SUPPLEMENTAL TEACHING MATERIALS FOR CERES COMMUNITY ENVIRONMENT PARK

An Interactive Qualifying Project Report
Submitted to the faculty of
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ABSTRACT

This project, in collaboration with the Centre for Education and Research in Environmental Strategies (CERES) Community Environment Park, created supplemental teaching materials for CERES' excursion programs. We gathered data from stakeholders across Victoria to develop design principles that directed the creation of pre- and post-excursion teaching materials. Ultimately, we created two types of materials for use before and after the excursions to extend the lessons learned at CERES and encourage sustainable practises, along with establishing recommendations to evaluate their use.

ACKNOWLEDGMENTS

We have been very fortunate to work with a wide variety of individuals throughout the course of this project who always went above and beyond what we asked of them. For this, we would like to acknowledge all of their contributions that have helped make this project a great success.

First we would like to thank our sponsoring organisation, the Centre for Education and Research in Environmental Strategies (CERES) for their willingness to host our group, to see out the completion of this project, and for providing us with necessary transportation to and fro. CERES Community Environment Park was a beautiful and exciting place to work and we appreciate the creative atmosphere CERES provided us for the duration of the project.

Shane French, our liaison, was of the utmost help with answering any questions we had over our two month stay in Melbourne, Australia. Shane served the role of being our main contact within CERES, and as such was able to take time out of his busy schedule to provide helpful feedback during the development of the pre- and post-excursion materials we created.

Glenn Evans, the land excursion coordinator at CERES, took on the role of filling in as our liaison when Shane French was away during the first week of this project, and acted as a main contact in the development of pre-and post-excursion teaching materials for the land strand at CERES. We greatly appreciate his commitment to the success of this project.

Ian Culbard, the energy excursion coordinator at CERES, despite departing for London half way through the course of the project, provided us with much guidance and advice on CERES' excursion programs in general and gave us insight into how the programs were interconnected. Ian even provided us with philosophical lessons for which we are much obliged.

Our advisors, Professors Chrysanthe Demetry and Richard Vaz of Worcester Polytechnic Institute, also deserve great recognition for their supportive guidance and feedback on our entire project. Both Chrys and Rick spent countless hours reviewing and making suggestions on every document that is included in this report. They also aided in developing our critical thinking, organisational skills, and fostered a drive to produce quality work.

Sean Coleman and Dianne Gordon, representatives of Zoos Victoria, deserve mention for their terrific responses during formal interviews. They both provided great insight as to the creation process involved in establishing pre-and-post excursion teaching materials for the Melbourne Zoo and the Healesville Sanctuary.

Finally, we would like to thank Professor Holly Ault of Worcester Polytechnic Institute for organising and planning all of the sponsoring organisations in Melbourne, Australia. Professor Ault took it upon herself to introduce us to the culture of Australia through many presentations and meetings making our transition to a new culture much easier.

EXECUTIVE SUMMARY

Australia has the world's 9th largest per capita ecological footprint (Global Footprint Network, 2010). To promote sustainability, many Australian organisations offer community outreach programs, often geared towards empowering young students to take practical steps towards a more sustainable society. The Centre for Education and Research in Environmental Strategies (CERES) Community Environment Park is a non-profit organisation in East Brunswick, Victoria, which contributes to the cause of teaching urban sustainability through their award-winning excursion programs. CERES expressed interest in creating pre- and post-excursion teaching materials that could empower visitors to apply what they learn on-site to their lives in order to help make the community more sustainable.

This project was intended to help CERES Community Environment Park foster environmental education and encourage sustainable practises by enhancing the learning experience of visitors to CERES through the creation of pre- and post-excursion teaching materials. We used the following process to achieve this goal:

Identified the opportunities available for pre- and post-excursion teaching materials

We observed and participated in several of the excursion programs to understand what information was being presented to students and how that information was being conveyed. We interviewed the CERES educational staff for insight into how pre- and post-excursion materials could aid CERES in its mission to "create a new way of being." We also questioned teachers who visited CERES in order to find out what teaching materials could benefit their curricula. Educational staff from Zoos Victoria were interviewed to find what design criteria they had used to develop the teaching materials available through the Melbourne Zoo and Healesville Sanctuary.

Established a set of design principles for pre- and post- excursion materials that comply with CERES' mission

After analysing the data gathered from observations and interviews, we compiled the results and developed principles to guide the creation of teaching materials.

Developed a set of teaching materials and templates to be evaluated by CERES

We created pre- and post-excursion teaching materials for the programs within the land and waste strands at CERES. Templates for these materials were developed so that CERES staff might be able to edit and adapt the materials for other programs in the future.

Below we explain the principles used to aid in the development of pre- and post-excursion teaching materials. There are nine core design principles followed by principles specific to pre-excursion materials and specific to post-excursion materials.

Core Design Principles:

Attentive to CERES' mission

The four principles of sustainable environment, social equity, cultural richness, and community involvement are used to shape all of CERES' programs, and as such were used to shape the pre- and post-excursion material to ensure that they are faithful to the mission of CERES.

Common to many programs within strands

CERES staff educators preferred the materials to cover the concepts which connected each of the programs within a strand, so that pre- and post-excursion materials will be independent from the specific programs booked by teachers.

Supportive of the excursions while also being distinct from the excursions:

The materials will cover similar topics but will not be repetitive so that they will support but also remain separate from the excursion programs.

Activity-based

Hands-on, interactive activities are consistent with CERES' teaching style on-site at in the excursion programs and provide students with the benefits of experiential learning.

Replicable for future pre- and post-excursion materials

CERES staff educators suggested that the materials we develop should provide a way for staff to return to the materials at a later date and edit as well as adapt the materials for use with strands besides waste and land.

Compatible with the VELS curriculum

VELS, the Victorian Essential Learning Standards, is the curriculum established by the Department of Education and Early Childhood Development (DEECD) in Victoria. Teachers suggested that the pre- and post-excursion materials should have VELS-compatible activities and lessons.

Made available on the CERES website

CERES education does not have the resources to supply teachers and students with paper-form materials, so the materials we develop should be available online.

Easy for teachers to use

The materials needed to be practical and simple for teachers to use since they are the ones responsible for delivering the material to the students.

Appropriate for school years 3-6

The most common age group of students at CERES fall between the school years 3 and 6. CERES staff recommended that we tailor the materials for this age group so that they could be used by the most amount of students.

Pre-Excursion Design Principles:

Familiarise the visitors with CERES and the excursion programs:

Teachers suggested that pre-excursion materials provide an introduction to CERES and the activities that the students would go on.

Provide context to the topics and ideas covered on the excursion programs

CERES staff requested that the pre-excursion materials cover some basic ideas that would be presented in the excursion to save time during the excursion at CERES.

Post-Excursion Design Principles:

Draw upon the knowledge students have gained in the excursion:

The materials should continue to strengthen the ideas and thought processes that have been established as a result of the excursions at CERES.

Provide students with the opportunity to change their behaviour:

CERES staff wanted the materials to encourage sustainable habits in the students at school and at home. They said that this is integral to the mission of CERES to "create a new way of being" by educating the community about sustainability and living sustainably.

Encourage continued CERES connections:

Post-excursion materials should encourage and provide means for students to supply CERES with information regarding any follow-up activities they choose to do after their excursion, and the impetus to return to CERES on their own someday.

Provide activities for in-school and at-home use

CERES staff not only wanted to provide resources for teachers, but also examples of how what the students learned is applicable in their home life.

The pre-excursion materials include an introduction to CERES and their excursion programs, three to four resources that teachers can use to introduce the strand themes to their class, and follow-up discussion questions to get students thinking about the excursion. The document for the waste strand is shown in Figure 1.

The post-excursion materials are separated into materials for use at home and materials for use at school. Both sets contain one large, hands-on activity and two to four smaller activities, followed by a speech bubble from a mascot that we created, encouraging students to contact CERES and show the progress of their work. At-home post-excursion materials for the waste strand are shown in Figure 2.

Here we present the recommendations for CERES staff on the future use and continued development of the pre- and post-excursion materials.

Distribution of Pre- and Post-Excursion Materials

Pre- and post-excursion materials should be provided from the CERES excursions website underneath the strand they correspond to, in PDF format. Bookings staff should mention the materials to teachers during the booking process. Post-excursion materials should be suggested to students and teachers during the closing discussion of the excursion programs.

Evaluation and Future Development of Pre- and Post-Excursion Materials

Using the survey questions we developed, create an online survey using Survey Monkey or a similar tool for the pre- and post-excursion materials. This survey should be placed on the CERES excursions website underneath the provided materials, along with a brief sentence encouraging teachers to provide feedback on the materials. Using the feedback gained from the evaluation surveys, change and update the pre- and post-excursion materials as needed. The materials were developed with years 3-6 in mind. We encourage CERES staff to create more teaching materials for younger and older age groups, as well as for the rest of the strands of the excursion programs using the templates we created.

Introduction to CERES Community Environment Park:

Located on the banks of the Merri Creek, CERES is a 4.5-hectare urban park that presents a working model of a sustainable community. All waste and water at CERES is recycled, and much of the site is powered by solar and wind energy. Complete with examples of green technology in action, ecological building design, community enterprise, a cultural village, and beautiful mosaics and sculptures, CERES seeks to offer a new way of being to its visitors.

The excursion programs that CERES offers are hands-on, interactive experiences built upon the real-life resources and displays at the CERES Community Environment Park. All CERES staff are dedicated to providing the most engaging and informative activities for students. For a map of CERES, visit: http://www.ceres.org.au/sitemap

Waste Program Pre-Excursion Materials

Teachers: If you have booked programs within the Waste Strand, you may want to prepare your students by engaging in some of these pre-visit activities to get them thinking about Waste and its impact on the environment.

