangible
- Special evenings for hospital
    - Crafts
    - Touch- hands on
- Programs stayed as is, not adapted
    - Everyone is still able to participate
- Will modify for a whole group
- No programs just for special needs
- Voluntarily go by science education standards from public schools in Rhode Island
- Example:
    - Visual images, can be passed around
    - Measure heights as if a giraffe (students with disabilities: short giraffe, trees, helpers)
        - Pick up leaves to show natural selection
    - Questions to wrap up activity
    - Can be modified if needed
    - Bring out a camouflaged animal as an example
- Owl calls are examples of auditory exhibits
- For severe disabilities:
    - Communicating with an assistant is very important
    - Must use caution with any live animals
    - Can use tactile/other senses
    - Mimicking
    - It is more about getting involved
- For mild/moderate disabilities:
    - Educators are able to redirect discussion
    - May get a reaction from some
- An additional source to look at would be the Sherlock Center in RI College for legislation

Janice Gobert
Position: Psychology professor at WPI
Date: 20/11/07
Location: Fuller, WPI
Interviewer(s): Sara Kosmaczewski, Justine Ziobron
Contact Information: jgobert@wpi.edu

- CAST- in Boston: cast.org has info on universal design for learning, has a lesson builder
- Braincogs (Lexington): software for visual spatial delays
- Lexia (Lincoln): lexialearning.com
    - Tools for reading disabled
    - Learning and visual/spatial
- View the Concord Learning Consortium website
- Biokids website is a informal science education program
- Find out what technology is available, especially handouts
    - Kidsolve.com
- Learning more about IEP (individual education program)
- Copied pages from useful textbook on educational theory

JoAnn Van Dyke
Position: Director of Academic and Residential Disabilities Services
Date: 4/12/07
Location: Daniels, WPI
Interviewer(s): Ben Gilde, Sara Kosmaczewski, Nicole Maglione, Justine Ziobron
Contact Information: jvandyke@wpi.edu or 508-831-5235

- Computer technology info is a main source
- Director of disabilities services
    - For students with documented disabilities
        - What is it
        - How it impacts you
        - Services you need
    - Meet with the students
- ATC takes care of the tech stuff, but she coordinates the services
- Common Accommodations:
    - Extended time for test taking (for various reasons)
    - Books in alternate format (can't see it, or can't read it because of learning disability)
    - ATC can burn books to a disk
        - Contact the publisher first
        - Hear it, enlarge it, choose voice, speed, choose how much to see (paragraph or sentences individually)
    - Move class to new location so student has access
    - Residence hall with active elevator: handicap bathrooms
    - Hearing impaired "bed packages"
    - Can't alter the fundamental purpose of a course
- Always successful accommodations: people use them!
- Thinks students still getting the same out of class
- DO IT website
    - Focuses on universal design
    - Wishes professors would work with universal design more
    - Provide increase font on all assignments

For example: people who are hard of hearing should have handouts before hand to make lip-reading easier and the content more familiar

Henry Robinson
Position: Teacher Educator from the Boston Museum of Science
Date: 5/12/07
Location: Phone Interview
Interviewer(s): Sara Kosmaczewski, Justine Ziobron
Contact Information: Hrobinson@mos.org or 1-617-589-0361

- Responsible for support programs, working with the teachers
- If you look at the Association of Tech and Science website (www.astc.org), under publications there are guidelines for Universal Design
- Another person to talk to would be Maria Cabrera (mcabrera@mos.org or 617-589-0418)
    o Manager of community outreach
    o Is the accessibility contact for the museum
- All exhibits are ADA conformed
    o Form to current regulations
    o Tech changes (such as wheel chair size) create a need to adjust tables, buttons, cabinets, etc.
- Any exhibits from other museums must be accessible as well, and the Boston Museum of Science won't take them if they are not ADA conformed
- Reading, hearing, touch are all inherent in exhibit design
- In the last ten years they have enhanced hearing capabilities by including spoken text, in an effort to adhere to universal design
- Christine Reich (creich@mos.org or 617-589-0302) is head of research and evaluation program, and works with Universal Design
- The planetarium and IMAX shows have ASL available if requested 3-4 weeks in advance
- There is also curriculum available in Braille, so that constellations can be felt
- Resource Library
    o Large print and macro projector for a 15 x 15 foot screen
    o Also a Braille typewriter available
- Part of the strategic vision is to be both a private organization and a public resource, to open the doors to everyone
- Some museum volunteers come from the Perkins School for the Blind
- Students with multiple disabilities help in the live animal center with an assistant
- Exhibits always have multiple ways into the information
    o Geodes, for example (big rock with crystals)
        ▪ Have text with a sign and description
        ▪ Headsets available to hear the description
        ▪ Can touch it
        ▪ Braille interpretation there as well
    o Verbal, visual, and auditory roots
- Build and modify things that need to be accessible, not just the exhibits (guides, maps, elevators, restaurants, etc)
- Live presentations and exhibits
    o 60 educators at the Museum
    o Bring in animals for a 20 presentation

- o Use technology such as a video screen
- o Have a question and answer session
- Activity center
  - o Staff at the exhibit the whole time
  - o Staff helps guide and adapt language (ESL and learning difficulties)
  - o Hearing enhanced
- This is expensive!!!
  - o Ramps
  - o Adjusting bathrooms for handicap access for 2 million people per year

Paula Erickson
Position: Cognitive Disabilities
Date: 06/12/2007
Location: Phone Interview
Interviewer(s): Ben Gilde
Contact Information: 1-978-249-4163

- Experience with a whole range of disabilities including vision, hearing, mobility, and learning disabilities
- Basic premise – "Most disabled kids are more like the rest of the world than unlike."
  - What we need to enjoy an experience are the same types of things that they need.
  - One way to address what types of accommodations must be made for a student with a disability is to put yourself in their shoes. Think of an unfamiliar situation, something you know nothing about, and make a list of the things you would need to gain an understanding
- Differentiated Instruction
  - Accounting for different levels of understanding within a classroom
  - If there is a classroom that has a handicapped student, the teachers often know that students needs
  - Put handicapped students with a couple other students who he or she is familiar with
    - Learning Buddies
    - Other children love to help students with disabilities in general
  - Students with learning disabilities often aren't popular with the other students because of the hyperactive nature of their disorder
    - Keep these students in a group with the instructor
    - Provide a more intensive pace to keep them active
    - Give them special jobs to make them feel useful
  - Prepare lesson to account for 3 general tiers of understanding
    - Above average students
    - Average students
    - Below average students
- Mobility Impairment
  - Quality of surfaces and paths is essential
  - Just as normal students need to be active and moving about, students with mobility impairments need to have ways to stretch and move
  - Touch is important
  - Be sensitive to the fact that these individuals may have experienced the world in a different way and might be afraid or nervous about new experiences
- Hearing Impairments
  - Subtitles, auditory training units, and video presentations with subtitles are all useful
  - Preferential seating, upfront, to enable students with minimal hearing to be closer to the speaker
  - Amplification

- o Provide written presentation – but keep it short and effective to maintain the attention of the student
- o Signed interpretation of speaker
- Learning Disabilities
  - o Utilize their creative abilities
  - o Tape to listen to while walking around and observing
  - o Provide a preview of materials to help keep their attention
  - o For students with hyperactive disorders
    - ▪ Keep them active and involved
    - ▪ Hold, touch animals
    - ▪ Allow them to explore and move about
- Vision Impairments
  - o Touch, smell, and hearing are vital to their learning
  - o Just because they can't see doesn't mean they can't interpret what we say or how we describe a situation for their own experience.

Anna Gauthier
Position: Interpreter, Teacher of the Deaf
Date: 10/12/07
Location: Borders Bookstore Shrewsbury, MA
Interviewer(s): Ben Gilde, Nicole Maglione
Contact Information: 1-508-249-4163

- Interpreter, tutor, formerly taught high school deaf students (over 11 years)
- Experience mostly with deaf and hard of hearing students.

Accommodations:
- The primary accommodations made are language adaptations
    o Deaf and hard of hearing students experience linguistic problems due to the fact that the students often learn American Sign Language (ASL) as their first language.
    o Therefore students may experience reading and comprehension difficulties.
- Educators should be aware of multiple ways to communicate.
    o Cannot depend on students lip-reading, but should make an effort to face students when speaking

Adaptations:
    o Interpreter
    o Script
    o Keep language clear and simple (no idioms)
- Case-by-case basis
    o Individual Preference; understanding depends on certain factors:
        ▪ Exposure
        ▪ Familiarity
        ▪ Function

Suggestions for framework:
- Create a continuum (sliding scale)
- Look at MCAS ALT resource guide provides continuum steps
    o To accommodate for a large spectrum of disabilities think of extreme ends and setup pieces in between
    o To make the zoo more accessible ask each educational facility (prior to visiting) questions about students coming
        ▪ Prepare ahead of time, and make predictions
        ▪ Make a general checklist
        ▪ Make a guide to show resources available

To determine Success:
- Were goals reached? If not, why?
    o Inaccessible?
    o Too difficult?
    o Inattentive? (student)

Appendix N: Australia Interview Results

Shelley Waldon
Position: Zoos Victoria Education Officer
Date: 15/01/08
Location: Zoos Victoria
Interviewer(s): Ben Gilde, Sara Kosmaczewski, Nicole Maglione, Justine Ziobron
Contact Information: 03 9318 7045

- Teaches kindergarten-tertiary school students of all abilities
- Writes curriculum, makes sure programs are up to date, and comply with the VELS
- Runs professional development programs

Educational Programs:
- 45 minute programs
  - Time constraints
- Concept to connect students with wildlife and empower them so that they can make a difference
  - Connect →Knowledge→Make a difference (action)
- Early Years: Kindergarten-grade 1
- Middle Years: Grades 5-8
- Secondary: Grades 9-10
- Tertiary: Grades 11-12
- Student trail and teacher notes available online
  - Suggestions for pre-visit and post-visit work

Program Design:
- Early Years
  - Not long concentration spans
  - Make very interactive
    - Visual, tactile, kinesthetic
- Middle Years
  - Endangered Species Programs
  - Classification Programs
    - Expectations of children are different due to amount of information students can absorb

Accommodations
- Hearing Impairments-generally come in with integration aid
  - Clip on a microphone so children can hear
  - If profoundly deaf then use sign language so the child can interpret what the instructor is saying
  - Reduce the amount of language used and keep it simple
  - Try to incorporate all of the senses
- Vision Impairments
  - Concentrate on using descriptive language
    - Tell students interesting facts to make them feel a connection with the animals

- - Tactile Experience
    - Assess level of interaction before bringing a live animal out to touch
    - Do a test experiment by taking out animal skin to see how the children react
      - If a child is rough with the skin it is an important clue that an instructor may need to hold their hand to manage the interaction and help to give the student a more intimate experience
- Learning Impairments
  - Simple language, simple concepts, interesting facts
  - Be firm and gentle with children that have learning disabilities
  - Give extra time and support

Case-by-Case Basis
- Students have different learning styles
  - Incorporate various styles of teaching
- Mainstream schools: Conduct program for majority of students
  - Don't make judgment on mental capacity other than senses
- Special Schools
  - Taught on a different basis

Legal Obligations
- Comply with the VELS
- Full access to all of the rooms for physically disabled students (ramps)
- Safe operating and animal procedures that apply to all students
- Protection of animals and children (management)
- Students can never control the animal, but are allowed to touch when the animal is in the teachers control

Suggestions for framework
- A question should be added to the evaluation (the teachers receive at the end of the program) specifically regarding the experience of the children with disabilities
  - Are the programs meeting their needs?
- During the preliminary phone calls to the teachers, ask if there are any students with special needs
  - Easier to conduct class if the educator does not need to assess the children first
- Consider physical access for the new Discovery and Learning rooms that are being built
- Have an annual review of techniques and procedures regarding teaching students with disabilities

Jim Bond, Victorian Department of Education
Position: Manager of Student Learning Programs, Grampian Region
Date: 15/01/2008
Location: Phone Interview
Interviewer(s): Ben Gilde, Justine Ziobron
Contact Information: 03 5337 8484

- Department of Education responsibilities
  - Assist schools in implementing government policies regarding education
    - Programs and Curriculum
  - Covers 9 regions in Victoria
  - Deals with all government schools (primary and secondary)
  - Grampian region – 130 schools
  - Zoo does not fall under the education of schools but has education officers who deal the with Department of Education
- Legislation for education and programs involving disabilities
  - All students should have equal access to programs
  - Focuses on individual needs for children
  - Modified curriculum and teachers' aides
- Support network
  - Programs exist to support students with disabilities
    - An example is a statewide program for schools to work closely with the parents of the students
    - www.education.vic.gov.au → Programs for students with disabilities
- Resources provided to schools to support students with disabilities
  - 5 levels of funding based on the severity of the disability
  - Ranges from $5000-$40,000
- 4 special schools in Grampian region
  - Parents of students with intellectual disabilities have choice of mainstream or special school
- Zoo requirements
  - Have physical access (rails, ramps, toilets, etc.)
  - Educational programs – Materials should adequately provide for all children
- Educational programming
  - It is up to schools to make curriculum to cater for each student with special needs.
  - There are no exact requirements but there are curriculum frameworks that teachers use to develop programs
  - Guides for modified curriculum
  - Programs for the support of students
  - Educational goals are determined by the parents and teachers of the student
- Support Services
  - Speech therapists, guides, etc. are provided to the schools
  - Visiting teachers are also provided to assist in the accommodation and recommendations for students with physical disabilities
  - Psychologists for students with intellectual disabilities
- Success of services and education of students with disabilities

- - Evaluate the participation of kids in the programs
    - Schools report on the progress of child
    - Statewide testing programs that report on the progress of the goals as set for the child by the parents and teachers
- Schools and programs at the zoo must cater to individual needs
    - Different levels of understanding exist within the same class
    - There is a range of needs within a single class and program
    - There are also different levels of engagement from students
- It is important for the zoo to work in partnership with the teachers
    - The teachers have a better understanding of the needs of their students and the levels of understanding
- It is necessary to cater educational programs for diversity
    - This means engaging kids at an appropriate level
    - One great way to engage kids is to provide an interactive experience

Dianne Gordon
Position: Healesville Team Leader
Date: 16/01/08
Location: Healesville Sanctuary
Interviewer(s): Ben Gilde, Sara Kosmaczewski, Nicole Maglione, Justine Ziobron
Contact Information: 03 9459 0481

- Learning experience manager
  - Coordinates curriculum-makes sure it follows the strategic plan of Zoos Victoria
- Formerly worked at SDS in Brunswick
  - Worked with children with Autism
- Some educators feel more comfortable working with children with special needs than others
  - Depends on experience and training
- Teaches specialty school once every two weeks
- Specialty school groups are smaller
  - Spend more time on topics
  - Matches theme with what students are doing in school
  - More targeted questions
- If there are only a few students with disabilities in a classroom the teacher will make allowances

Educational Programs:
- Classrooms setup similarly to classrooms at Melbourne Zoo
- Kinder room
  - Activity station for free play
  - Exploring/self-guiding play
  - Puppet theaters/water trays
- Wildlife Hospital
  - Ask the children if they are comfortable before entering surgical rooms
  - Watch veterinarians perform surgical and post mortem procedures (hands-on)
  - Cut open models of animals
- Outside Classroom-In the Bush
  - Focus on Australian animals
  - Ecosystem surveys, water samplings, measurements, and recordings
  - Tricky to walk through brush
  - Not wheelchair accessible

Accommodations
- Mobility Impairments
  - Pre-visit phone call
    - ask if there are students with disabilities
  - Plan ahead to use a room that has better access
  - Will not take class on the nature trail
- Vision Impairments
  - Use tactile method of teaching
    - Use props such as skulls, skins, shells

- Bring out live animals that don't mind being touched such as lizards, tortoises, frogs, and snakes
  - o Work with the child to put the animal in their scope of vision and help guide them to touch the animals
- Hearing Impairments-generally come in with integration aid
  - o Clip on microphone so children can hear
- Learning Impairments
  - o Speak more slowly and ask more direct questions
  - o Plain and direct concepts

Success
- Read evaluation sheets (but sometimes there isn't a good turnout)
- Check throughout the lesson with the teacher
- Setup individual goals with the teacher for the students with disabilities
  - o For example it is a success if an autistic child can sit still, and relax their muscles for 45 minutes

Suggestions
- Wishes there was a formal training or program to help educators feel more comfortable teaching students with disabilities
  - o Bring experts in for a session to give suggestions

Yvette Finlay
Position: Education Officer
Date: 17/1/08
Location: Melbourne Zoo
Interviewer(s): Ben Gilde, Sara Kosmaczewski, Nicole Maglione, Justine Ziobron
Contact Information: 03 9332 3011

- Responsible for teaching classes from K through tertiary
- Designed the Wild by Design program
    - Incorporates both a zoo component and a class component
    - Students are responsible for examining both structure and habitat to redesign a new enclosure for the animals
    - This may be a difficult program for the visually impaired because it is about the redesign of the enclosure, not the interaction with the animals
        - They would have to rely on the description of the enclosure
    - Students who are hearing impaired shouldn't have a hard time
        - Able to use microphones and sign language
- Only two or so educators are able to do basic sign language at Melbourne Zoo
- Options for students with hearing disabilities
    - Has an interpreter or someone who can sign with them
    - Read lips
    - Use microphones
        - Often the students provide the schools with these devices and in return the school is responsible for providing the zoo with them
- Options for students who are Autistic
    - Usually there is a teachers aide present, but in some cases where the student hasn't been assessed you need to rely both on the teacher and your own personal skills
- The way most of the programs are structured already suits the needs for students with ADD/ADHD
    - Programs are pulsed: walk around the room for the first two minutes, ask the students to sit down, bring out an animal, bring out a new animal, move outside, etc.
    - Give them something to hold/do such as holding an egg or petting fur. Then you can ask them questions about whatever it is they are holding or doing in order to keep them focused and engaged with the rest of the group
- Case-by-case basis
    - Need to work out your own survival tactic
    - Example: Say you're on a bus with a group of students and you have a two year old crying, you can't stop the bus and get off, so instead you can hand a feather over to a teacher/parent to entertain and distract the child so they are no longer distressed
- It helps to share your own personal survival tactics with other members of the staff
- In a mainstream school you usually have the aide, teacher, yourself, and other students to help control/monitor any student with a disability

- If you have a large group of students from a special school, you need to go into survival mode
  - Asses the level the students are at within the first five minutes
  - Decide which animals are appropriate to bring out
    - Which animals are easy to handle
    - Students may be very startled by some of the animals
  - Need to be very aware of what is going on at all times because you don't know the students on a personal level so you can't tell what they may do or how they may react
- Preparation prior to the students arriving
  - Pre-visit phone call
  - Find out what level the students are at and if there are any special needs
- Difficult to gage if the students are gaining anything from it
  - Need to rely on the communication with the aide who know the students better
    - The problem is that the educator would rather be interacting with the student instead of the aide
- Much of the information/legislation provided by the Department of Education isn't enforced at the zoo
  - Classes are only 45 minutes long so it would be hard to accomplish everything while following a strict set of rules and requirements
- Touching animals and artifacts is great for students with disabilities
  - Not all programs involve touching the animals, but they involve other tactile activities
    - Example: The students may spend their time exploring and studying the plants and different habitats
- Comments/Suggestions
  - It may help to have a room designed to cater to students with disabilities that is completely accessible for everyone. The only problem is having the space for it
  - It would help to bring in a professional who is an expert in the field of disabilities
    - She has been asking for this for 5 years now and still hasn't received any proper training
    - They brought in a professional named Caroline last year but she only held a brief 45 minute conference with the staff
      - It would have been nice if she stayed longer and showed how to put everything into practice
    - Wants to learn how to manage students with disabilities; how to gage what they are doing, what their actions mean, etc.

Libby Weaver
Position: Education Officer and Librarian
Date: 17/1/08
Location: Melbourne Zoo
Interviewer(s): Ben Gilde, Sara Kosmaczewski, Nicole Maglione, Justine Ziobron
Contact Information: 03 9497 3019

- Both an educator and the librarian
    - Teaches all levels from K through grade 12
    - Makes orders for the different properties
    - Job Sharing with Ann and only works two days a week
- There appears to be more classes with intellectually challenged students
    - These types of students are difficult to educate
    - Has limited background knowledge on how to manage these students because they are harder to control, especially those who are older and stronger
    - These students usually have an aide with them
    - The lesson needs to be very tactile, you can't just throw a lot of information at them because they won't retain it
    - They may have a hard time responding to questions
- The classrooms have boxes of a variety of things used during the lesson
    - Determine how the students react to these things first before bringing out a live animal
        - Example: If they don't like the snake skin, then they most likely won't like a real snake
- You may need to help control the students motor functions so they don't harm any of the animals
- Students who are hearing impaired are usually mainstreamed
    - Teachers bring along headsets and microphones for the educators to talk into
    - Need to speak slowly and clearly
        - Similar to talking to ESL (English as a Second Language) students
- Can't usually run normal programs for groups of students from a special school
- Prefer to have a focus/theme for the programs
    - Some teachers just want to have a fun touchy/feely session
- Hard to get to know the students when you only have 45 minute programs
    - You need to make comparisons within the group in order to evaluate the level of understanding and success
- Different levels of learning
    - Still want the program to be challenging and interesting
- Usually sit in a circle and talk to the students to try to pick up on their reactions and behavior
    - Need to acknowledge when one student is dominating and know how to manage that
    - Want all students to have an equal opportunity
- It is also important to evaluate yourself as you go

- One method of teaching involves asking questions at the beginning, doing an activity and handling the animals, and then re-asking the questions at the end to see if the students retained the information
  - The problem with this method is that there is a time constraint
- Sensory trail
  - This is something that has been done in the past
  - Students walk along a trail and stop at various boxes to answer questions/complete tasks before proceeding to the next box
- As a teacher you often think you aren't making any impact students with disabilities
  - Depends on the goals/expectations of each student within the class
  - Example: something as simple as getting a student to sit through an entire lesson or them having the ability to pet an animal gently could be a great accomplishment
- Technology is a good aide
  - Helps with communication
- Showed us Zoo Animals books used for students who are visually impaired
  - Included both Brail and textured images
  - One of the books had normal print for students without a vision impairment

Mark Langdon
Position: Education Officer at Melbourne Zoo
Date: 18/1/08
Location: Melbourne Zoo
Interviewer(s): Ben Gilde, Sara Kosmaczewski, Nicole Maglione, Justine Ziobron
Contact Information: 03 9689 8993

- Teaches K through VCE
- Primary is his favorite, hasn't done as much VCE
- Challenging aspects of the programs:
    - Programs are very flexible
        - Can simplify and make very tactile
        - Can beef up a program, you want it to be suitable for VCE level
        - Just have to look at the kids needs and adjust accordingly
    - Vision and hearing would be ok in most any program
        - Would have an interpreter
        - Can continue the program as you normally would
- Has worked in a school with high needs children, where students have no verbal skills, but are brilliant
- Intellectual disabilities would be more difficult
    - Break down the program into steps and fragments
    - Simplify in blocks
    - If there is one student with a disability in a mainstream group, you can pitch it at mid-level
        - You can ask challenging or easy questions to the appropriate kids
        - Ex: What are reptiles covered in, versus what other aspects make reptiles different from other animals
- Has worked in special needs adult employment, and mentions how he has taught them to answer the phone through breaking it down and repetition (physically picking up a phone)
- 45 minute program limit means that you can't do much, but you want to get the topic across
- If students are disabled, they will often have an aide and the zoo will have talked to the teachers ahead about strategy
    - Eye contact during questions
    - Having full attention
- Its very important to speak with the schools ahead of time
    - What strategies
    - Any behaviors
    - Any aides, who help and support
- SDS is the school for most severely disabled, non-verbal communication
- For Makaton and Auslan, training would help
- Sensory things, tactile elements, sounds, and music would all help make it more multi-sensory
- Areas for improvement:
    - Training for staff: simple strategies for dealing with kids with disabilities

- - Special education takes a 4th year of training, not many have done it
    - o Any strategies, such as what do you do in a group when handling a snake
- Gauging success:
  - o Interacting during the session
  - o Any response is good
  - o Amount of engagement varies
  - o Smiles are always good!
  - o Teacher feedback is often very helpful
- Places to contact:
  - o Angela (teacher of the deaf) and Meghan (works at Broadmeadow)
  - o Ascot Vale, Western Autistic Center
  - o Museum, Planetarium, Aquarium, Gallery of Sport: check their resources and programs
  - o Melbourne, LaTrobe, RMIT, and Deacon Universities: check for disability programs
  - o Disability support centers
  - o 9637-2000 Student well being branch, ask for more contacts
  - o www.sofweb.vic.gov.au