- Watch The Story of Stuff, a 20min. film which looks at the shortcomings of the current system in which resources are obtained, processed, used, and disposed. http://www.storyofstuff.com/
- Find out where local recycling and waste services are using Recycling Near You. http://www.recyclingnearyou.com.au/
- Visit the website of Planet Ark to learn about campaigns that encourage community involvement to address our environmental impact. http://www.planetark.org/about/
- *Calculate individual and school ecological footprints at the website of EPA Victoria. http://www.epa.vic.gov.au/ecologicalfootprint/calculators/default.asp

After engaging in these activities, generate some pre-visit discussion by using these thought-provoking questions:

- What are all the different types of waste your school produces?
- What are all the different types of waste produced at home?
- How do your shopping habits contribute to the waste stream?
- What is recycling?
- How can we reduce the amount of waste we produce every day?
- How can waste be used as a resource?
- How do we become more conscientious consumers?

*Do not suggest this resource for students if you plan on booking the Ecological Footprint excursion activity.

Figure 1: Example of pre-excursion material for the waste strand.

WASTE: AT HOME ACTIVITIES

The D.U.M.P. Awards

Environment Victoria's annual D.U.M.P. Awards (Damaging and Useless Materials from Packaging) are awarded to companies whose products have the most excess or non-recyclable packaging. This is to help these companies realise that they are wasting many resources.

Now it's time for you to hand out your own D.U.M.P. awards! Search around your house and find the packaging of a few different items. Is there more material being used than is necessary? Is the packaging made of recycled materials? Compare all of the packaging on the items you found. Which one do you think should be the winner of the D.U.M.P. award?

Now that you know which product deserves the D.U.M.P. award, see if you could come up with a way to fix the packaging. Try making the packaging smaller, out of a more recyclable material, or even have them packaged together rather than individually. By using some of these ideas and some of your own, see if you can redesign it.

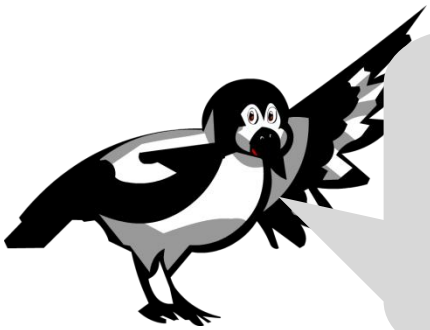
Clean Up Your Home!

Consider ways to give new life to all of the unused or old items you have at home. Donating your items to charity or running a garage sale are good ways to provide others with the things they want and need.

Finding broken items around your home that can be recycled will clear up space and also means that those items won't be sitting in a rubbish tip leaking toxins into the environment.

Bigger Is Better

Buying food in larger quantities is not only cheaper, it's also more sustainable. Instead of buying potato chips in small bags, you should try buying a large bag of chips and putting those in a reusable container. Ice cream tubs make great reusable containers!



Maggie the Magpie says, "Send pictures of your D.U.M.P. award and what you came up with to education@ceres.org.au. We would love to see your work!"

Recycling Detective

If a plastic material has a recycling symbol imprinted on it, such as the ones shown below, this means that it is made out of a plastic that can be recycled.

This symbol is used in Australia to identify the type of plastic used to make the material. However, sometimes plastics from other countries make it into Australia. These plastics don't always have the imprinted recycling symbol and may not be recyclable, even if the label says that they are.

Become a detective and find plastics in your home that have the imprinted plastic identification symbol. Then try to find plastics that don't have the symbol. Do these plastics have labels that say they are recyclable? Don't be fooled!

Figure 2: Example of post-excursion material, the home version for the waste strand.

AUTHORSHIP

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Acknowledgements	Ryan	Ben	All
Executive Summary	All	All	All
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3.3	Stephen	Ryan	Ben
4.1	Ryan	Ben	Stephen
4.2	Elena	Ben	Ryan
4.3	Stephen	Ben	Elena
5.1	Stephen	Ben	All
5.2	Ryan	Ben	All
6.1	Ben	Elena	All
6.2	Ben	Elena	All
6.3	Ben	Stephen	Elena
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Appendix D	Ben	Stephen	Ben
Appendix E	All	All	Ben
Appendix F	Ryan, Stephen	Ben	Ryan
Appendix G	Elena	Stephen	All
Appendix H	Elena	Ben	All
Appendix I	Ryan	Ben	All
Appendix J	Elena	Stephen	All
Appendix K	Ben	Elena	All

Appendix L	Ryan	Stephen	All
Appendix M	All	All	All
Appendix N	Ben	Stephen	Ben
Appendix O	All	All	All

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1 INTRODUCTION

Australia has the ninth largest per capita ecological footprint in the world (Sustainability Footprint Network, 2010). According to the Environmental Protection Agency of Victoria, if everyone lived like Victorians, we would need roughly four Earths to support us. Government initiatives and environmental organisations in Australia have created educational programs to help educate individuals and groups about sustainable practises. These programs are often geared towards youth in an effort to develop eco-responsible members of society before they become accustomed to wasteful habits. The educational programs are intended to empower students to take practical steps towards a more sustainable society.

The Centre for Education and Research in Environmental Strategies (CERES) Community Environment Park is one organisation offering such programs. CERES is a non-profit organisation in East Brunswick, Victoria, which provides employment opportunities to local residents by way of their cafe, community garden, nursery, farmers' market, and much more. Their mission, as a whole, is to "create a new way of being" in regards to sustainability education and personal wellness. One of their prime offerings is educational opportunities to the community, particularly through their school excursion programs, which serve approximately 60,000 students each year. CERES' influence reaches students from all over Victoria. Their educational programs are based around the idea of sustainability; they do not only teach sustainability but also invite students to take a look at their lives and the practises that they use that may or may not be environmentally-friendly.

CERES' excursion programs are well-established and award-winning for the rewarding experience visitors receive through the activities and information provided on site. These programs are broken down into sections called strands, which cover different focus areas like land, waste, and energy. CERES received feedback from teachers mentioning that the excursion programs could be improved further with the addition of pre- and post-excursion materials. CERES is also interested in ways they can reach out to students both before and after an excursion program to help supplement their excursions and to inspire behavioural change. This led to the idea of creating pre- and post-excursion teaching material that could empower students to start making a difference once they return to school and perhaps even before they arrive on-site.

This project was intended to help the CERES Community Environment Park foster environmental education and encourage sustainable practises through the creation of pre- and post-excursion materials. To achieve this goal, we began by identifying the opportunities for pre- and post-excursion teaching materials at CERES. We were interested in determining the content and teaching styles CERES employs during its excursion programs, learning the opinions of visiting teachers, defining the goals and desires of CERES' educational staff, and also discovering the motivation and process other local organisations used to create supplemental teaching materials for their programs. After analysing all of these perspectives, we developed a set of design principles to guide the creation of pre- and post-excursion teaching materials. From these guiding criteria and in collaboration with CERES staff, we developed teaching materials for the land and waste strands. The hope is that these pre- and post-excursion teaching materials will enhance the existing excursion programs at CERES by providing a connection between the excursions and the classroom and by influencing students to live sustainably.

2 Background

The goal of this chapter is to provide the necessary background information to understand CERES programs and initiatives for sustainability education in the Melbourne community. We begin by introducing the sustainability movement in Australia. Then we introduce our sponsor, CERES Community Environment Park, a non-government organisation that seeks to provide sustainable solutions for individuals and for the community. Finally, we discuss experiential learning as a form of education.

2.1 The Movement for a More Sustainable Australia

Like people in most other developed countries of the world, Australians place a large demand on the environment. In this section we introduce the concept of an ecological footprint and its relevance to individuals in Australia. We then highlight some initiatives to help reduce the per capita ecological footprint of Australians.

An ecological footprint is a measurement for an individual's or other entity's impact on the environment. This measurement is an analysis of the consumption of resources and waste produced by the subject over the course of a year, as well as the Earth's current ability to recover from the subject's actions. Generally, if a nation's per capita ecological footprint is less than 1.8, the ecological demands of that nation are considered sustainable (Global Footprint Network, 2010). According to the Footprint for Nations 2007 published by the Global Footprint Network, Australia's per capita ecological footprint is 6.8 global hectares, the ninth largest in the world. If everyone on Earth had the lifestyle of the average Victorian, we would need four Earths to sustain us (EPA Victoria, 2008).

There are many environmentally-focused organisations and community endeavours that have been attempting to combat the large per capita ecological footprint of Australia. These organisations have developed educational programs to teach their communities about sustainability and its importance to their way of life.

EPA Victoria, for example, has an online assessment citizens of Victoria can take to determine their personal ecological footprint. It also provides suggestions for how concerned individuals can lower their footprint (EPA Victoria, 2010). A few of the leading organisations that provide sustainability education to the community are the Melbourne Zoo and the Healesville Sanctuary, who use the animals located on their site to help inform the public about ways they can make a difference and help with conservation efforts. In Victoria, one of the leading organisations in sustainability education is CERES Community Environment Park.

2.2 CERES Community Environment Park and Sustainability Education

The Centre for Education and Research in Environmental Strategies, or CERES, is a one-of-a-kind educator in sustainable practises and green technology. It provides educational programs in an effort to combat Australia's large ecological footprint by teaching the youth of the state of Victoria about sustainable practises. This section contains a brief history of the CERES Community Environment Park, its goals and mission, as well as an in-depth discussion of its educational programs aimed at promoting sustainable practises.