Angela Maclean
Position: Educator and Interpreter for the Deaf
Date: 22/1/08
Location: Melbourne Zoo
Interviewer(s): Sara Kosmaczewski, Justine Ziobron
Contact Information: 04 0333 9447

- Works at the Victorian College of the Deaf
    o Second oldest school of the Deaf in Australia
- Teaches from prep to U12 – ranges from 6 to 19 year olds
    o The type of disabilities range: Some have intellectual problems along with hearing impairments
- Ranges from being slightly deaf where the person can still communicate orally with the use of hearing aids to those who are profoundly deaf and don't hear at all
    o Mild (they can still talk) to severe (they need to sign all the time)
- Some Deaf people consider themselves to be a part of a small cultural group
    o They speak a different language, but everything else is the same
- Deaf people in Australia like to refer to themselves as Deaf with an uppercase "D"
    o The term disabilities and impairments implies that they are a hearing person that is damaged so it has a negative connotation
- Some Orally Deaf people can still speak and listen, but they may not feel 100 percent confident or comfortable with it so they still prefer to use signing
- Group work
    o In a special school the students sign to each other
    o If the student has been integrated into a mainstream school there will most likely be a teacher there to interpret for them
- Make sure they are as equally involved as everyone else
- Important to treat them just like a hearing person [a person without a hearing impairment]
    o Don't make them look different
    o Don't ask the interpreter questions
    o Direct the questions towards the student [acknowledge them]
    o Don't give them any special treatment just because they have a hearing impairment i.e. don't just allow them to pet the animal, allow the whole class to pet the animal
- It is distracting when the educator pauses, talks slowly, and keeps looking at the interpreter
    o Don't do this, just teach like you normally would
- For things to run smoothly [in a classroom setting]
    o Maintain eye contact with everyone
    o Don't speak in a loud voice
    o Converse normally with a Deaf person
- Need to be aware of the lighting
    o Example: If you are bringing the students into a dark room to show off nocturnal animals you need to do all your talking prior to entering the room because the Deaf student won't be able to read lips or see the Interpreter

- o Example: Be aware of where you are standing. Some spots in the room may not be as well lit as others, or there might be too much light coming in through a window that makes it hard for the student to see your face
- A circle is the best set up so everyone can see everyone else
  - o A Deaf student needs to see the teacher, interpreter, and other students
- It would be great if people knew how to interact with Deaf people
  - o If the teacher is talking to the Interpreter and then says "Oh, don't sign that part to them" this is unfair to the student because they are the same as everyone else and you shouldn't be able to choose what they hear through interpretation
- An Interpreter is very professional and highly qualified
  - o Their role is to facilitate communication
  - o Sign everything that is said
  - o Don't opinionate or interrupt
- An Aide is more of a helping role
  - o Make sure the students are on task
  - o Focus more on the behavior aspects
  - o Deaf people don't really need an aide unless they have additional disorders
- Receiving information
  - o Whether they are slightly impaired or severely impaired, Deaf students benefit from using sign language because it allows them to pick up 100 percent of the information
  - o By lip-reading you only get about 35 percent of the information and you need to use the context to fill the rest in
- Biggest Problem is their lack of English skills because they can't hear the language
  - o Reading and writing is exceptionally hard
  - o Lack grammar skills
  - o Words have different meanings when you say them, but there is only one sign for it
- Language and Vocabulary is hard
  - o They may not know a word when they see it written in English even though they know it in sign
  - o Example: One solution for watching videos is to use subtitles, but not all Deaf students cant pick up the language
- Communication has improved with the use of technology but there is still not solution to improve reading and writing
- Oral listeners need to be able to see everyone
  - o It is harder for them to pick up information
  - o May struggle more than signing Deaf students
- The Experience of the student can be destroyed if they have a bad instructor and/or a bad interpreter
- Important for the educator to provide the school with some sort of lesson plan before the student arrives
  - o It helps if the student can become familiar with the language beforehand
  - o You can't introduce a lot of new information because chances are they won't pick up on all the language

- Example: if the student saw the word nocturnal they probably wouldn't know what it meant, but if they were given enough time to familiarize themselves, then the interpreter could teach them that nocturnal means awake nighttime in sign
- It is part of the Interpreters job to prepare the students before the trip, but it may help if the zoo could make suggestions
- The level of preparation depends on the school, their rules, and how much they cater to meet all students needs
- Academically, many Deaf students don't get as far as hearing students
- In special schools, students usually work in smaller groups
  - A lot more one-on-one
  - Students can get individual help
  - Assignments are given out in small parts
    - Example: Students aren't asked to read an entire novel at one time. They are asked to read sections with the help of an Interpreter
- Special Schools offer different classes directed specifically to those with disabilities
  - Example: There may be a class on Deaf studies and using Auslan
- Background noise can be distracting
  - The Zoo isn't acoustically sound
  - Harder to hear outside than in a classroom
- Deaf students will miss out on animal noises
  - The interpreter might be able to give them a visual idea of what they sound like
  - They may be able to hear with headphones that block out all other sounds
- Deaf people don't want to see people talking, talking, and talking
  - Visual things aren't as fun because they rely so much on their sight
  - Tactile things are a lot more engaging and fun
    - To see and touch an animal means a lot more than to "hear" about the animal
- Suggestions/Comments:
  - Being open minded enough to realize you need assistance
    - Example: Just because you have a brother who is Deaf doesn't mean you are an expert in the field
    - Understand that not all Deaf students are the same [they all have different hearing abilities, skills, and intellectual levels]
  - Preparation: Knowing what you need to do beforehand
  - It may help to have an information kit on Deaf people and other people with disabilities

Andrew Walshe
Position: Teacher at a Deaf school
Date: 22/1/08
Location: Melbourne Zoo
Interviewer(s): Sara Kosmaczewski, Justine Ziobron
Contact Information: N/A

- He is Deaf himself
    - He can communicate orally with the use of hearing aids but also uses sign
- Angela interpreted for him
- Brought a group of students to the Werribee Zoo last year
    - Very good/ had a great time
    - The Zoo provided them with tons of information
    - 1 Staff member went along with them
    - Great one-on-one experience
        - Students could easily ask questions and be interactive
    - Usually Werribee has safari rides that the general public pays to go on, but they were able to go around on their own bus so it was a lot more personal
- Hands on activities are good [so are posters and pictures]
    - Allows the students to acquire a lot of information
- Deaf students are behind on information compared to hearing students
    - Example: In a mainstream school the students may be asked to watch a specific program on TV as part of their curriculum which poses a problem for Deaf students
    - There is a big difference on their knowledge [And it isn't because they aren't intelligent]
- In mainstream schools desks are usually lined up in rows
    - Deaf students may have a hard time recognizing who or when someone is asking a question if they can't see their other classmates and/or the teacher
- Deaf students miss 70 percent of information in hearing schools
- Methods of communication is based on the level the student can take information in, not on their level of hearing loss
    - The way they communicate and how well they can hear/ not hear doesn't matter
    - It depends on their educational background and language skills
- Hearing the animals is a challenge
    - Example: Recently he was out on a river with some family where they could hear Koalas. His brother was trying to describe the sound to him, but it was really difficult
    - You might be able to set up vibrations or something you can feel that helps to explain the sound
- It would be great if all staff knew how to work with both the Deaf students and their interpreters
    - By developing a better understanding they can work towards building relationships with the students
- For question and answer portions of the lesson, the students participation depends on the interpreter and the educator

- It is important for the educator to develop a trust with the student
  - To build a connection, start with small activities, introduce yourself, and let the student ask questions even if they are about personal things
- Doesn't find background noise particularly distracting as the background in general
  - Visual distractions such as people walking may cause the students to lose focus on the teacher or interpreter
- Note: agreed with what Angela restated and didn't have any other suggestions for us

Andrew Eadon
Position: Mainstream School Teacher
Date: 22/01/08
Location: Zoos Victoria
Interviewer(s): Ben Gilde, Nicole Maglione
Contact Information: aeadon@zoo.org.au

- Mainstream School Teacher for 12 years
- Experience teaching students with disabilities
    - Disabilities include cerebral palsy, dyspraxia (loss of motor skills), multiple personality disorder, tourettes, dyslexia

Accommodations
- Modify curriculum
    - Less verbose
    - Concrete material
    - Chalk and talk
- If a student (ex. with cerebral palsy) cannot physically write, the aide can record the student speaking
- Laminate on task cards on students desks
    - Visual reminder
- Aide can make a picture storybook
    - Whole story told through pictures
- Braille
- School board makes general accommodations such as access ramps
    - Teachers responsibility to make case-by- case accommodations
- Teacher proximity: sit near students and teach from there
- Informal peer teaching

Success
- Parent Support Group (PSG)
    - Team of parents, aide, teacher, specialist, principal etc.
    - Make a goal sheet for the child
        - See that goals are met
        - 2 or 3 page document, setting goals, addressing materials needed to achieve goals, describes how the student achieved the goals
    - Formal evaluation day by day
    - Constant communication between teacher, and the aide

Educational Programs:
- Class participated in Discovery and Learning Program
    - Student with dyspraxia in the class
        - Mom and full time aide came
    - Program effective because the student loved animals
    - Helped her to focus and gain more out of the experience

Suggestions:
- Educators should involve the teacher and aides
    - To ensure the safety of the animals and the student
    - Teachers know their students best

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Dan Maloney
Position: General Curator Zoos Victoria
Date: 22/01/08
Location: Zoos Victoria
Interviewer(s): Ben Gilde, Nicole Maglione
Contact Information: dmaloney@zoo.org.au or 03 9285 9328

- General Curator for the 3 campuses
- Experience working at zoos for over 25 years (US and Australia)
  - Bronx Zoo, Philadelphia, New Orleans, Audubon, Queens Zoo, Zoos Victoria
- Zoos in the US are more conscious of ramps and slopes because of ADA requirements

Problems:
- Physical accessibility ranges among the three zoos
- As General Curator looking to change the restriction on bringing assistance animals to Zoos Victoria
  - Thinks it's insensitive, combative, and discriminatory
  - Assistance animals are well behaved and pose little threat to people or the animals
  - However, won't allow assistance monkeys because they would captivate visitors, and people may think a monkey has escaped from the zoo

Ideas:
- Rhino Encounter
  - Get to go "behind the scenes" with a Rhino
  - Wide open area made wheelchair accessible
- Props such as Bear Claw
  - Tactile
- At the Bronx Zoo some of the signs contain brail
- When at Audubon had an idea to design a frequency exhibit
  - Would be beneficial for hearing impairments
  - Based on the idea that animals hear different frequencies
    - Ex. An elephant can hear a larger range of low frequencies
  - It would be interesting to say ones name and hear it repeated how a bat would hear it
- Wife's twelve year old brother has Autism
  - He uses a stencil like instrument to spell out words
  - Would help with students that cannot give a verbal response

Challenges:
- Behind the scenes encounter with the elephants was proposed
  - Not yet wheelchair accessible
  - Human labor element
    - Assign people to work, and train animals
- Impairments of view
  - Cluttered view from enclosures, plants, trees etc.
- Gravel and dirt paths may not be fully accessible for wheelchairs

Success:
- Replaced windows at some of the exhibits

- o Extended down to 400 mm from the floor to prevent visual impairments
- Also removed big timber rails
  - o More wheelchair accessible
  - o Were originally right in the sight line of children
    - ▪ Building code doesn't pick this up
- Programs are very interactive and focus on a multi-sensory approach because people learn in multiple ways
- Walking the dingoes around Healesville is a powerful experience
- Birds of Flight- informal education program
  - o Close proximity
    - ▪ Birds fly right over audience
  - o Use microphones
  - o Visual Experience

Suggestions:
- Looking into a GPS program
  - o Will help people with hearing impairments
- Trainees from Vicdeaf spend a day at the zoo and cannot talk the entire day
  - o Have them discuss their experience
    - ▪ Difficulties? Strategies?
  - o Would be beneficial to have them teach educational staff Auslan
  - o Or record a keepers talk in Auslan and make a video

Rachel Lowry
Position: Team Leader Werribee Open Range Zoo
Date: 23/01/08
Location: Werribee Open Range Zoo
Interviewer(s): Sara Kosmaczewski, Nicole Maglione, Justine Ziobron
Contact Information: rlowry@zoo.org.au or 03 9731 9635

- Differences in programs (Werribee and Melbourne)
  - More student centered (less teacher directed)
  - 15 minute block students work together to problem solve
    - High energy
  - Actions based programs
    - Facilitate actions instead of just talking about them
    - Here is some grass→ "go home and plant"

Challenges:
- In group work activities problem solving may be hard
  - More interactive so requires more abilities
  - May be more passive

Success:
- Use a probe to assess knowledge
  - Ask the students questions before the session to see what they know
  - Then at the end of the lesson re-assess the students to see what they have learned
    - Did they engage in the new vocabulary?
- Attitude assessment is more difficult
  - Only assess for all day programs
- Skill assessment-formal assessment
  - Assess according to student sheets (ex. plant identification)
    - Did the students have the correct answers?
- Behavior assessment-how the students leave/how excited they are
  - One time behavior
    - Can assess at the zoo
    - Give the class a nest box and call the school to see if they put it up
  - Repetitive behavior
    - Hard to measure
    - Can't record after students leave the zoo
    - Interesting to have a study on this and see if students actually do take action

Karen Underwood
Position: Disabilities Coordinator from the Department of Education
Date: 29/1/08
Location: Phone Interview
Interviewer(s): Ben Gilde, Sara Kosmaczewski
Contact Information: underwood.karen.k@edumail.vic.gov.au

- Works at the Department of Education, specifically the disability area
- Legislation:
    - Essentially says educational institutions are required to make every activity available to a child with disabilities, as covered in 1992 ADA
    - In 2005, the education standards were clarified and this information was provided to all educational institutions
    - Covers 5 areas:
        - 1: Capacity to enroll:
            - Should be able to participate in all programs
            - Need to make it accessible, and to provide any additional supports that are needed by a student with disabilities
            - Any kid should be able to participate unless its an onerous strain, which is a rare occurrence
                - Ex: Child with multiple disabilities requiring oxygen, feeding tubes, wheelchair and a bed may be unreasonable, but providing safety measures, vision/hearing aides, ramps, and caution/guidance (cognitive disabilities) would be reasonable
- In a mainstream school, extra personnel and equipment (wheelchair) will come with the student already
    - Issue at the zoo would be if the chair fits and the toilet set up is accessible
- ILP
    - Developed by the principle, the teacher, and the parent
    - Details may or may not include trips to the zoo
- Ask schools about safety, and ask what time is needed for that
    - Ex: For a vision impaired group, what do students need to know about handling snakes
    - Autism may be more problematic because not only do precautions need to be taken to keep them safe, but precautions need to be taken so students can cope with the situation without becoming anxious
- Other areas covered:
    - 2: Participation
    - 3: Curriculum
    - 4: Harassment/Victimization
    - 5: Access to student support services
        - Applies to all schools, more details available on Dept. of Ed. website
- 2 and 3 are the areas probably most relevant to the zoo
- Also on website is work from 2006 that tells what schools need to do
- Offered to send our questions out to specialty schools to get them to contact us

Colin Johanson
Position: Designer and Director for COOL Mobility
Date: 29/01/08
Location: Phone Interview
Interviewer(s): Ben Gilde, Nicole Maglione
Contact Information: colin@coolmobility.com.au or 03 9399 8000

- Designer and Director for COOL Mobility
- Been in a wheelchair for thirty years

Limitations of Reach
- Restrictions due to the perimeter of a wheelchair
    - The arm rest of a wheelchair may cause additional restrictions
    - Balance can be compromised by leaning forward or down

Range of Disabilities
- Some students (especially ones with cerebral palsy) are more comfortable sitting on the ground
    - Bean Bags may be an option, but reach is limited
- The reverse is also true. Some students require restricted seating for posture
    - These students would have their own wheelchair
    - A different surface may cause them to spasm more (contractions in knees)
- Spasms can be more severe in times of excitement
    - Could damage people, equipment, or themselves
- Strength can be minimal to phenomenal
    - Limbs straighten out and could knock objects over
- Different ranges of motion

Challenges
- Colin visited an aquarium which had a touch board for stingrays across the width of the wall
    - It was difficult to reach up and over the wall in a wheelchair
- Exhibits should be as functionally pleasing as architecturally pleasing
    - Take into account the width of the exhibit
        - Limited ability to reach
- Displays at the zoo are built for people that are standing
    - Barriers may be too high for some people to see over the wall
    - Restricts the field of view
        - Risk of lifting students on rails to see

Adaptations
- The problem with disabilities is the only common aspects of disabilities is that they are all different
    - Different capabilities require different accommodations
- Best advice would come from teachers and carers
    - Know the students best
    - They will explain how to overcome any problems in the classroom
    - Also talk to the children because they know their capabilities

- However they may downplay their disability
- Have to be willing to ask questions. If don't ask questions, don't get answers, without answers there is a risk factor
- Need space for wheelchairs
  - Two wheelchairs take up the space of 4 people
- Time is a big factor
- Specialty schools may require as much as 50% more time than general school group
  - Need time to absorb facts then complete task
  - Time allows for students to get situated and lineup etc.

Legal Requirements
- ASA-1428 documented standards for ramp design
  - 1/12 is preferable and 1/18 is substantial
  - For every 5 meters required to have a 1 meter wide flat stop
  - Short entry (maximum distance 2 ft) steep as 1 and 6

Recommendations
- Provide a questionnaire for teachers to fill out about perspective students with different capabilities
  - Questions could incorporate behavioral issues, muscle control, and comprehension of commands
  - Send it out to school prior to visit- chain of information
    - This allows the teacher time to sit down and fill out the forms, and to be more specific about limitations
    - Ask the teacher if the student needs assistance, will have assistance, or does not need assistance
    - Zoo staff will have a reference in front of them and be more prepared
- The zoo should take into account different approaches to the exhibit
  - People with disabilities have developed their own way of doing things to adapt to situations
  - May need to approach an exhibit from the left or right side
    - May not have ability to turn head so have to turn chair
  - The space within an area should allow for a wheelchair to approach from either side
    - Feet are in the way if approach from the front
  - For example a McDonald's Drive through is good for the driver, but not for the passenger
- Bring animal in direct contact with students
  - Or make the cage more portable to enable closer viewing
  - Contact with the animals (especially tactile) is much better experience than television or picture book

Liz Dosser
Position: Leading Teacher at Northern School for Autism
Date: 5/2/08
Location: Northern School for Autism, Broadmeadows
Interviewer(s): Sara Kosmaczewski, Justine Ziobron
Contact Information: Phone: (03) 9309 6258

- Autistic kids are visual learners
  - Even if they can read and speak
  - Northern uses Boardmaker
    - American program used to present visuals
- Range of students covers a big spectrum
  - Students have a difficulty with communication and behavior
  - Verbal
    - Some simply repeat what is said to them
  - Nonverbal
    - Students will have a folder and books with words, a "pix folder" that would be brought with them, even to the zoo
    - Teachers may have a lanyard with pictures of animals so student can identify the animal that they want to see
    - If talking about a specific animal, students would need to have a picture available of that animal
- Autistic students need a schedule
  - In the classroom, they use visuals to support what you say
  - Students need to know what to expect, and that way educators can refer students back to the schedule if they become distracted
  - The same would be useful for mainstream schools with autistic students that are integrated, and having a visible schedule would benefit everyone
- Experience at the zoo:
  - Have done general visits, but not ed. Programs
  - Zoo would need the visuals and structures, as well as knowing to not speak in long complicated sentences, and have to have aides to break down information for the students
- Parents have a right to integrate their children into mainstream schools, regardless of school's recommendation
- Autistic students with animals:
  - Would need visuals to explain before hand what was going to happen
  - Zoo would need to speak with the aides and teachers first before letting students near animals, as many don't have the coordination
- If the zoo were to accommodate for students with Autism, the staff should visit an Autistic school so they have understanding of how to work with those types of students
- Autistic students can have intellectual disabilities as well
  - At Northern School for Autism, Autism is the strongest disability
- Learning disabilities:
  - Can be social/emotional: students would want structure and to be familiar with expectations

- o Intellectual: need to know the age level that the students are functioning at
- Even just becoming familiar with one more animal would be a great success for some Autistic students, but the standard for success varies with each student
  - o May be useful to build a game into the end of a program
    - ▪ Have students sit and say one thing you remember, but it has to be different from what the other students say, similarly you can say what was the best part
- The more interactive the program the more they remember
- Sometimes just having different staff in the room can be disruptive to them
- Visuals are the main part of the Autistic learning program
- Making sure the environment is secure
  - o Students can be absconders
  - o Having a discreet tall wire fence would help ensure students could run away
  - o Having locks and handles high up is helpful
  - o The more secure the better it will be for all students, regardless of needs
- Different kids will find different things to be problematic
  - o Strobe/flashing lights
  - o Some are sensory oriented, so sounds or surfaces may be bothersome
  - o Some may focus on or enjoy a particular thing, such as sand
  - o One child they have doesn't like clapping, and would throw a fit if he heard any clapping, even from a distance
- It might be worth it to have a form that would enquire about any sensory considerations
- Some students can only sit still for 5 minutes
  - o Having white blankets and calming visuals are useful for calming students
  - o The zoo would want to have such items available if they are looking to seriously start accommodating for Autistic students
  - o Having an area where a child could withdraw so not to disturb the rest of the group would be helpful
    - ▪ At the school oftentimes they will have a trampoline to calm them down, or a big ball for them to sit on and bounce
    - ▪ Items that occupational therapists use is very helpful
  - o Teachers would know and be prepared to deal with any disruption
  - o Some items are helpful across the board: swing, balls, trampoline
- Question and answer session are difficult
  - o Students may only give simple answers or repeat part of the question
  - o Some high functioning Asperger's students can have very in depth questions
  - o Many don't have the ability for "who", "why", "when", or "where"
  - o Any information given to the students would have to be short
    - ▪ Might be suitable for some Autistic students
    - ▪ Those within a mainstream school probably would do fine
- Strongly recommend that a zoo educator spend time in an Autism specific school
- Kids love going to the zoo
  - o They have expectations of what they are going to see and do
  - o The teachers are very conscious of students behavior
  - o It can be disappointing when students go to see an elephant and the elephant is not there, and this can cause a major problem for Autistic students

- It might be helpful for the school to call up in advance and be able to enquire if any particular animals will definitely not be able to be seen, so they can prepare the kids
  - Often students will follow a routine when they get to the zoo if they've gone more than once, and it can be difficult for teachers to change that routine
  - Some students will become distressed if a different route is taken to get to a location from what they are used to

Observations from the classrooms:
- Locks are very high up
- Classrooms are very visual
  - Board with velcro pictures of what they are going to do
  - Pictures of the individual students and their particular schedule
    - When anything is done you put its picture in the "finish pocket"
  - Pictures for turn taking, want, and different activities
  - It can take a while for students to process what is being said
- Good to cover things with a sheet if you don't want it to be distracting, because for Autistic students if you can't see it then it does not exist
  - Important to know that if you're taking something from them, then it must go either in the finish pocket or on a shelf or else they will think that it is gone forever, which can be distressing
- Use certain terminology, and use it consistently
- Use photos of things that Boardmaker doesn't cover
- It may be helpful for the teacher to provide pictures of the students to the zoo educator in advance
- It may be very useful to have one staff member fully trained in working with Autistic students
- Bean bag chairs help to calm students down
- Sitting in chairs is better that sitting on the floor because the students are less likely to fidget
  - They are fine with sitting on the floor, but could start crawling around
- The school takes kids up to 14, but will probably go up to 18 as those current 14 year olds grow
- When working with the students, it is helpful to repeat the question until a proper answer is given
- Changing something like a bus route is a very big problem
- Telling social stories can reinforce that something is ok
  - Telling stories for petting the snakes at the zoo: Use the snake's name (if possible), only that snake, "but its ok", and then reinforce this with similar terminology/story during the actual lesson
- Older students may use words in conjunction/instead of the pictures
- Students know how to use the "one more minute" technique on the other students to get their turn on the computer

- They know they will need to stop soon when they hear "one more minute" regardless of who is saying it
- Important to put things positively
    - If a student didn't want to pet the snake, then give them the option between that and something less threatening
    - Then they are still participating
    - Gives the students control of the situation as well
- Using the pictures from Boardmaker is universal

Meghan Adams
Position: Assistant Principle at Broadmeadows Special Development School
Date: 5/2/08
Location: Broadmeadows Special Development School
Interviewer(s): Sara Kosmaczewski, Justine Ziobron
Contact Information: Phone: 03 9302 1244