CERES Beginnings and Mission

CERES Community Environment Park was one of the earliest attempts at tackling some of the important environmental and urban sustainability issues affecting Australia. In the late 1970s, there was response by citizens of the Melbourne community to search for ways to face the pressing social and environmental issues associated with urban life. These citizens came together and were leased a former landfill and bluestone quarry by The Brunswick Council in 1982. They intended to improve the state of the land and to heal damage caused to the local Merri Creek by years of waste disposal from nearby factories. This soon became known as the CERES Community Environment Park and grew into a working model of a sustainable urban community (CERES, 2010).

After 30 years of existence, CERES members have changed the landscape of the site from a rubbish tip to a thriving model of sustainability. Their current mission is to "create a new way of being" (CERES, 2010). This mission is achieved by the founding principles that CERES abides by for everything they do. These principles are: sustainable environment, community involvement, cultural richness, and cultural equity. Their mission and founding principles together help represent a positive effort towards uniting members of an urban community under a singular focus: providing environmentally-friendly solutions in the hopes of affecting future societal development. They wish to promote lifestyle changes through the modelling of practises they think would be effective if utilised in Australian society. CERES also focuses largely on educating the youth as a means of putting sustainability into practise and creating a more sustainability-conscious future.

Educational Programs

CERES is well-known in the state of Victoria as being a unique model of a sustainable community. Its educational programs have provided CERES with a reputation as a leader in sustainability education in Victoria. These programs are the reason that CERES won the Banksia Education and Training award in 1996, presented for outstanding achievement in the development and delivery of educational programs that contribute to the protection, enhancement and sustainability of the Australian environment (Banksia, 2009). The programs are delivered through two methods: incursions, where CERES staff members bring their programs to present at schools, and excursions, where teachers and students can take a trip to the CERES site and participate in the activities there.

The CERES excursion programs service over 60,000 students every year from schools across Victoria (CERES, 2010). There are five main themes or strands teachers can select from, each representing a different aspect of sustainability education: waste, land, water, energy, and culture. In addition to these five main strands, there are also multi-strand excursion programs, covering topics which cannot be separated into any one category, as well as programs for continued adult education. Within the strands, there are many individual programs that students can embark upon, resulting in nearly eighty different tailored experiences (CERES, 2010).

Figure 3 shows the CERES program and activity options that are made available to teachers. Teachers begin by selecting one of five strands: land, water, waste, energy, and culture. Each strand covers a varied area of concepts and information within sustainability. Within each strand there are a variety of programs. As an example, Figure 1 shows programs available in the land strand. Teachers can select a program appropriate for the year level of their students, and then can select individual activity options, such as Plant a Seed as seen in Figure 1. Activity selection is aided by information that is made available to teachers on the CERES website that consists of summaries of individual activities for most program strands.

Strand	Land (example)				
Program	Plants & Animals	Shelters	Earth Discovery	Ecology	Applied Gardening
Grade Level	Pre-2	Pre-2	3-6	3-6	7-10

Program	Plants & Animals (Years Pre-2)
Activity Options	Where Our Food Comes From
	Bees & Bee Dance
	Plant a Seed
	Worms & Minibeasts
	Netting for Waterbugs

Figure 3: Strand, program age breakdown, and activity options for CERES excursions

Experiential Learning

The excursion programs at CERES use experiential learning as their main method for teaching sustainability to students. Experiential learning allows participants to become engaged in a subject matter in a more experiential, hands-on fashion. David Kolb's Experiential Learning Theory (ELT) describes experiential learning as, "the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming [one's] experience" (Kolb 1984, p. 41). This theory describes that four processes are necessary for learning from an experience; these are represented in Figure 4 and consist of Concrete Experience, Reflective Observation, Abstract Conceptualisation, and finally Active Experimentation.

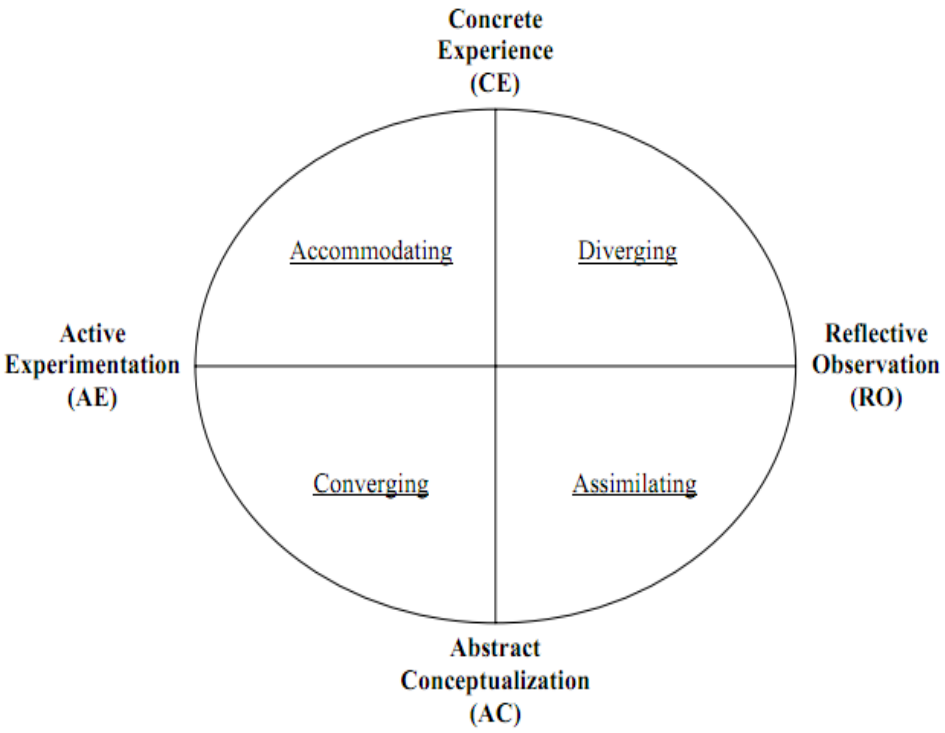

Figure 4: Experiential Learning Theory diagram (Kolb 1984)

This four step learning process starts off, as outlined by Kolb, with concrete experiences as the building blocks of reflective observation. The reflections are then transferred to abstract concepts that allow for new implied concepts to be created. From here, these implied concepts lead into active experimentation, or testing, to form a new experience (Kolb, 1984).

CERES education excursion programs naturally cover three of the four elements of Kolb's experiential learning cycle. They start off by introducing a concrete experience to students, mostly related to an ecological implication or problem. From here, the learning experience of the excursion follows the circular diagram to represent ideas of how a student's actions can influence the status of a given ecological problem, followed by abstract thought about where future lifestyle changes can be applied to help conquer the problem.

One step of Kolb's cycle is currently missing in CERES programs, the active experimentation phase. Other organisations such as Zoos Victoria apply an extended form of education outside of the programs that they offer. They provide teaching materials to be used by students before they arrive to the organisation, or after they leave to promote active experimentation with topics provided during the excursion. CERES programs could benefit from using a similar approach, since they do not currently have any established pre-or post-excursion teaching materials for any of their excursion programs. To truly make the most of experiential learning, CERES programs could benefit from creating the opportunity for Active Experimentation following the excursion.

Pre- and Post-Excursion Teaching Materials

Teachers have expressed interest in pre- and post-excursion materials as evident by surveys CERES conducted of their excursion programs: one in 2006 and one in 2008. These surveys were distributed to the teachers that were participating in the excursion programs at the start of the day, and then collected at the end of the day before the

teachers left the CERES site. These surveys covered all aspects of evaluation of the excursion programs ranging from the content of the programs to the quality of the CERES educators. CERES staff members were interested in learning what areas of the excursion programs could use improvement or adjustment in order to provide the most effective delivery of sustainable topics to students. Multiple teachers responded with suggestions for pre- and post-excursion material. Refer to Appendix A for an analysis of the evaluation survey responses. These responses, along with a general desire to enhance the overall effectiveness of the excursion programs expressed by the CERES staff, provided the spark that led CERES educational staff to believe pre- and post-excursion teaching materials could be used as a means of extending the lessons learned during the excursions into the classroom and home settings.

3 METHODOLOGY

This project was intended to help the Centre for Education and Research in Environmental Strategies (CERES) Community Environment Park foster environmental education and encourage sustainable practises in urban communities by enhancing the learning experience of visitors to CERES through the creation of pre- and post-excursion materials. We created the following set of research objectives in order to achieve our goal for this project:

- Identify the opportunities available for pre- and post-excursion teaching materials
- Establish a set of design principles for pre- and post- excursion materials that comply with CERES' mission
- Develop pre- and post-excursion teaching materials and templates to be used and evaluated at CERES

In this chapter we present the methods used to accomplish each of these objectives.

3.1 Identifying Opportunities for Pre- and Post-Excursion Teaching Materials

This section describes the methods we applied to gather information on opportunities for pre- and post-excursion materials for the CERES Community Environment Park. The research questions we sought to answer are as follows:

- What content is presented to students in CERES' excursion programs, and what general methods are used to convey this information?
- What are the perspectives of CERES staff educators on what information should be included in pre- and post-excursion materials?
- What are the perspectives of visiting teachers on how pre- and post-excursion materials might enhance the excursion programs at CERES?
- How are pre-and post-excursion teaching materials used by other organisations, and what process do they use for creating those materials?

We utilised four different methods to find the answers to these questions. These methods included observing excursion programs at CERES, obtaining perspectives of CERES' staff members and the opinions of visiting teachers, and finally obtaining information from local experts regarding their creation process for pre- and post-excursion teaching materials.