- Meghan is the assistant principal
    - Oversees curriculum, manages staffing issues, student welfare
    - It is a government department school, so she deals with legislation regarding the school
- All students here have an IQ less than 55, and have moderate to severe disability
    - May have cerebral palsy, hearing problems, autism, challenging behavior
    - Little to no language skills, and use signing/symbols/electronics to communicate
    - Many are not toilet trained, and at school they focus on learning life skills
    - Medical needs, tube feeding, etc, are also administered
- Range from 5-18 years old
    - Break into small groups: early, middle, and senior
    - There is also a sensory group, which is very high needs
    - School has some groups that work at the primary school, so it is an example of mild integration
    - They cater for individual needs
    - All staff are trained in Makaton (a form of signing)
- Use strong visuals: pcs symbols for schedules, behavior charts, and stories
- The sensory group works on sensory activities
- Zoo visits:
    - Werribee
        - Loved it because it was hands on
        - Brought the kinder group
        - Enjoyed the eggs and feathers that the students could touch on the safari
        - Within the classroom they got to use clay and play dough which was good because the students won't sit and listen for long
    - Melbourne
        - Did the basic lesson while they were there
        - Would be helpful to request robust things
        - Used the tortoise shell, and the movement and hands on aspect was great
    - Would visit with groups of 5 or 6 with two staff members
    - It was good that the educators know to move on quickly, due to the short attention span
    - How comfortable the educator is makes a big difference
- Zoo used to advertize a special needs kit, but does not seem to do that anymore
- It would be helpful to have pictures of the animals with the signs for that animal on the back because you won't be able to know all the signs for all the animals
- Maybe having a pictorial representation of the rules would be useful
- The more visual the better, because the students won't have an auditory memory

- The school has one student who is totally blind, and is learning Braille, but completely blind students are very rare
- At the aquarium:
  - They send out emails to the schools advertising their programs
  - "Blue School": online tool, helps teachers to know what exactly is going to happen in advance
- Publicity in advance will help with the pre-visit phone call so teachers know what is important for the program
- To gauge success, they look at levels of engagement
  - If behavior is good it means they're engaged
  - Teachers are very sensitive to behaving well, and become worried if one of their students is misbehaving, even if it is probably a normal occurrence for school groups
- Learning disabilities: struggling in school, ex: dyslexia
- Intellectual disabilities: profound
- Communication: if there is no speech, then they offer as many options for forms of communication as possible
- For question and answer sessions, you may only get a few kids who could ask/answer questions
  - Activities are better
  - Looking for a sensing experience
- Students within a mainstream setting would be adjusted, and their aide may answer for them
- Students respond well to petting animals, and the teacher would let you know if there were any concerns in advance
- Broadmeadows SDS brings animals to the school for holidays sometimes
- For the zoo as it is now, the location of the classrooms is good, no security concerns
- The school will bring equipment, chairs, walkers, nappies
- They use Boardmaker, a program by Mayer Johnson, that uses pcs images
  - It would be very useful if the zoo used it too
- Often they will visit the zoo, but won't do the educational programs
- Also are turned away by the expense of going to the zoo, as they're located in a poorer area
  - Companion cards allow carers to be able to get in for free on weekends and holidays, and the school strongly encourages this

Observations from classrooms
- Maybe use photos at the zoo and send them to the school in advance
- Choice boards help students to communicate
- Make picture books of their trips
- "Big Mac" used to communicate, connects audio and visual (it's a big button with the student's picture on it, and when pressed it says the students name)
- Use music therapy (play beach music and feel the sand)
- Use terms "more" and "finished" as most important words
- Important to make things age appropriate but still relevant
- Many students can use the computers

Julie Halls
Position: Assistant Principal at Western School for Autism
Date: 06/02/08
Location: Phone Interview
Interviewers: Sara Kosmaczewski, Justine Ziobron
Contact Information: halls.julie.j@edumail.vic.gov.au or 03 9337 9175

- Was a teacher for 11 years and now works as an assistant principal
  - Her job now is to support the staff
- School teaches students from Prep to Grade 3
  - Age ranges from about 5 years old to 9 years old
- There are a few older groups
- There are two primary campuses with 250 students total
  - Of the 250 students, 220 of them are primary
- Autism Spectrum ranges from severely to moderately impaired
- The intellectual level of the students also ranges
  - Some of the students are high functioning and fall within the normal to above normal range
- One of the biggest problems is lack of communication and social understanding
  - They have problems understanding what is said to them and being able to respond correctly
- Another problem is imagining/picturing things they have never experienced
  - Since many of them have limited experiences in the world, many of them don't understand what is going on around them, especially when they are exposed to new things
- Communication: Use visual means to support what you are saying
  - Objects, pictures, lines, and words
  - Example: A cup may signify a drink or a lunch box may signify lunch
  - The objects help them to make connections with what you are saying and what they are suppose to do [helps them develop an understanding]
- The students success is based on their own individual evaluations and the goals they have achieved within the curriculum
- Some Autistic students become "obsessed" or very engrossed and focused on a certain topic and are able to retain a lot of information concerning it
  - It may appear like they know a lot about it, but they tend to just talk about it without actually having and understanding of it
- Question and Answer Sections aren't a good method to getting information across
  - Depending on the Student, a student with autism may not be aware that there is a leader that all the students are listening to and everyone is suppose to follow along
  - They may not understand the dynamics of the discussion
- Educating Techniques
  - Visual support! Use objects, photos, line drawings
  - Universal Program: Boardmaker
  - Help organize the tasks for the student
    - Example: First find a picture, second cut it out, and third paste it on a piece of paper

- o Doesn't differ if you have one student integrated into a mainstream school or a whole group of students with Autism
  - ▪ Some in mainstream schools have great difficulties
  - ▪ Some in specialty schools cope very well
  - ▪ It depends on the parent's choice for the child
  - ▪ The tasks and abilities of the child are no different
- Have difficulty organizing a task: where to start, what is needed, and how to do it [independently]
- She has attended the zoo before, but not any specific program [just a general visit]
  - o One of the problems is that the students take in a lot of information visually but they can't distinguish between what is important and what isn't important
    - ▪ Example: Some of the students may look into an enclosure and only see the cage or the plants, they won't actually see the animal
- Any precautions with handling the animals depends on the individual students needs
  - o Some students may be anxious or scared while others may be very engaged
  - o The staff who brings the students should know if a student needs close monitoring
  - o May not understand the animals so they may accidentally hurt them [lack of social understandings]
- Suggestions:
  - o Use lots of visual support
  - o Keep the information factual
    - ▪ Don't have the students try to imagine or pretend
  - o Give structure to tasks so the students know what and how to do things
  - o Have a schedule with a time table showing what is going to happen and when
  - o Try to make the programs and activities within their scope of experience and understanding

Garry Stinchcombe, Gail Stinchcombe, Michael Donnelly
Position: Employees of Vision Australia
Date: 05/02/08
Location: Burwood School; Vision Australia
Interviewer(s): Ben Gilde, Nicole Maglione
Contact Information: 1300 847 466

Gary Stinchombe- Assistant Head of School and Support Skills Coordinator
Gail Stinchombe-Orientation Mobility Instructor
Michael Donnelly-Art teacher

Burwood:
- Specialist primary school for vision impaired students
- Small school because most students are integrated into mainstream schools
- 70% of students who attend the school have another disability
- Have a support skills program
  - Use tapes, CDs, tactile mediums, and Braille
- Variety of conditions varies from child to child so there is a range of strategies
- Allow students to investigate in their own ways, and slowly on their own time

Student Feedback:
- General visit to the zoo couldn't feed or touch the animals
  - Some students were not able to answer the questions on the activity sheet
- At Healesville (two people low vision) were able to feed the wombats
  - Close up good look
- Touch tables with lion skin effective

Seating:
- Seating arrangement of a classroom can also affect visually impaired students
- Some students need to work better at table
- Allow option of sitting on the floor or at a table

Lighting:
- Make sure lighting conditions can be adjusted
- Retinitis Pigmentosa (RP)- tunnel vision
  - Peripheral vision is lost
  - Nighttime blindness
- Color blind
  - At zoo enclosures look natural and students may not be able to see camouflaged animals because there is no contrast

Partners:
- Pair visually impaired students with sighted students
  - Use other students as eyes
  - See from a child's point of view
    - Get information as a child sees it

Color:
- Use color when explaining

- Important when communication with students aware of different colors

Tactile objects:
- Students "see" an object by touch
- Great experience to feel stuffed animals or live animals
- Make simplified, straightforward, good explanations
- Some students are tactile defensive
    - Don't like to touch objects with fingertips
    - May be more comfortable feeling with the palm of their hand
- Describe and discuss an animal before student touches it
    - Tell the student if it is alive or not
    - Reinforce the animal will not hurt them
    - Be aware and sensitive

Physical experience:
- Allow students to get close enough to physically experience
- Compare to objects the students understand
    - Realm of experience
    - For example one student thought an elephant was only up to his waist
    - Use props such as a blow up whale so students can walk around and feel how long and wide a real whale is

Time:
- Need more time to touch the object and process information
- Give students as much time as necessary
    - Difficult 45 minute program so cut down amount of information
- Allow sufficient time to focus on one object

Tactile Diagrams:
- Piaf Paper
    - Used heat sensitivity to raise images
- Thermoform
    - Vacuum plastic forming process
    - Softens and shrinks
    - Shows images like sculptures
    - Use indication of scale
        - Size of adult comparison to a person

Vision aids:
- Act as "eyes" for students
- Students generally bring vision aids with them
- Monoculars

Aide:
- Sighted guide may help the student to read and describe printed material
- Schools prefer bringing an aid or visiting teacher on an excursion

Printed Material:
- Standard font for visually impaired: 18 bold Arial

Technology:
- Digital Accessible Information System (DAISY)
    - Similar MP3

- o Digital or audio recording of book on CD's
- o Can change speed, switch to other chapters
- o Designed for students who cannot read written material
- Talking Tactile Table (T3)
    - o Which was produced by the Royal National College for the Blind (RNC) in England
    - o Turns tactile images on a screen into audio feedback
    - o Connects through a standard PC or laptop computer
    - PAC Mate
        - o Portable Braille writing device
        - o Made by Freedom Scientific
        - o Stores information and can refresh its display
        - o Connect to a computer and is works with Windows operating systems
        - o Very expensive. Costs over $12,000
    - Also use GPS, MP3 players, and podcasts
        - o Access some technology from mobile phones

Recommendations
- Zoo educators should be trained to guide a visually impaired student
- Have a general awareness program annually
    - o Could setup through Vision Australia
    - o Part of ongoing professional development
- Do a session blindfolded to simulate vision impairments
    - o Vision Australia does a reverse integration program
        - Sighted children come into a vision impaired school
- Option to make sessions longer than 45 minutes?
- Less content in the program
    - o Work out what is important
    - o Find balance; don't want to compromise other students
- Option of have specialty group with two educators
- Eliminate background noise
    - o Students with vision impairments easily distracted by noise

Deb Lewis, Lyn Robinson, Marion Blazé
Position: Education Officers of Statewide Vision Resource Center
Date: 05/02/08
Location: Statewide Vision Resource Centre
Interviewer(s): Ben Gilde, Nicole Maglione
Contact Information: 03 9841 0242

- Department of Education Facility
- Produce e-text, tactile diagrams, and auditory resources
- Professional development
  - Simulation experiences: blindfold
- Majority of students are low vision

Lighting
- Adjust light (Shades, lamp)
- Control glare

Language
- Do not use descriptors such as "over there" or "up here"
- Specific language to identify a location should be used.
- Use analogies for comparisons
  - Compare to things that the student will understand
  - Example "as small as a finger."
- Imagine talking to someone on the phone
  - Very descriptive
- The teacher should address the students by name so student with visual impairments can identify who is speaking

Assistance
- Sometimes students will need assistance
- Work with a partner
- Hold arm and lead, don't come up behind visually impaired person

Accommodations
- Encourage children advocate for themselves
- Plan ahead, put in suitable form
- Use of Braille material is in minority, but should be available
- Predictable environment
  - Markings on steps
- Hands-on is the key
- Size of print
- Proximity
- Audio material

Technology
- Laptop with assistive software
- Podcasts and audio description
- Cameras for magnification
- Monoculars, magnifying glasses
- Video magnifiers
  - Enlarge the size of an object and display the image in great detail

Appendix O: Observation of Zoos Victoria Educational Programs

General Lesson
School Type: Mainstream School
Middle Year Program: Grades 4-6
Instructor: Shelley Waldon
Date: 15/01/08
Observed by: Ben Gilde, Nicole Maglione

- General introduction to the zoo and educational programs
- Immersion experience- path to classroom looks like rainforest
- Outside experience at owl enclosure
  - Discussed camouflage and food
- Ramp and steps were available for access to the classroom as well as a back door
- Upon entering the classroom, students were allowed to explore and look at the animals in the room while Shelley answered questions
- Shelley had the students make a circle and sit down on the floor
- Asked students which two countries the animals in the room were from
  - Told children to reflect and use clues such as aboriginal art, giraffe skill, hippopotamus skull, and leopard skin
- Passed the leopard skin around the circle and had children feel the skin (tactile experience)
- Discussed the difference between leopards and cheetahs
  - Cheetahs have spots
  - Leopards have rosettes-introduced new vocabulary word and showed the students the rosettes (circles around the spots)
- Then Shelley brought out several different live animals,
  - gave information about that animal
- Asked questions of the group, students raised their hands to answer
  - restated the answer so that everyone could hear
- Waited to answer questions when the whole class was paying attention
- The students were very well educated/prepared for the visit and were able to answer many of the questions (completed student trail before visiting the zoo)
- The first live animal was the bearded dragon
  - Explained that the lizard is very smart and referred to as "Einstein's Lizard"
  - Discussed how the lizard uses camouflage to blend in with trees, logs, and rocks
  - Covered defense mechanisms such as spikes, and puffing out sides and beard
  - Explained that the spikes are actually a trick because they feel like rubber
  - Allowed students to experience this by walking around and letting them touch the spikes
- Next animal was the shingleback lizard
  - Showed the students the lizard, and pointed out that it looks like it has two heads
    - Asked children why this would be helpful
  - Told students that the lizard has hard, heavy scales
  - Walked around the circle with the lizard and allowed children to touch the scales

- o Helped students to imagine how hard it would be for animals to bite through them
- Then asked if anyone was afraid of snakes before taking the snake out of the cage
  - o Asked two students to help her carry around the snake
    - Specifically asked the two children with Asperger's to help
    - Gave instructions how to support the snake
  - o Brought snake around the room, and only allowed them to feel the body of the snake with two of their fingers
- Allowed well behaved student to feed the monkey with mealworms
- Wrapped up and asked the children if they had any questions

*The lesson was part of the holiday general lesson, where animals were used to tell independent stories

General Lesson
Melbourne Zoo
School Type: Mainstream School
Grade: 1-3
Instructor: Mark Langdon
Date: 15/01/08
Observed by: Sara Kosmaczewski , Justine Ziobron

- Younger group
- Gather the group and gave a brief introduction
- Began by walking around the discovery center to view animals
- Showed animals, then gave information about that animal, asked questions of the group, students raised their hands to answer, restated the answer so that everyone could hear
- Interactive: allowed kids to feed the monkey with mealworms, after asking who wasn't afraid to hold the worms
  - Allowed multiple kids to have the opportunity (only gave 2)
- Lots of questions involving color
  - teaching difference between male and female
  - feathers versus fur: what you call the different animal
    - gave clues and hints by first letter of word to answer
- Discussed types of animals that are endangered and why
- The younger kids were very well educated/prepared for the visit and were able to answer many of the questions
- Ramp and steps were available for access to the classroom
- Upon entering the classroom, kids were allowed to explore and look at the animals in the room
- Feeling the furs that are scattered in the room added a tactile experience
- Mark then had the kids stand in a circle and sit down on the floor
- Question and answer session took place to introduce the animals in the room
  - Covered safety issues
    - What happens if you see a snake, what would you do
    - Asked if anyone was scared before he took the snake out of the cage
  - Brought snake around the room, and only allowed them to feel the body of the snake with two of their fingers
- Waited to answer questions when the whole class was paying attention
- Discussed the difference between snakes and lizards
  - Snakes can't hear
  - Snakes don't have legs or eye lids (used hand movements to demonstrate)
- Next animal was the tortoise
  - Explained the differences between tortoise and turtle
  - Compared the feel of shell to scales of a snake (incorporated a previous animal to strengthen connections)
- Reinforced previous questions and connected it to current discussion
- Next animal was the green tree frog
  - Told them safety issues, such as what to do if it jumped on them

- o Asked them to put two fingers out, and demonstrated how to pet the frog
- o Showed how they would use the spray water bottle to wet fingers before petting the frog so that the frog would not be harmed
- o Interacted first, then gave the info so that kids are already engaged
- Walked through the nocturnal room
- The above lesson was part of their holiday general lesson, where they use animals and tell independent stories

ESL-English as a Second Language
Healesville Sanctuary
School Type: University Students
Instructor: Hilary Tabrett
Date: 16/01/08
Observed by: Ben Gilde, Justine Ziobron

- Group of 19 students from Deacon University
  - English wasn't their first language
- Gathered group and gave a brief introduction
- Formed the group into a semi-circle and brought out an owl
  - Allowed a group member to feed the owl a mouse
  - Group had a strong reaction
- Spoke very slowly, clearly, and used hand motions
  - Due to the language barrier, additional explanations and descriptions were required
- Brought group into a classroom
- After the students roamed freely, Hilary formed them into another circle and sat them down on the floor
- The first thing she showed was Koala fur which she laid out on the floor for the group to touch
- Took out a live possom and brought it around one by one for the group to pet
- Throughout the lesson she asked questions and gave basic information
  - Example. Talked about the types of food a possom eats and showed the different types of food to the group
- Similar to the classrooms at Melbourne Zoo
  - Rooms are themed: the painting on the walls/ lighting/ animals and artifacts within the room fit a certain theme
- Some of the words and animals that she discussed were written up on a white board so the group could see the word as apposed to trying to figure out what she was trying to say [remember there was a language barrier]
- There was a bit of background noise that was distracting
  - One of the filters for the tanks was loud and made it hard to hear the instructor
  - The room also carried echoes in a strange way so it was difficult to hear what someone was saying if other people were talking or making noise
- Note to make: Some of the students were frightened by the animals and moved away from the group. Hilary was understanding if they didn't want to touch the animal but could have given more warning to the group prior to taking out an animal
- Other animals showed: small python, turtle, and green fog
- Did a good job of describing the animals using simple language and instructing the group how to interact with the animals, but she did have to tell them not to touch the tail of the possom a few times

General Lesson
Melbourne Zoo
School Type: Special School
Age Varied
Instructor: Shelley Waldon
Date: 22/01/08
Observed by: Sara Kosmaczewski, Justine Ziobron

- Special needs group: about 15 people of varying age
- Gathered the group and walked towards the classroom
  - Given the option to go in or not go in, one kid had a problem with going inside but went in once everyone else was inside
  - Shelly gave instructions before going in
    - What to expect inside
    - Ensured that skins, etc. were not alive
  - One student in a wheelchair
    - Minor difficulty in going over branches
    - Was able to walk into the classroom
- Students explored the room first, then sat in a large circle
- Shelly always spoke slowly and clearly
- Question and Answer session:
  - Ensure that the answer was clarified
  - Make the students feel comfortable
  - Get an understanding of what they are afraid of
- Took out a Koala skin
  - Show it up in a tree
  - Allow them to gently touch the fur one at a time
    - Enforce the idea of being gentle
    - One on one instruction as Shelly went around the group
  - Kids were very patient
- Bring out tortoise/fake turtle
  - Talked about the difference between a tortoise and a turtle, swimming and walking feet
  - Talked about where bones are located
    - Had them feel their own backbones so they can relate to what they were seeing
    - Showed the turtle shell
  - Repeat info that was just learned/discussed, for reinforcement
  - Had them count the scales in the shell by counting out loud with them as she pointed
- Brought out the live tortoise after preparing them and explaining
  - Told them his name (Georgy)
  - Repeated that it was a live animal
  - Had them look at the feet as they had discussed before
  - Prepared the kids before bringing it around
    - Pet it gently

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- - Where to touch
    - What to expect
  - One student was deaf
    - Signified that they wanted to touch it by reaching out
    - Shelly guided his hand to touch different parts of the turtle
  - Respectful if they don't want to touch the animal
- Allowed them to be a turtle
  - Get on hands and knees with a large shell over their back
  - First demonstrated on one of the chaperones
- Brought out a lizard
  - Name was Tripod
  - Only has 3 legs and is blind in one eye (good for making relation and connection with the animal)
  - Talked about it first and described it in detail
  - Prepared kids before touching it and then brought it around to one kid at a time
- Gave clues and had them guess what she was describing to introduce the frog
  - Again told them its name
  - Gave a brief introduction and description
  - Guided their hands to touch it, and had to spray their hands with water first
  - Deaf child signified he wanted a photo with the frog (and each of the other animals as well) by reaching out and using rough signing (as if taking a picture)
    - Resulted in a positive reaction, easy to tell they were engaged
    - May not have been focusing all the time, but always kept eyes on the animals
- Asked the teacher/whoever was in charge of the group if a snake was ok to bring out and how the students might feel about that
  - Gave the name of the snake, type, and description
  - Explained that they don't bite, but that they should touch the snake's face
  - Had them practice petting their own arm gently
  - Had them be quite, which was good in keeping both the snake and students calm
  - Had the chaperone demonstrate first to act as a model
  - One student was anxious, and a little overbearing, but was able to wait until her turn to touch the animal
  - For one student who was afraid and reluctant to touch the snake, Shelly linked fingers with her and touched the snake with her
    - Instantaneous response
    - Rewarding to touch the animal for the student
    - Overcame her fears
- Shelly had them clap at the end of the program, to show they had done a good job
- Brought them to the hand wash station
- *Note* they skipped the walk around the outside of the classrooms to see the animals intentionally

Fur, Feathers, Scales, and Skins
Werribee Open Range
School Type: Mainstream School
Ages: 5-8
Instructor: Kylie Gordon
Date: 23/01/08
Observed by: Sara Kosmaczewski

- About 22 students aged 8 and younger
- Brief intro covering what we're going to do
- For viewing the meerkats, Kylie asked students in front to kneel so all can see
- Described the relation between humans and meerkats
- Feed the meerkats with mealworms
    - Had students line up
    - Handed a mealworm to each student who wanted to participate
    - Held worms up in the air, and threw them in all at once
- Children were noisy, so everyone was asked to put up a rhino horn to show they were paying attention
- Brought into the classroom and allowed to wander around for about five minutes but were asked not to touch animals that were alive
- Classroom had many visual objects
    - Painted scenery on the walls
    - Branches, rocks, logs all along the edge of the room
    - Many animals on display
- Sat in a circle around a pile of various animal coverings
- Asked a single student to sort the pile of biofacts into 3 groups (did not specify groups)
    - Volunteer was picked by raising hands
    - Went into the middle and sorted
    - When the first child ended up with four piles, a second child was chosen to help
- Did a question and answer session covering vocabulary like mammals
- Brought out a shingleback lizard
    - Students asked more questions rather than answering the ones Kylie asked
    - Students with a fear of the lizard had their hands held while they pet it
- Kids got noisy again, so the rhino horn activity was used again
- Brought out the ring-tailed opossum, had to turn the lights off
    - Had students wiggle fingers to demonstrate tail action
    - Described fur, camouflage, and marsupials
    - Had to keep "opossum voices" on, to stay quiet
    - Brought the opossum around to pet it
- Students often got distracted when it wasn't their turn to pet, and would talk and walk around
- Brought frog out of toilet display and explained how frogs breath and drink through their skin
- Crickets and bubbling water noise in the background is very distracting

- Large flying bug flew across the room and distracted many of the kids, made it hard to focus
- Students often yelled out and asked to see the snake even though it wasn't part of program
- Program was ended by thanking the audience and having a round of applause

Additional notes from the Vet Check program with Jason
- Did a head count approximately 5 times in 30 minutes
- When asked for silence, asked them to be as loud as a giraffe (silent)
- Allowed them to wander around the classroom for a while
- This classroom also had painted walls, and more tactile elements (furs, stuffed animals)
- Frog was croaking and distracting, students were asked to ignore it
- Question and Answer about caring for a snake
- They were asked to show with their arms how the snake moves

General Lesson
Werribee Open Range Zoo
School Type: Mainstream School
Age: 9-12
Instructor: Rachel Lowry
Date: 23/01/08
Observed by: Justine Ziobron