Program Observations

To develop a foundation on which to base the pre- and post-excursion materials, we needed to understand the excursion programs first. We observed over fifteen of the land, water, waste, energy, and multi-strand excursion activities in order to understand the content of the programs and the teaching methods utilised by CERES staff educators. We chose to observe only activities within the land, water, waste, energy, and multi-strand programs because these were the programs which were booked most frequently and are currently under revision by CERES staff in order to address new topics such as changing consumer habits and viewing waste as a resource. The land, water, waste, energy, and multi-strand programs were also chosen for observation because the programs span an overlapping set of subject matter and are easily relatable to each other for this reason. We created and used an observational protocol focused on the following:

- **Structure of the programs**
  We made note of any challenges CERES staff members faced with the content or organisation of the programs that could be alleviated through the development of pre-and post-excursion teaching materials.

- **Level of involvement of the students**
  We recorded which elements of programs were most engaging for the students and also which portions the students didn't find particularly engaging. The engaging elements were noted so they could be built upon in the post-excursion activities.

- **Emphasis and focus of teaching topics (content)**
  We looked at the topics that were and were not covered during the excursion program in order to gauge what students learned from the activities so we could determine the information that could be focused on in pre- and post-excursion materials.

- **Types of teaching materials/activities**
  We looked at the types of media used to present the material during the excursions in order to develop ideas for different methods of delivering information to the students before and after the specific programs.

While observing programs we collected examples of written documents used for teaching purposes during the programs and also the lesson plans developed by CERES staff. These lessons plans provided us with information on the logical order of how the programs were taught. Observation and participation allowed us to eliminate obvious questions we might have had from interviews with CERES staff such as questions about the nature of the participation of students in the programs, and question about logistics and structure of the programs.

The observation results were analysed by defining categories or themes for frequent observations, and then recording the number of times those elements were observed in the programs. We then discussed each theme to see if it suggested either ways to create materials or ways to develop design principles for those materials. For a full list of the programs observed and the observational protocol used to carry out our observations refer to Appendix A.

Staff Perspectives

Within CERES education, there is a specific program coordinator who oversees a particular strand of the educational programs (such as waste, land, etc.). The program coordinators have taught these programs numerous times, so they are very knowledgeable regarding the details of the programs. By interviewing them, we sought answers to the following questions.

- Does CERES have pre-existing design principles or internal policies used for the creation of their excursion programs?
- What do students know about the topics covered on the excursion before they arrive on site? What could be done to prepare students before they arrive?
- What is currently done by teachers to conclude or tie-in these excursions when they return to the classroom? What could be done to follow-up these excursions?

During these semi-structured interviews with the staff members, we recorded the conversations to create an accurate transcription of the interview and allow for easy

reference at later times. In total, we interviewed four staff members. The full list of questions used in these interviews can be found in Appendix E.

Teacher Perspectives

Another method that we used to identify opportunities for pre- and post-excursion materials was brief individual interviews with teachers while they were on-site with their school group. The materials that we created will be used chiefly by teachers, thus their insight was very valuable to this project. The questions that we sought answers to were as follows:

- How are teachers using the CERES excursions within their curriculum?
- Are teachers looking at the information provided on the CERES website before arriving at CERES?
- If CERES started offering teaching materials for use before and after the excursion programs, what sort of materials would they use and how would these materials affect the excursion experience and the overall learning of their students?

The main focus of these short interviews was to quickly gain teacher perspectives as to the students' level of engagement with the information in the excursion, and how supplemental teaching materials could help with student comprehension before and after the excursion.

After observing several programs, we decided that the most practical time to engage teachers was while they were with their school group on an excursion. The attention of teachers was best gained while students were being actively engaged by the CERES' staff educators, and this allowed us to interview twelve teachers from varying schools around Victoria. A full list of questions we used with visiting teachers is included in Appendix C.

Gather Experience of Local Experts

In order to gain expert opinion on the process of creating teaching materials for educational programs, we conducted formal interviews with two members of the Zoos Victoria education staff who have a history of using and creating supplemental teaching materials for educational excursions. The general questions we sought answers to in these interviews were as follows:

- Do they find that teachers often use the pre- and post-excursion material that the zoo offers? If not, what is done to encourage its use?
- How prepared are students for the material presented by the excursion programs at the zoo?
- Are there any design principles or best practises that the zoo uses to create its pre- and post-excursion materials?

Sean Coleman, the learning experiences coordinator at the Melbourne Zoo, was the first expert we interviewed. He has worked at the Melbourne Zoo for two years and has overseen the refocusing of the zoo's educational programs towards sustainability and conservation. Dianne Gordon, a member of the senior leadership team for the learning programs at the Healesville Sanctuary, was our second expert interview. She worked at the Melbourne Zoo for seven and half years and had recently started working for the Healesville Sanctuary. In her time at the Melbourne Zoo, she witnessed the creation and refining of the VELS-compatible worksheets that the zoo traditionally offered. She also witnessed the transformation of the pre- and post-excursion materials away from the traditional fill-in-the-blank style worksheets towards more conservation-based activities.

Once again, computer software was used to record these interviews, and then using our notes from the interviews and these recordings, we created interview summaries and analysed the key points and important facts found during these interviews. For the full list of the questions asked during these interviews, refer to Appendix D.

3.2 Establish Design Principles for Pre- and Post-Excursion Teaching Materials

After identifying the opportunities and options available to create supplemental teaching material, we worked collaboratively with CERES to establish design principles for pre- and post-excursion teaching materials. The following research questions were used to guide the process of developing design principles:

- What type of teaching materials will most adequately incorporate CERES' principles and aims?
- What was learned from interviews with CERES staff, visiting teachers, and Zoos Victoria staff that might influence the design of pre- and post-excursion teaching materials?
- What is CERES' capacity for producing teaching materials?

These design principles were meant to serve as a guide in the development of pre- and post-excursion teaching materials. We analysed and compiled our observations and interview responses in order to determine what facets of that data could be used to form well defined design principles. From this analysis we generated a set of initial design principles which covered the creation of both pre- and post-excursion teaching materials. We created these core design principles with heavy influence taken from the interviews with CERES staff, what teachers were looking for from these materials, and from the methods Zoos Victoria staff used to create their pre- and post-excursion teaching materials. We discussed this initial set of design principles with CERES staff and made modifications using their feedback.

3.3 Create Pre- and Post-Excursion Teaching Materials

The established design principles acted as a guide to help with the creation of supplemental teaching materials for the land and waste excursion programs at CERES. They also ensured that all materials were homogenous in terms of their appearance and general opportunities for interactive activities. We began the creation process by developing a generalised layout and theme for the materials. This step was to help organise our thoughts before brainstorming about student learning activities. We then collaborated with the land and waste program coordinators to establish topics that could be incorporated into major activities for students to do. After this initial brainstorm, we further developed the ideas to incorporate in the pre-and post- excursion teaching materials. We then met with each program coordinator for a second time to gain feedback on the activities we generated.

We wanted to make sure the activities were an accurate reflection of the content presented in the excursion programs at CERES. We also sought feedback on whether the activities were appropriate for students in grade levels 3-6, who were suggested by CERES to be the target audience of these materials. The CERES staff members have much knowledge on the content that various age groups are able to comprehend, so this step was very crucial to make sure the materials were feasible for student use.

After this final round of feedback, we created pre-excursion teaching materials for teachers to use within the land and waste strands. To go along with these, we also developed post-excursion teaching materials for the land and waste strands. From these models, we developed template versions to be used by CERES for future additions to the materials and as a guide for CERES staff to create materials for the other strands.

Due to time constraints, we were not able to test the pre- and post- excursion materials with school groups. Instead, we developed a survey to evaluate the materials and provided CERES with the means to deliver the evaluation survey. In addition to this, we devised a set of recommendations for ways in which CERES could distribute and evaluate the pre- and post-excursion teaching materials.

4 Design Principles

In this chapter, we present design principles for the pre- and post-excursion materials. These principles are based on our observations of the programs and interviews with visiting teachers, CERES staff, and with education coordinators at Zoos Victoria. First, we describe the core principles that are applicable to both the pre- and post-excursion materials. Then, we will explain more specific design principles for just the pre-excursion materials. Finally, we will present additional design principles specific to post-excursion materials.

4.1 Core Principles

In this section we will describe the guidelines that we created to aid in the development of both pre- and post-excursion materials. The following design principles should be maintained in both the pre- and post-excursion materials.

Attentive to CERES' mission

CERES staff informed us that there are four founding principles of CERES: *sustainable environment, social equity, cultural richness, and community involvement*.

These four principles are used to shape all of CERES' programs, and as such should be used to shape the pre- and post-excursion materials to ensure that they are faithful to the mission of CERES.

Made available on the CERES website

All the materials should be accessible by teachers and students on the internet in an effort to reduce unnecessary waste associated with the use of paper materials. CERES staff lack the resources to provide pre- and post-excursion materials to teachers and students in paper form, so the materials should be designed to be available online. Teachers and students will be able to download the contents of the information on the website and print them out if necessary.

Common to many programs within strands

From participation in the excursion programs, we determined that the differences between each program under a particular strand were only found in the structure and content of the activities provided; the concepts covered were fundamentally the same for programs within each strand. For example, the ending discussion to each program we observed within the waste strand connected back to ways to limit waste and act responsibly with regards to the use of resources. The materials should be designed to cover all areas within a strand rather than relate directly to any singular program offered at CERES. CERES staff also advised that the materials should be strand-focused rather than program-focused because of a lack of a capacity to develop program-specific materials at this time.