- Group of children ranging from age 9 to 12
- Rachel had not been informed of any students with disabilities prior to the program
- Based on her general assessment, it appeared that one child had Asperger's [this is something teachers can usually pick up on] and another child had some other behavioral disorder
- Gathered the group outside the classroom, asked them to touch their eyes so she knew they were looking at her
- Gave a brief introduction and asked questions
- Asked them what sound a giraffe makes and then made a demonstration
  - The point was that a giraffe doesn't make any noise so whenever she told them to be as loud as a giraffe they were actually suppose to be silent
- The main theme was What does a Zoo Keeper do
- Told the kids of what to expect when they entered the classroom and what they would be doing in there
- Similar setup to the lessons we have seen thus far
  - Give Introduction, bring out animal, have discussion
  - Not school lesson, just a fun lesson
- Brought out a snake
  - Reassured the students that they would be safe and if they don't want to touch it or be near it then they don't have to
  - Still encouraged them to interact with the animal
  - Asked questions, gave information, and brought the animal around individually
- There were 3 free ranging lizards within the room
  - Students were asked to get up and find them [this may be a problem for children with a mobility impairment]
  - When one of the lizards was found, all the students rushed over to see it but Rachel told them to freeze their feet and be as loud as a giraffe
  - She told them she would bring it out as long as they reformed a circle and sat on the floor and then asked them to touch their ears so she would know they were listening
- Brought out a small glider possum that she trained herself
  - Asked the students to be very quiet as she brought it out
  - Placed it in the middle of the room
  - Asked questions and gave information, but the students weren't allowed to touch it
- Brought out a Green Tree Frog
  - Asked questions, gave information, brought around individually
  - One of the questions was to guess their secret

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- - In doing so the students touched upon a lot of important facts
- Re-asked the students what a zoo keeper does
  - Told them the last part to being a zoo keeper that they hadn't mentioned yet
    - Part of the zoo keepers job is it enrich the animals
    - Gave personal examples of how they improve the animals well being
- Brought the students outside to feed the Meerkat
- Had the students repeat everything they had learned about the animals
- Distractions:
  - There was a bird in the room making some noise
  - Some students spoke out of turn and had side conversations [which is to be expected]
- Note: At the beginning of the lesson, one of the students started having a fit [stopping her feet and yelling]. The aids that were with her led her outside to a bench where she would be less stressed. When we talked to Rachel about it afterwards Rachel said it was probably a good thing she left, but had the aids not led her out, she probably would have had a separate conversation with the aids to see if there was anything she could do to help. Also, as long as the student isn't destructive or a threat to the animals there is no reason to exclude them from the group.

Vet Check- All day holiday program
Werribee Open Range
School Type: General Public
Ages 5-12
Instructor: Jason Shadie
Date: 23/01/08
Observed by: Nicole Maglione

- Students that participated in the program were children from the general public interesting in being veterinarians
- General introduction to the zoo and educational programs
  o Called the students zoo adventurers
- This program took place outside the classroom
- Trail walk around "Pula Community Conservation Wildlife Reserve"
- Reiterated safety instructions written on a board before beginning
  o Some of the trail was composed of dirt and gravel and some parts were paved
- Asked questions of the group, students raised their hands to answer (throughout entire session)
  o restated the answer so that everyone could hear
  o Waited to answer questions when the whole class was paying attention
- The first exhibit was the monkey enclosure
    ▪ Enclosure was clear glass
    ▪ Flat path made of dirt and gravel
  o Jason asked if the monkeys looked healthy
  o Explained that monkeys don't like the taste of their medicine so the vets have to hide it in their food
- While walking to the next enclosure, the students had the choice of taking a path designed to look like a grassland, or an alternate cement paved path (accessible)
- Stopped at an animal skeleton
  o "Vet Check" time
  o What animal was it? What animal ate it?
- Second exhibit was the lion enclosure
  o Described how the vets check the lion's teeth
    ▪ Train them and give them a treat
  o Brought out lion claw and passed it around (tactile)
  o Opened a box to show the students what a lion skeleton looked like (visual)
- Third exhibit was the meerkat enclosure
  o Told the students that it is hard to give the meerkats medicine because they have a great sense of smell
  o Told the students that the one standing on the rock was called the "sentinel"
    ▪ Described how he was on the lookout for predators
- Made a stop at the Pula Tourist Center
  o Had many objects on the wall
  o Tank with frogs for the students to look at
    ▪ Sliding magnifying glasses on tank
- To get to the next exhibit choice of going through obstacle course or alternate path

- o Also animal sound machines on the paths
- Hippopotamus exhibit
    - o Exhibit
        - Walkway made of wooden panels
        - Enclosed by short wooden fence
    - o Does their behavior look normal?
    - o Taught students how hippopotamus are trained
    - o Dive under water to stay cool
        - Lungs like humans: take a deep breath and can stay under water for 6-7 minutes, if hiding can stay under water for 20 minutes
    - o Went into hut near the exhibit
        - Hippopotamus noise machine
        - Hippopotamus skull- the children could examine the skull and feel teeth and tusks
- Cheetah enclosure
    - o Fastest animal on land in the world
    - o Asked students, "Do the vets hide their medicine in peanut butter sandwiches?"
        - Children answered no, then said put it in something like steak
- The students were very well educated/prepared for the visit and were able to answer many of the questions (completed student trail before visiting the zoo)
- Wrapped up and asked the children if they had any questions
- Lunch break
- Behind the scenes with the vets
    - o Students got to explore an operation room
    - o The veterinarian showed and described different tools
- Classroom session
    - o Split students into groups of three
    - o Gave them x-rays to examine
        - Task: Find out what animal it was, and what was wrong with the animals
    - o Then had the students circle up and the groups presented their findings
    - o Afterwards, Jason described how the animals trainers tranquilized the animals
    - o Showed the students how to assemble and shoot a tranquilizer gun
        - Each student got to shoot at a zebra target outside
    - o Brought all the students inside and talked to them about sterilization
        - Each student had to try and put on gloves without touching the outside
- Ended the program by letting the students feed the meerkats and ask any questions they may have had

Appendix P: Compiled Barrier Checklists

Mobility Barrier Checklist

Task	Barrier	Possible Solutions
Traverse down dirt path	Uneven and obstructed at points	Have an aide with them (as needed, independently) Still do the walk Use rooms 3 or 6 for wheelchair access (Melbourne)
Feed animals (owls, meerkats, monkeys)	Can't reach or use fine motor skills	Educator and/or aide can guide the student's hand Allow student to just watch
	Can't gently hold a mealworm	Hold a small plate or cup with the worm to avoid squishing it
	Muscle control – difficulty grasping the food	Guide the hands of the student
Touching, feeling animals	Using refined motor skills for appropriate handling of animals	The instructor can guide the hands of the student Use animals that are less likely to react if handled rougher
	Can't reach over fence	Lift up animal Pull wheelchair up to side/closer Use educators hand to guide Simulate it with a stuffed animal
	Students in wheelchair can't reach Limited range of motion	Bring animals closer to students Make sure that enclosures are accessible for students in wheelchair
Reaching	Muscle control	Place objects where the students can reach
Kneel to allow all students to see animals	Not all students can knell, and consequently can not see animals	Spread out the group Take turns looking in enclosure
Sitting in a circle with the group	Flexibility is limited or child can not sit	Provide chairs or alternate items to sit on for students who may have difficulty sitting on the floor
Raising hand for questions or volunteering	Cannot raise hand	Work out method of signaling with the aide in advance Allow that student to use a bell or even speak out
	Limited range of motion	Use a different means for that student to get the attention of the teacher. If an aide is present have the aide signal when the student wants to ask something or needs something
Exploring	Access and ease of transport	Clear pathways and open spaces Preferential viewing for students in wheelchairs
Wiggle fingers to demonstrate opossum tail	Lacking fine motor skills	Watch educator wiggle fingers to portray same idea

Auditory Barrier Checklist

Task	Barrier	Possible Solutions
Hear educator's instructions	Can't hear instructions properly	Written instructions Audio enhancement
	Construction noises make it difficult to hear	Give instructions indoors or in a different location
	Other students are noisy	Use the rhino nose activity to keep all students quiet
Listening to lecture	Smaller rooms or bigger groups makes it harder for viewing the speaker or interpreter	Preferential seating for students with hearing impairments so that they can have the best view of the teacher Semicircle seating when possible
	Can't hear well or at all	Depending on the level of disability, audio enhancement may help (such as a microphone) Facing forward and improving speakers visibility would help for any level of lip-reading For the completely deaf an interpreter may be appropriate Written instructions and lecture notes can be used
Understand what is being said during opossum display	Lights out, difficult to see interpreter	Do most of the talking before turning lights out Use different animal
Hear bird calls	Can't hear them (especially over the background noise)	Have an audio recording available with headphones
Listening	Background noise Echoes	Eliminate any background noise that could make hearing difficult Examine the amplification in a room and see if other rooms might be more suitable
Responding to questioning	Can't hear the questions Understanding the language	Use an interpreter Making language simple Written questions
Hearing questions from other students	Can't hear the questions Understanding the language	Instructor repeats question to make sure that the student understood Instructor adapts question to make sure that the language can be understood by the hearing impaired student Use interpreter

Visual Barrier Checklist

Task	Barrier	Possible Solutions
Observe camouflaged owls	Due to camouflage nature, can not see birds	Feel feather samples Use detailed description Maybe provide picture
	Low field of vision hinders ability to observe	Instructor uses descriptive language to paint the most accurate picture for the student Listen for noises the animal might make
See animals	Can't see animals	Pet or feel animals (or their likenesses) Hear their calls Feed them with the help of the educator or aide
	Can't see the colors and shapes	Describe colors and textures in detail Have a tactile example
	Can't see small details	Have enlarged picture/diagram Ask if anyone wants to use a magnifying glass Have an optional picture book for animals
Observing animal feeding	Teacher feeds animal	Allow student to feed animal
See the opossom	Lights out, difficult to see in dark room	Sit closer to open windows Use different animals
Explore the discovery room	Can not see the discovery room	Feel the furs scattered around the room Feel the stuffed animals as well as their bones and shells Smell the odor created by the animals and plants within that room Suggest multi-sensory methods when first allowed to explore
	Students and objects around room are barriers to safely navigating the room	Provide guide to explain things and direct the student Give the student more access to touch Make sure that pathways are clear and that rooms are open without objects in areas where students walk
	Entering nocturnal room when they're not supposed to	Use a gate, door, or someone to stand by the doorway
Walk into/ see in dark nocturnal room	Dark and difficult to see anything	Red lights (or any lighting that would be unobtrusive) Footpath lighting Door markings Reflective tape to indicate boundaries Have educator say what to watch out for (glass wall, etc)
Understanding references to locations	Cannot relate through sight where things are located	Provide enlarged images for students with low vision Descriptive language, don't assume students know what you are referring to
Reading written notes on board	Low vision	Make sure writing is large for students with low vision Students should be seated near board for better viewing Any notes that are going to be written on the board should be provided in writing

Cognitive Barrier Checklist

Task	Barrier	Possible Solutions
Participation in the question and answer sessions	Doesn't participate	Adjust questions Direct discussion Smooth topic transition
	Loud/quiet students	Acknowledge and move on quickly for loud students Ask for more details from quiet students Give specific tasks (hold an item, sit in a certain spot)
	Different levels of understanding and intellectual ability in each group	Simplify language of the questions Repeating questions to emphasize
Understand animal descriptions	Can't comprehend	Rework the wording to accommodate for audience
Hear loud noises (bird calls), sudden movements of live animals, walking in dark room	Distracting/frightening for some students	Explain what is going to happen in advance Be sure to communicate with the aides about anticipating
Showing the animals	Fear of snakes/other animals	Clarify you don't have to pet it Start smaller (ex: koala fur) which also indicates the level of physical control For the turtle use the large shell to pretend students and aides are turtles Allow to hold frog in hand Practice petting on one's arm
Interact with students in group	Not paying attention, being loud and disruptive	Ask individual questions (i.e.: do you have a shell?) Give encouragement Engaging activities such as counting aloud (counting scales on a turtle shell with the whole group)
Paying attention	Bubbling water and chirping crickets are distracting	Turn off/find alternate methods of water filtration systems Give crickets as a food source earlier/later than the program (or dead)
	People standing up or speaking out is distracting to group	Politely ask aides to behave themselves (maybe ahead of time as well) Ask them to help out and give them specific tasks as well
	Hyperactivity	Avoid long periods of speaking without any participation from the students
Sitting still in circle for long periods	Hyperactivity	Make the time interactive Give the students something to do that will not distract the other students
Exploring the discovery room	Entering nocturnal room when they're not supposed to	Use a gate, door, or someone to stand by the door

Appendix Q: Tasks from the Themed Program Lesson Plans

Compiled from all programs found in Melbourne Zoo database:
- Educators write on white board
- Observe differences in habitat
- Find/draw animals
- View plants
- Taste plant
- Observe and compare animals
- Group objects in center of the room
- Work in group to figure out what animal a skull comes from
- In a group, make a bug out of cards with bug body parts (demonstrated once by educator)
- Look for bugs under leaf litter, use magnifying glass to ID bugs
- Bug tool kits: pliers, sponge, straw, syringe (all ways that bugs eat)
- Come up with enrichment activity for animal using objects
- Read booklets and see diagrams
- Watch movies
- Use imagination
- Role-play: birds and rhinos and giraffes and lizards (for camouflage, discipline, examples)
- Educators read a story to them
- Trace your hand and calculate surface area
- Do math
- Use scales to weigh elephant poop
- Taste bamboo
- View photos
- Design enrichment devices for orangutans

Appendix R: Fur, Feathers, Scales, and Skin Program Description

VELS - Level 1, 2

Theme: Animals have different body coverings that help them to survive and which we use to sort them into different groups.

At the outcome of this session we would hope that students understand….

There is a range of different types of animal coverings; these include fur, feathers, scales and skin.
We can place animals into groups by observing their body coverings.
Animals covered in dry scales are called reptiles. Those with fur are mammals. Feathered animals are birds and animals covered in naked skin are amphibians.
An animals covering helps survival by:
Providing camouflage,
Helping to attract a mate
Giving protection
Helping with temperature control
Assisting movement

Outside the Classroom – Intro

Observing a body covering…FEATHERS!
Tawny Frog Mouth (Can also use birds at core river) – What type of animal is this? How were you able to recognise that it was a bird? *…From it's body covering!* What type of body covering does it have? *Feathers.* Why do we think birds have feathers? *Waterproofing, warmth, camouflage, flight.*

Fun Role Play Activity – Beware of Predators!
Use a roleplay to demonstrate how birds use their feathers to camouflage.
For example, if you are using the tawny frogmouth… Ask students to spread their wings as though they were stretching on a sunny summer's day. Then imagine that they've heard a predator calling (eg. eagle). Ask them to pull their feathers tight against their body so that they begin to look more like bark than feathers. Then straighten up tall like a stiff branch. Lean forwards so that it looks as though they are a branch leaning from a tree. Do tree branches have eyes? *NO!* Quickly close your eyes and do not move a feather. No chirping, just stay still until your sure that the eagle has gone…… *you can carry this activity forward and use it as a disciplinary technique once inside the room. When you are ready for students to stop and listen to your next set of instructions call 'Tawny Frogmouths I heard an eagle coming!'.*

Inside the Classroom:
Once students are sitting in a circle, it is a good idea to get a sense of what they have done back and school, as well as gain insight to any prior conceptions that will help you judge what

direction you will need to take the lesson in. Be prepared, if you use the sorting activity as a probing activity and the students use terms such as mammal, bird, reptile and amphibian with confidence, you will need to beef up the content of your lesson plan. Eg. perhaps make the focus more on WHY do they have those coverings and introduce additional terminology etc.

Sorting Activity – Probing for prior conceptions:

Set the scene: Ask students to name (and discuss briefly) the items that have been placed within the centre of the circle (things such as bison fur, snake scales, eggs, nests etc).
Ask students to think about how they would group these items by keeping in mind the animals that they belong to.

Their turn: Then ask a volunteer (or two) to show the class how they would sort these items into groups. Explain that there is no wrong or right answer. Allow one student at a time to come into the circle and move items around to make a group. Ask them to clarify why those items belong together. Expect students to use all sorts of criteria such as colours, textures etc.Always thank them for their efforts and encourage new ideas.

Your turn: Once a few ideas for sorting have been discussed ask students to watch you very carefully, for you will now group the items. Place items in categories based on: Fur, Feathers and Scales. – Ask students to make suggestions as to why you have grouped them this way?

Conclude intro by highlighting that we have sorted each item into groups of 'body coverings'.

Lesson Structure:

Use available class animals to highlight different body coverings and their purpose.

Investigating scales…..
Lizard (any reptile can be used) –
Go searching for an animal. Pretend that you are searching hard but can't quite find what you are looking for. Then act surprised when you find your lizard and explain to the class that you though that it was a rock!
Why does this animal look like a rock? *Discuss.*
What type of animal is this?
If we had to sort this animal into one of the four groups we discussed earlier, which group would it fit into? Fur, Feathers, Scales or Skin?
Why would we put it into that group? *Because it has dry scales.* Reiterate the way in which body coverings can help to recognise what group the animal belongs in.

Ask a few students to pretend they are a lizard or a snake and drag their body forward along the ground. Ask students how their stomach would feel if they dragged their bare belly over rocks? *Sore, bruised scratched.*
Check the lizards belly for scratches…. Why doesn't this lizard have any scratches under its belly? *Discuss*
Does anybody know of any other animals that have scales?

And what do we call this group of animals again? *REPTILES!*

The scales of this lizard all face the one direction, so do you think it would feel smooth or rough? *Great opening to highlight technique of stroking reptiles before the lizard is moved throughout the circle.*

Guessing Game to highlight a mammal (you can use any animal e.g. ringtail):
Explain that you have a type of animal in your mind, and you would like them to try and guess it as you give clues (hands up after each clue).
I am an animal that is found within Australia.
I am covered with fur.
I live up in trees.
I sleep in the day and come out in the night!
I have a long white tail that I can wrap around braches like a ring.
Etc…
Once students have guessed (accept possom or ringtail possom depending on the ability of the kids).
Allow students to take turns to stroke the possoms one by one. Ask students to which group they would put possoms in. Talk about benefits of fur.

If time permits… (a good activity to have up your sleeve if the students are advanced and the probing activity was completed quickly):
Bring lion pelt into the circle and again ask students to classify. Ask if they can tell whether it is a male or female. Discuss benefits of mane. E.g. Attract the females. Makes them look bigger and scarier to other males. Helps to protect their heads when fighting.

Introducing the idea of amphibians….
Ask student to raise their hand if they can tell the class what our <u>top</u> body covering is? *Expect many students to answer skin.* To assist or help confirm idea's ask students to role up their sleeves and take a close look at the fine hairs on their arm. Or touch their heads and feel their own fur. Ask the same question again, and you should get a unanimous answer that humans are covered in fur. So what group of animals do we belong in? *MAMMALS!*

Can anybody think of an animal that is covered only in naked skin?

Frog Handling:
Use a similar line of questioning as outlined above. Get students thinking about why amphibians benefit from having naked skin only. *Camouflage, breath and drink through skins etc.*

CONCLUSION-

Before dismissing the class ensure to tie the lesson together by drawing attention to the lesson focus:
So…. Animals have different coverings for different reasons! And their coverings help us to recognise what group an animal belongs too!! Very soon, you can go on safari or for a walk

on our walking trail and using your eyes, you will be able to tell your teacher and friends what group that animal belongs in!

Quick Assessment Technique: 'Permission to callout at the touch of an ear!'

Before students can say goodbye and venture on a safari adventure, explain that you are keen to ensure that they now know how to use put animals in groups. To assess this, you're going to ask a question, and when you touch your ears, students can call out the right answer (judge the temperament of your group, you may want to ask for possom voices only…)

Animals covered in dry scales are called (touch ears) REPTILES!
Animals covered in Fur are called (touch ears) MAMMALS!
Animals covered in Feathers are called (touch ears) BIRDS!
Animals covered in naked skin are called (touch ears) AMPHIBIANS!

Remember: A teacher must lead students out of the room, with an accompanying teacher or guardian trailing at the back. You should accompany them to the taps and direct the group to their next destination. Ensure that your conclusion not only ties the lesson theme together, but also thanks the students for their time and sets them up for the rest of the day.

Appendix S: Table of Authorship

Section #	Section Title	Primary Author(s)	Primary Editor(s)
	Abstract	Ben	All
	Acknowledgments	Sara	All
	Nomenclature	Nicole	All
	Executive Summary	Ben	All
1	Introduction	All	All
2	Literature Review	Sara	All
2.1	Informal Education	Sara	All
2.2	Discovery and Learning	Nicole	All
2.2.1	Discovery and Learning Visits	Nicole	All
2.2.2	Discovery and Learning Resources	Nicole	All
2.2.3	Discovery and Learning and the VELS	Nicole	All
2.3	Disability Legislation	Nicole	All
2.3.1	Australian Legislation	Nicole	All
2.3.2	United States Legislation	Nicole	All
2.4	Types of Disabilities	Ben, Justine	All
2.4.1	Mobility Impairment	Ben	All
2.4.2	Hearing Impairment	Ben	All
2.4.3	Vision Impairment	Ben	All
2.4.4	Learning Disabilities	Justine	All
2.5	Special Education	Ben, Justine	All
2.5.1	Adaptations for Mobility Impairments	Ben	All
2.5.2	Adaptations for Hearing Impairments	Ben	All
2.5.3	Adaptations for Vision Impairments	Ben	All
2.5.4	Adaptations for Learning Disabilities	Justine	All
2.6	Universal Design	Sara	All
2.7	Summary	Ben	All
3.	Methodology	Justine, Nicole	All
3.1	Interviews	Justine, Nicole	All
3.2	Assessment of Zoo Programs	Sara	All
3.3	Framework	Ben	All
4.	Findings	Ben	All
4.1	Interview Results	Nicole	All
4.1.1	Education in Australia	Ben	All
4.1.2	Disability Barriers	Ben	All
	Barriers for Students with	Nicole	All

	Mobility Impairments		
	Barriers for Deaf Students	Sara	All
	Barriers for Students with Vision Impairments	Ben	All
	Barriers for Students with Cognitive Impairments	Justine	All
4.1.3	Accommodations	Ben	All
	General Accommodations	Ben	All
	Accommodations for Students with Mobility impairments	Nicole	All
	Accommodations for Deaf Students	Sara	All
	Accommodations for Students with Vision Impairments	Ben	All
	Accommodations for Students with Cognitive Impairments	Justine	All
4.1.4	Technology	Ben	All
	Technology for Students with Mobility Impairments	Nicole	All
	Technology for Deaf Students	Sara	All
	Technology for Students with Vision Impairments	Ben	All
	Technology for Students with Cognitive Impairments	Justine	All
4.1.5	Evaluations	Sara	All
4.2	Observation of Zoos Victoria Educational Programs	Justine, Nicole	All
4.2.1	General Program Structure	Justine, Nicole	All
4.2.2	Barrier Checklist	Justine, Nicole	All
4.2.3	Accommodations Made in Zoos Victoria Programs	Justine, Nicole	All
5.	Introduction to PAR	Sara	All
5.1	Universal Design PAR	Ben	All
5.2	Mobility PAR	Nicole	All
5.2.1	Mobility Spectrum	Nicole	All
5.2.2	Mobility Tasks/Barriers	Nicole	All
5.2.3	Mobility PAR Accommodations	Nicole	All
5.3	Auditory PAR	Sara	All
5.3.1	Auditory Spectrum	Sara	All
5.3.2	Auditory Tasks/Barriers	Sara	All
5.3.3	Auditory PAR Accommodations	Sara	All
5.4	Vision PAR	Ben	All
5.4.1	Vision Spectrum	Ben	All
5.4.2	Vision Tasks/Barriers	Ben	All
5.4.3	Vision PAR Accommodations	Ben	All
5.5	Cognitive PAR	Justine	All

5.5.1	Cognitive Spectrum	Justine	All
5.5.2	Cognitive Tasks/Barriers	Justine	All
5.5.3	Cognitive PAR Accommodations	Justine	All
6	PAR Evaluation	Sara	All
6.1	Implementing Universal Design	Sara	All
6.1.1	Case Study 1: Sue-Mobility	Sara	All
6.1.2	Case Study 2: Thomas -Auditory	Sara	All
6.1.3	Case Study 3: Ian-Vision	Sara	All
6.1.4	Case Study 4: Jodi-Cognitive	Sara	All
7	Conclusion	Nicole	All
8	Recommendations	Nicole	All