Supportive of the excursions while also being distinct from the excursions

The learning experiences coordinator for the Melbourne Zoo pointed out the importance of keeping pre- and post-excursion materials related to but distinct from the excursions themselves. He said that pre-excursion materials that provided too much preliminary information would make the excursions less informative for school groups, and post-excursion materials that provided too much information already presented in the excursions would be redundant or be seen as a replacement for the excursion itself. Since the supplemental materials are to be made publicly available on the CERES website, if they contain too much information about the excursion, such as providing directions on how to perform the activities at home, teachers might not book the programs that cover those activities, and this would ultimately be detrimental to CERES. The purpose of teachers taking their students to CERES is so they can learn new things in an exciting and experiential way that is not necessarily possible in the classroom. Overall, the supplemental teaching materials should contain activities and information that are not presented in the excursion programs, but are very much related to the topics covered.

Activity-based

Many of the programs we observed at CERES made use of a worksheet to help guide the students through the activities. We also observed that the hands-on activities at CERES were far more engaging for students than the worksheets. The learning experiences coordinator at the Healesville Sanctuary pointed out that worksheets quickly break the connection made through interactivity, and students become so focused on filling out the worksheets that they lose interest in the activities occurring in front of them. Therefore the focus of the pre- and post-excursion materials should be on activities which get students involved and engaged with the lessons.

Replicable for future pre- and post-excursion materials

CERES staff informed us of how busy they are throughout the school year. They had wanted to develop pre- and post-excursion materials for a long time, but they never found time to do so. CERES suggested creating a template so they could fill in or update the materials as needed for new or updated programs. The template should provide a framework for CERES staff to go back to at a later date and fill in with more program-specific activities.

Compatible with the VELS curriculum

Most of the teachers that we interviewed were using the CERES excursions to open or close a VELS unit on environmental science or recycling. VELS, the Victorian Essential Learning Standards, is the curriculum established by the Department of Education and Early Childhood Development (DEECD) in Victoria. The teachers said that VELS is a very broad curriculum, which makes it easy to fit excursion programs into different lessons. The DEECD just passed a new model for classroom structure called e^5: engage, explore, explain, elaborate, and evaluate. By the nature of the CERES excursion programs, they already coincide with the e^5 model. The excursion programs seek to help students *explore* sustainability and *explain* the important issues associated with current unsustainable habits. The materials we develop should also be consistent with this curriculum model. Pre-excursion materials will help to *engage* students before they come to CERES by getting them thinking about

their personal effect on the environment. Post-excursion materials will *elaborate* on the topics presented in the excursion and the post-excursion materials should also comply with the fifth 'e,' *evaluate*, because they will provide activities for teachers to use with students at school and allow them to evaluate student learning. Using the post-excursion materials the students will hopefully evaluate their own environmental impacts and rethink their habits; this also aligns with the fifth 'e' of the DEECD's curriculum model.

Easy for teachers to use

The Zoos Victoria staff warned us against overwhelming teachers with pre- and post-excursion materials. They decided to cut back on the volume of their pre- and post-excursion materials because they were not being used. The materials we create should be practical for teachers to use because they are the ones responsible for delivering the material to the students. CERES staff suggested that we keep the materials concise for teachers because teachers tend to have busy schedules and might not have the time to carry out particularly involved introductory lessons in preparation for the excursions. Therefore, the pre- and post-excursion teaching materials should be user-friendly and provide simple activities for students. Limiting the materials to one page each would ensure that the materials are easy to read, print, and distribute.

Appropriate for years 3-6

CERES staff informed us that the materials we create should be focused on providing activities for students between the school years of 3-6. One reason for this is that teachers most often book programs for students within this year range. Also, students within this range tend to present the most enthusiasm to take what they have learned on the excursions and respond to it after they leave CERES.

4.2 Principles for Pre-Excursion Teaching Materials

We received varied and sometimes conflicting advice on the benefits and limitations of pre-excursion materials. Both the Zoos Victoria staff and visiting teachers at CERES reported that pre-excursion materials are often not used. Zoos Victoria offered pre-excursion materials for several years and found through surveys given to teachers and the frequent unpreparedness of visiting school groups that they were not being widely used. When asked if pre-excursion materials would be useful before coming to CERES, many teachers replied that no preparation was necessary since they were using the excursion to open a lesson. The most common suggestion that we received in favour of pre-excursion materials was that they include some sort of introduction to CERES and the activities that the students would participate in. However, all of this information is already available on the CERES website.

On the other hand, CERES education staff believes that certain simple pre-excursion materials could be effective. Glenn Evans, the land coordinator, mentioned that having pre-excursion materials that explained some of the basic concepts to be covered in the excursion could help him dive into his programs faster. In our observations, we noticed that sometimes a CERES educator had to backtrack if students did not understand a basic concept right away. In a situation such as this, having the students understand basic

concepts ahead of time would benefit the CERES teachers and not waste the limited time they have for excursions.

The overall goal of pre-excursion materials is for teachers to engage students in activities and discussion to prepare them for the CERES excursion programs, but CERES cannot rely on these materials being used by teachers consistently. As a result, we have developed the following principles, in addition to the core design principles, to serve as a guide for pre-excursion materials that would strike a balance between these conflicting points of view.

Familiarise the visitors with CERES and the excursion programs

The teachers we interviewed expressed a desire for a brief introduction to CERES and the activities that the excursions would be covering. Teachers who were visiting CERES for the first time often didn't have a clear understanding of what CERES was. One teacher even thought that it was a type of factory. From this apparent confusion surrounding the basic facts about CERES, we decided that the pre-excursion materials should provide a way to familiarise teachers and students with CERES and its excursion programs. Information about CERES as an organisation and the various opportunities available onsite can be found already on the website, but are not contained within the Education tab where teachers are likely to be looking. Pre-excursion materials which help to familiarise teachers with CERES and its excursion programs could be placed under the Education tab.

Provide context to the topics and ideas covered on the excursion programs

Pre-excursion materials should provide a bit of background information on the concepts that will be elaborated on during the excursion programs. The idea of providing background information was determined through talking with the CERES staff members. Using the pre-excursion materials to provide the students with a set level of background information, the staff members would be able to move with increased speed into the excursion activities rather than dwell on the introduction to the excursion.

4.3 Principles for Post-Excursion Teaching Materials

In this section we present principles specific to post-excursion materials. These post-excursion materials have the role of supplementing an excursion by providing opportunities for students to engage in post-visit activities. Teachers will have the ability to design lessons around the activities provided within the post-excursion materials. The materials should continue to strengthen the ideas and thought processes that have been established as a result of the excursion at CERES. Lastly, post-excursion materials should provide students with opportunities to change their behaviour in accordance with the information covered by the excursion programs. Following is further elaboration and justification for each of these principles for post-excursion materials.

Draw upon the knowledge students have gained during the excursion

Teachers interviewed during the excursions expressed interest in post-excursion teaching materials that drew upon what the students learned during the excursion. Both the land and waste coordinators at CERES expressed the same interest as visiting teachers; they saw the benefit of having post-excursion materials link back

to the ideas and concepts presented during the excursions. Post-excursion materials should help students take what they have learned at CERES and expand on those topics to continue learning. Staff also felt that post-excursion materials should have the same goals as the lessons being taught during the excursions. In other words, the post-excursion materials should have similar learning outcomes.

Provide students with the opportunity to change their behaviour

Waste excursion coordinator Shane French explained to us that the post-excursion teaching materials should focus on changing an individual's thinking rather than trying to change a whole school group. This idea is founded on CERES' mission to "change the way of being." For Shane and other CERES coordinators, the sort of change CERES looks to instil in students starts at the individual level. CERES staff educators hope that their lessons will help students learn to change their behaviour in their everyday lives. To live up to this guiding mission, the post-excursion materials should provide students with opportunities to examine their behaviour and make changes to limit their environmental impacts.

The post-excursion materials we create should therefore be designed to be motivating to students. Shane French emphasised that rather than shaming students into taking environmental action, we should encourage students to take part in the activities because of the benefits these activities can provide to both themselves and the world. One teacher we interviewed stated that younger students are more concerned psychologically with themselves and how they can immediately benefit from an action rather than how an action might benefit someone else. By providing information on the benefits of sustainable lifestyle changes, we hope to positively encourage students to want to change their habits.

Encourage continued CERES connections

CERES staff educators also hope that the post-excursion teaching materials can keep students and teachers connected with CERES after their visit. The learning experiences coordinator at the Melbourne Zoo mentioned that the most successful way the Zoo had found to encourage continued correspondence between the excursion site and schools was to provide embedded forms of evaluation in their post-excursion materials. If students choose to engage in the post-excursion activities, they are encouraged to send in photos and letters explaining what they have done to further what they learned from the program they experienced. In this way, the educational organisation can see if the post-excursion materials are being used and to what degree the activities are affecting student behaviour. For CERES, the post-excursion materials should contain built-in encouragement for students to supply CERES with information regarding any follow-up activities they choose to do after their excursion. The materials should be designed to provide students with the impetus to return to CERES on their own as well.

Provide activities for in-school and at-home use

The post-excursion materials should present activities for students to do both while at school and at home. We based this idea on results from interviews with program coordinators at CERES and interviews with visiting teachers. Shane French pointed out that the CERES education group wants to take students beyond sustainability at school and to provide examples for actions the students can take when they are at home with their parents. By having post-excursion materials accessible to students while they are at home, 'pester-power,' or a child's influence over his or her

parents, could then be utilised to encourage behaviour change in the whole household. Teachers, on the other hand, provided suggestions for post-excursion activities that would be conducted at school because this is where the teachers could find the most benefit to their classroom curriculum. The simplest way to accommodate both teachers and CERES staff would be to provide post-excursion materials that contain activities for school and home.

5 Teaching Materials

In this chapter, we describe the pre- and post-excursion teaching materials that we created for CERES Community Environment Park. These materials were created with the design principles in mind, as outlined in the previous section. We created pre- and post-excursion teaching materials for the land and waste programs, and provided templates for CERES staff to use to create or update future materials for the remaining strands. First, we will show an example of pre-excursion materials for the waste strand followed by the reasoning behind the design. Then, we will show examples of the post-excursion materials created for the waste strand followed by a description of the important features of those materials.

5.1 Pre-Excursion Teaching Materials

When we designed the pre-excursion materials, we did so with a focus on teachers. These pre-excursion materials include an introduction to CERES as a place and what the site has to offer. In addition, the materials are intended to help teachers prepare their students for the excursions with resources such as interesting films to watch and websites to visit. We also created discussion questions to get the students thinking about the topics that would be covered in the excursions. Apart from the introduction to CERES, which is the same for the pre-excursion material in every strand, the resources and discussion questions are entirely specific to each major strand in which they are to be used. Within this section we discuss some of the motivations for choices we made in the development of the pre-excursion materials and how the design principles fed into this process. A generalised template for the pre-excursion materials can be found in Appendix J. Figure 4 shows an example of the pre-excursion materials we created for the waste strand.

Introduction to CERES Community Environment Park:

Located on the banks of the Merri Creek, CERES is a 4.5-hectare urban park that presents a working model of a sustainable community. All waste and water at CERES is recycled, and much of the site is powered by solar and wind energy. Complete with examples of green technology in action, ecological building design, community enterprise, a cultural village, and beautiful mosaics and sculptures, CERES seeks to offer a new way of being to its visitors.

The excursion programs that CERES offers are hands-on, interactive experiences built upon the real-life resources and displays at the CERES Community Environment Park. All CERES staff are dedicated to providing the most engaging and informative activities for students. For a map of CERES, visit: http://www.ceres.org.au/sitemap

Waste Program Pre-Excursion Materials

Teachers: If you have booked programs within the Waste Strand, you may want to prepare your students by engaging in some of these pre-visit activities to get them thinking about Waste and its impact on the environment.

- Watch The Story of Stuff, a 20min. film which looks at the shortcomings of the current system in which resources are obtained, processed, used, and disposed. http://www.storyofstuff.com/
- Find out where local recycling and waste services are using Recycling Near You. http://www.recyclingnearyou.com.au/
- Visit the website of Planet Ark to learn about campaigns that encourage community involvement to address our environmental impact. http://www.planetark.org/about/
- *Calculate individual and school ecological footprints at the website of EPA Victoria. http://www.epa.vic.gov.au/ecologicalfootprint/calculators/default.asp

After engaging in these activities, generate some pre-visit discussion by using these thought-provoking questions:

- What are all the different types of waste your school produces?
- What are all the different types of waste produced at home?
- How do your shopping habits contribute to the waste stream?
- What is recycling?
- How can we reduce the amount of waste we produce every day?
- How can waste be used as a resource?
- How do we become more conscientious consumers?

*Do not suggest this resource for students if you plan on booking the Ecological Footprint excursion activity.

Figure 5: Waste strand pre-excursion material

Introduction to CERES

It was clear through our interviews with first-time visiting teachers at CERES that a better description of CERES would be helpful in the pre-excursion materials. CERES supports so many different resources and communities under the umbrella of sustainability that it is difficult to describe to those who have never visited. Glenn Evans suggested that the introduction to CERES should excite visitors as well as provide an informative description of the various resources that it provides. Shane French pointed out that we did not want a description that tried to "sell" CERES since the pre-materials will only be used after the excursions are booked. We kept the description informative but concise in order to keep the pre-excursion materials on one page. We also included a link to an online map of CERES, in case a visual representation of CERES would be more helpful in describing it to teachers. Figure 4 shows the introduction to CERES that was designed to be included at the start of each pre-excursion material.

Pre-visit activities and suggested resources

As explained in the previous chapter, one goal for pre-excursion materials was to provide context for the excursion program. We provided this context by listing pre-excursion activities and resources for teachers to use with students. In order to avoid overwhelming teachers, we kept this list brief, typically no more than four activities and resources. As suggested by Shane French and Glenn Evans, we provided resources specific to each strand for teachers to use in class to provide some perspective for students on how their actions affect the environment. These resources vary depending on the strand and the specific concepts encompassed by that strand, with the only exception being the suggestion that the students do the EPA Victoria ecological footprint assessment which was included as a suggested resource for all strands.

CERES energy excursion coordinator, Ian Culbard, advised that an online ecological footprint assessment that students could do ahead of time would benefit the CERES staff educators by providing the background context necessary for the students to understand their role in the movement towards sustainability. Some teachers that we interviewed had referenced an online ecological footprint assessment as their only preparation activity for the excursions. Thus, we chose to include a link to EPA Victoria's ecological footprint assessment to help students understand their personal impact upon the environment. However, there is a particular excursion program that focuses solely on the ecological footprint. Because of this, we put an asterisk next to the link and explained that teachers should not do this ahead of time if they plan on booking Ecological Footprint in order to maintain the distinction between the pre-excursion material and the excursion programs.

Additional pre-visit activities and resources in the waste strand pre-excursion materials can be found in Figure 4. For example, teachers are encouraged to download and watch the "Story of Stuff" with students. This short, explanatory video shows the process by which resources are transformed into consumer products and finally thrown out or incinerated and suggests places within the system that can be easily fixed by adjusting consumer habits to reflect a more sustainable life style. This type of resource for information in preparation for CERES' excursion programs covers many topics within the strand of waste without overlapping significantly with the excursions.

Discussion questions

Through CERES staff interviews and informal teacher interviews, we learned that providing follow-up discussion questions to these pre-visit activities would benefit the excursion programs by creating the necessary base level of knowledge for students to get the most engaging program experience. CERES staff members suggested that discussion questions be provided for teachers so that they could have a preliminary discussion with their students to get the students ready to learn from the excursion. The questions we generated reflect significant input from CERES staff in order to ensure the questions are broad enough to not deal with the distinct lessons taught at CERES but specific enough to provide sufficient background for the excursions. Teachers are asked to use these discussion questions as a way to reflect on the pre-activities they chose from the resources provided in the pre-excursion material. Figure 4 shows the discussion questions we created for the pre-excursion material for the waste strand. These discussion questions address general waste-related concepts but do not address anything provided in the excursion programs specifically.

5.2 Post-Excursion Teaching Materials

The post-excursion materials were designed with a focus on students- how to impact their behaviours and promote sustainable habits. The template for post-excursion materials can be found in Appendix L. Figure 5, 6, and 7 present the post-excursion materials we designed for the waste excursion programs. In this section, we present the overall formatting and design choices for these materials. We then discuss the importance of a few of the suggested activities and of the mascots we created. Next, we discuss the differences between the activities that can be done in the classroom and the activities that can be done while students are home.

WASTE: AT SCHOOL ACTIVITIES

Lunchbox Detox

What are you eating for lunch? What kind of packaging does your food have? What was is made of?

As you found out while at CERES, most of your packaging does not decompose very easily and builds up in the rubbish tips. Let's see how much rubbish you produce during the week just from lunch.

Keep track of what you are using to bring your lunch to school every day for a week, and then record this information in the chart provided. See if the number of packaged items you bring each day decreases over the course of the week. Are the things you are using recyclable or are they creating rubbish? Plot your packaging usage over the week on a graph to get a better picture of how much of each item is being used. Notice the totals of each item you are using. What effect are you having on the environment around you by using those items for your lunch?

No Waste Here!

Try having Rubbish Free Fridays to help lessen your impact on the environment. This means bringing your lunch to school without any packaging, serviettes, or other rubbish-creating materials. Create a Golden Lunchbox award and compete against the other classes in your school to see which class has the most rubbish free lunch.

Label Fable

The next time you go shopping, look around at all of the products that claim to be environmentally friendly. Not all of these claims are actually true. For example, a product might claim to be biodegradable... but it might take over 1,000,000 years! Truly environmentally friendly products will bear a seal from a trusted eco-friendly source, such as Planet Ark or Environmental Choice Australia.

Travelling Food

The next time you eat your lunch, look at where your food comes from. The closer the food is to where you live, the more sustainable it is! This is because trucks and aeroplanes used to transport food give off a lot of CO_2 emissions.

Keep track of where your food is coming from. Mark on a world map where your food comes from. Does the food you get really need to travel that far? Find ways to get the same food for less food miles. Use different coloured stickers or thumbtacks to track each week's progress.

Kevin the Kingfisher says, "Send pictures of your progress to education@ceres.org.au. We would love to see your work!"

Figure 6: School-based post-excursion material for the waste strand

		Monday	Tuesday	Wednesday	Thursday	Friday	Total
Example: Drink Cartons		3	3	2	1	1	10
Juice Boxes							
Paper							
Cardboard							
Milk or Juice Cartons							
Recyclable Plastic							
Non Recyclable Plastic							
Glass							
Aluminum Foil							

Figure 7: Table for the school-based post-excursion material for the waste strand

WASTE: AT HOME ACTIVITIES

The D.U.M.P. Awards

Environment Victoria's annual D.U.M.P. Awards (Damaging and Useless Materials from Packaging) are awarded to companies whose products have the most excess or non-recyclable packaging. This is to help these companies realise that they are wasting many resources.

Now it's time for you to hand out your own D.U.M.P. awards! Search around your house and find the packaging of a few different items. Is there more material being used than is necessary? Is the packaging made of recycled materials? Compare all of the packaging on the items you found. Which one do you think should be the winner of the D.U.M.P. award?

Now that you know which product deserves the D.U.M.P. award, see if you could come up with a way to fix the packaging. Try making the packaging smaller, out of a more recyclable material, or even have them packaged together rather than individually. By using some of these ideas and some of your own, see if you can redesign it.

Clean Up Your Home!

Consider ways to give new life to all of the unused or old items you have at home. Donating your items to charity or running a garage sale are good ways to provide others with the things they want and need.

Finding broken items around your home that can be recycled will clear up space and also means that those items won't be sitting in a rubbish tip leaking toxins into the environment.

Bigger Is Better

Buying food in larger quantities is not only cheaper, it's also more sustainable. Instead of buying potato chips in small bags, try buying a large bag of chips and putting those in a reusable container. Ice cream tubs make great reusable containers!

Maggie the Magpie says, "Send pictures of your D.U.M.P. award and what you came up with to education@ceres.org.au . We would love to see your work!"

Recycling Detective

If a plastic material has a recycling symbol imprinted on it, such as the ones shown below, this means that it is made out of a plastic that can be recycled.

This symbol is used in Australia to identify the type of plastic used to make the material. However, sometimes plastics from other countries make it into Australia. These plastics don't always have the imprinted recycling symbol and may not be recyclable, even if the label says that they are.

Become a detective and find plastics in your home that have the imprinted plastic identification symbol. Then try to find plastics that don't have the symbol. Do these plastics have labels that say they are recyclable? Don't be fooled!

Figure 8: Home-based post-excursion material for the waste strand

Simple, concise layout

The post-excursion materials fit on one page of A4 size paper, except for additional charts or graphs. This was done to keep the information from overwhelming teachers, as well as to make it more feasible for teachers to print and distribute the material to their class. The materials will also be posted on the CERES website, rather than given to students and teachers while at CERES.

At the top of the page is the title with the CERES logo to its left and the strand logo (waste, land, etc.) placed on the right. The CERES logo is a formality to make clear that these materials were provided by CERES, and the strand logo was placed at the top to indicate the strand that the specific material covers. To add colour to the page, we applied the colour scheme that CERES had already chosen to designate each strand. Below the title is a large space for a major activity, followed by space for several minor activities, and finally a section for the inclusion of a mascot at the bottom of page. This simple and concise layout will ensure ease of use for teachers and students.

Multiple theme-based activities focusing on behaviour change

To be consistent with CERES' focus on experiential learning, the focus of each set of post-excursion materials is a group of activities that are intended to draw upon the knowledge learned during the excursion and also affect behaviour change. Shane French made it clear that the in-class activities that we created needed to be more than "busywork;" they needed to be engaging for the students since the post-excursion materials are an extension of the programs at CERES. Taking the need for post-excursion teaching materials and the finding that teaching materials for post-excursions should provide activities for students to take part in while at school, we have developed post-excursion activities that coincide with the established design principles.

The first design principle that was taken into consideration was creating materials that draw upon the knowledge students learned during a given excursion. To meet this principle, we developed materials that are focused on supplementing the entire strand of programs rather than one specific program. We also established a general theme that was to be represented in the excursion materials. For instance, the waste strand has a generalised theme of recycling. This specific theme became evident after observing the waste programs at CERES.

Changing the behaviour of students was the second post-excursion material design principle that we focused on. Drawing upon the strand-specific theme that was presented in each post-excursion material we generated, we focused on creating activities that constructively allowed students to take part in an activity by showing an alternate procedure for a common daily habit. For example, we generated an activity related to recycling that had students take part in new ways to package their lunches, such as reusing plastic containers instead of sandwich bags.

The smaller activities were developed to add emphasis to the larger exercise and also to add emphasis to the material covered during the excursion program. They are composed of a concise bit of background about the activity and basic instructions on how to carry it out. The major activity is an interactive, hands-on activity which is more time consuming and complex than the other activities. This activity has a brief introduction followed by instructions to carry out the activity.

Kevin the Kingfisher and Maggie the Magpie mascots

These mascots are intended to provide a specific way for younger students to remain connected to CERES and its excursion programs. We observed that education staff at the Melbourne Zoo use animals as a means of connecting their conservation activities with students, and we felt that CERES could utilise a similar approach. Every year, CERES holds a Kingfisher Festival to celebrate the return of the kingfisher bird to the Merri Creek after its many years of absence from the area due to habitat destruction and rubbish build-up. It was from this idea that the Kevin the Kingfisher mascot was created. By performing the eco-friendly activities the materials suggest, the students can feel that they are doing something to help the colourful kingfisher mascot back at CERES. For the home-based post-excursion activities, Maggie the Magpie was created. Magpies are common across Australia, so Maggie the Magpie is a mascot that all students should be able to recognise and associate with their homes.

The mascot call-outs also provide an opportunity for embedded evaluation, an idea suggested by Sean Coleman at the Melbourne Zoo. To help CERES understand how the materials are affecting students, Kevin the Kingfisher and Maggie the Magpie have a phrase or comment that encourages the students to contact CERES, whether in person, or in a simple response email. This serves not only as an embedded evaluation of the materials, but also encourages a future connection with CERES in order to provide further resources for the students' personal growth as environmentally-conscious individuals.

Separate school-based and home-based materials

We developed both school-based and home-based post-excursion materials for the waste and land programs. Our intent is that teachers could use the school-based activities as a launching point for additional lessons, while the home-based materials could provide activities students could participate in while they were home with their parents. We incorporated all of the same elements in the creation process for these at home post-excursion materials, such as our design principles, but focused more specifically on activities that are more home appropriate, such as creating a small worm compost pile.

6 Conclusions and Recommendations

In this chapter we provide a summary of the materials that have been produced, and provide some recommendations for the distribution and evaluation of the pre- and post-excursion teaching materials.

6.1 Summary of Project Deliverables

The result of our efforts was two-fold. We created pre- and post-excursion materials for the land and waste strands that are ready to be distributed, and we developed design principles and templates that will aid in the development of additional materials.

Pre- and post-excursion materials for the land and waste strands

The goals for the created pre- and post-excursion material are to provide a way for teachers to connect the CERES excursion programs back to the classroom and to provide ways for students to continue thinking about sustainability and their own habits after their visit to CERES.

The pre-excursion materials aid CERES by giving teachers the option to introduce their students to topics of sustainability so that they might come to the excursions with a base level of knowledge. This will allow CERES educators to begin with more advanced information during the excursion. The pre-excursion materials also allow teachers to explore online resources and discuss these resources with a focus on how students are affecting the world around them. These pre-excursion materials were designed to open the minds of students to environmental issues and show them their current habits and understandings.

The post-excursion materials aid teachers by providing a way to connect the excursion programs back to a lesson at school. The activities provided within the at-school materials can be adapted by teachers into lesson plans that will complement their curriculum. The post-excursion materials also give students methods to begin living sustainably at home in addition to school. The at-home materials are designed to connect to the students as individuals and attempt to change their behaviour at home. These materials urge students to send into CERES any evidence of their use of the materials. This provides CERES with a way of seeing how much and in what ways the post-excursion teaching materials are being used.

Templates and design principles for continued development of teaching materials

The template for pre-excursion materials contains all the formatting of the finished materials as well as the introduction to CERES that is independent of the strands. The template also provides CERES staff with places to add strand-specific resources and accompanying discussion questions.

The template for post-excursion materials, similar to the pre-excursion material template, also contains all of the completed design and formatting of the finished materials for the land and waste strands. This template provides space for CERES staff to add activities and create post-excursion materials for the other strands.

The design principles we used to create the supplemental teaching materials for CERES could also be used by CERES staff to guide the development of materials for the other strands. These principles along with the templates provide the CERES staff with a sense of direction to guide the brainstorming process and addition of activities to the pre- and post-excursion materials.

6.2 Recommendations for Distribution of Teaching Materials

We have created pre- and post-excursion materials for the land and waste strands, but there is much to be done to ensure that teachers are aware of their existence. We recommend that CERES:

Make pre- and post-excursion materials available on the CERES website in PDF form

PDF format would allow the pre- and post-excursion materials to be downloaded easily and also ensure that the materials would be difficult to tamper with. These materials could be provided under the Excursion Programs tab and be associated with each particular strand.

Tell teachers about the materials during the bookings process

When teachers call to express interest in the excursion programs, CERES bookings staff could suggest that the teachers check out the website for the pre- and post-excursion teaching materials. We would suggest offering the teachers the chance to view the post-excursion materials very early in the bookings process because teachers may want to use the materials to create a follow-up lesson and the sooner they have access to these materials the better.

Remind teachers and students of the materials at the end of the excursions

In addition to suggesting the materials to teachers during the booking process, it would be useful to provide a bit of redundancy in recommending at the end of the day that the teachers and students download and use the post-excursion materials. The closing discussion period of the excursion programs is normally the time when CERES staff educators suggest additional resources for students to look at after they leave so it is the perfect time for staff to remind teachers and inform students about the existence of the post-excursion materials on the CERES website.

6.3 Recommendations for Evaluation and Future Development of Teaching Materials

The pre- and post-excursion materials for the land and waste strands have not yet been tested with teachers and school groups. Gathering feedback about their use and ways they might be improved will facilitate the development of materials for additional strands. We have developed a questionnaire for this purpose, which can be found in Appendix N. It contains separate sets of questions for pre- and post-excursion materials. We recommend that CERES:

Use Survey Monkey or a similar tool to evaluate the effectiveness of materials

This survey type allows the administrator to review results of the data collection in useful tables and is simple to set up and run. CERES staff would be able to easily tabulate and analyse the data gathered through this type of online survey. Analysis of an online survey doesn't require nearly as much effort as a traditional paper survey.

The CERES education group had created one such paper survey that was used to evaluate the effectiveness of the excursion programs. We considered adding questions to this survey in order to keep the evaluation of the pre- and post-excursion materials and the excursion programs streamlined and in one document. However, there were limitations with this goal in addition to the difficulty of tabulation and analysis of the results. Because the survey is distributed during the excursion, teachers will not have a chance to use the post-excursion materials which would then point towards a need for a second survey that evaluates the post-excursion teaching materials alone. A survey available online would alleviate this need.

Place the survey on the same page of the website as the provided materials

Both the questions developed for the pre-excursion materials and the questions that ask teachers to evaluate the post-excursion materials can be placed in a single survey provided beneath the download buttons for the materials on the website. The survey can be prefaced on the website by saying that CERES is always interested in feedback and that any comments would be greatly appreciated. Providing the survey questions in the same place as the materials on the CERES website might increase the return rate of responses because when teachers visit the page to download the materials they will be reminded that CERES is looking for feedback; they may also be more inclined to answer the questions if they are provided in the same place as the materials.

Use the templates and design principles to make materials for the remaining strands

Having the completed set of materials for all strands available for teachers and students would benefit all of the excursion programs. The templates for the land and waste materials can be adapted and changed to fit the other strands. The feedback from the evaluation survey should also be used to improve the effectiveness of the materials.

Create materials for additional school years

The materials that we designed for the land and waste strands are tailored for students within the school years 3-6. The pre- and post-excursion materials we created allow teachers to be discerning in whether the information provided is suitable for the age of their students. However, some teachers may find that the materials are not appropriate for students outside of this range and will not use them. Therefore, CERES staff may find that developing materials which cater to younger and older students will become necessary.

REFERENCES

CERES. (2010). *About Us*. Retrieved 2 28, 2011, from CERES Community Environment Park: http://www.ceres.org.au/about

EPA Victoria. *Ecological Footprint*. Retrieved 4 27 2011, from EPA Victoria: http://www.epa.vic.gov.au/ecologicalfootprint/ausFootprint/default.asp

Global Footprint Network. (2010, 12 4). *Methodology and Sources*. Retrieved 4 15, 2011, from Global Footprint Network: http://www.footprintnetwork.org/en/index.php/GFN/page/methodology/

Healesville Sanctuary. (2011). *Learning Experiences*. Retrieved 3 27, 2011, from Zoos Victoria: http://www.zoo.org.au/Healesville/Learning_Experiences

Kolb, D. (1984). *Experiential learning: Experience as the source of learning and development*. New Jersey: Prentice-Hall.

Melbourne Zoo. (2011). *Learning Experiences*. Retrieved 3 27, 2011, from Zoos Victoria: http://www.zoo.org.au/Melbourne/Learning_Experiences

APPENDIX A: EXAMINATION OF CERES EDUCATION DRIVE CONTENTS

CERES educational officers control a computer drive which contains: all current teaching materials for use during the excursions, lesson plans for each activity, photos of students on excursions (with explicit written permission), supplemental resource material for the programs, as well as a collection of responses to an informational survey that was once used by CERES to evaluate the effectiveness of its excursion programs. Analysis of the CERES education drive yielded valuable information for use in the development of pre- and post- excursion materials by:

- Providing examples of teacher responses on the evaluation survey that contributed to a body of evidence revealing the need for pre- and post-excursion materials
- Showing what has been created by CERES' core teaching staff to facilitate in the direction of the programs
- Providing examples of sources for further information which can be adapted for pre- and post-excursion materials

Provided in this appendix is a summary of the findings gathered from analysis of the excursion evaluation survey results. The summary provides a statement of the concepts which we applied to the development of pre- and post-excursion materials.

Below is a list of suggestions gathered through an annual evaluation survey emailed to teachers who had participated in the excursion programs:

Pre- and Post-Related Suggestions

- "A general orientation/overview of the set-up would be beneficial for students"
- "On-line materials for student to do"
- "On-line pre-visit materials helps students before they come"
- "Resources for schools"
- "Brochures/info to take back to school"
- "Pre-visit materials"
- "Access to activities on the net for back at school. eg. green cleaner recipes"
- "Teacher info packs available on the internet before the excursions. Would help teachers prepare better"

Other Valuable Suggestions

- "More personalized links with their school project"
- ""Use" the children to educate the parents"
- "More time for an activity rather than squashing more activities in"
- "Needed more practical activities"

These responses were paraphrased in most cases to fit within the boundaries of the evaluation survey analysis grid provided in the education drive by CERES staff. There are overlapping statements which address the same needs for improvement of the programs, they are provided to show that more than one teacher had been requesting pre- and post-teaching materials.

Analysis of suggestions:

- Multiple teachers made the suggestion that pre-excursion materials would be useful
- Multiple teachers made the suggestion that post-excursion materials would be useful and in some cases provided examples of the materials to which they were referring
- Multiple teachers made the suggestion that providing online materials would be useful

The 'other valuable suggestions' are each ideas which can be applied to the creation of pre- and post-materials but were not specifically addressing a need for these types of materials. One suggestion was for more practical activities during the excursion but this could easily be adapted into our design criteria for creating pre and post materials; the activities we suggest in our materials should be practical for students. Another suggestion is for more time for the activity offered on the excursion and this can be taken under consideration when designing our teaching materials because they should be designed to provide more information before and after the excursion so that more time can be devoted to the activity during the excursion. Using students to educate parents is a helpful suggestion for suggesting particular activities to students that will also get their parents involved. By providing more personalised links with school projects, the pre- and post-excursion activities can appropriately support school curricula.

APPENDIX B: OBSERVATIONAL PROTOCOL

(Adapted from http://ed.fnal.gov/trc_new/program_docs/instru/classroom_obs.pdf)

The following is a systematic format for the way in which our team decided to observe the excursion programs.

Aspects of observation:

- structure of the programs
- level of involvement of the students
- emphasis and focus of teaching topics
- types of provided teaching materials and applications for follow-up activities

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Preliminary Information (to be filled-out before program):

Date:

School:

Grade/Level:

Observer:

Program Title:

Category of program (Strand):

Time of Activity:

Observations (to be filled out during or after the program):

Materials Used during program (attach photocopied materials if applicable):

Description of Location of the Activity:

CERES Staff Introduction to Lesson: (Explains activity and how it relates to previous lessons; assesses students' prior knowledge)

Description of Activity/Task: (Content; nature of activity, what students are doing, what teachers are doing; interactions)
How students are engaged in the program (method for involving students in subject matter):

Outcomes of engagement (how students presented their findings):

What elements of the activity were students most engaged with:

What didn't happen (e.g., students didn't grasp the idea of the lesson)

Applications for Pre- and Post- Teaching Materials:

List of programs observed:

Waste Strand: Bin Sorting & Plastic Fantastic, E-waste, Organic Recycling, Paper Making, Waste Time-lines, and Water Savers in the Home

Land Strand: Biodiversity & Habitat Corridors, Food Webs, Hands-on Gardening, and Organic Gardening

Energy Strand: Carbon & Climate, Renewable Energy, and Smart Travel

Multi-strand: Australia 2030 Trail, Fair Trade, and Sustainable Building Materials

Water: A Rivers Tale, Merri Creek Walk, and Netting for Water-bugs

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APPENDIX C: STRUCTURE OF THE EXCURSION PROGRAMS

The excursions begin at a home base.

From this home base, the students are generally split into three equal groups and depending on the size of the school group it can be close to 30 students per group.

Each group is taken to a specific activity which lasts for about 50 minutes.

The groups then reconvene at the home base for a 15 minute break which may be a time for a snack.

The groups then switch and head off with a different instructor for a second activity which lasts 50 minutes.

Depending on the excursion/size of school/payment plan, there can then be another break for lunch and then another program or two for the rest of the day.

What goes on during the program?

The activities start with a brief introduction at the home base about the history of CERES and their commitment to recycling and not leaving rubbish all over.

Then there is an introduction to the topics and ideas which form the foundation for the activity. This is often done in a question and answer type of setting where the staff enquires about the student's previous knowledge.

Often times this introduction is cut very short because the previous program has run long.

The basic facets of the activity are then explained and the outcomes of the activity are stated.

Depending on the age group the activities may involve:

- *A group game*
- *A series of stations at which the students visit and interact with tangible items*
- *A walk with observations about the local environment*
- *Creating something or practicing a skill*
- *Story-telling to emphasise cultural significance or human impacts on environment*

After the activity has ended, there is a follow-up/conclusion portion to the program where the staff teacher may ask the students about what they have learned or how their thinking has changed as a result of taking part in the program.

The staff teacher will then make a case for why changing your thinking is only the first step and that changing your actions is the next step.

Staff educators encourage follow up activities and places to look for more information.

Appendix D: Analysis of Observations and Participation in Programs

Student Years:

There were sixteen separate programs observed. Out of those sixteen programs there were nine groups observed that fell into the grade range of one to four. There were only four programs observed that were for students in the grade range of year eight or older. There was one program observed for students in the year prep and two programs for year six. From this spread of programs observed, it was determined that the majority of the programs observed were taught to students between the school years one through four which corresponds to students between the ages of six and ten.

Materials used during program:

The four main materials used in the programs were quantified worksheets, posters, interactive items, and the surrounding nature. Out of those four materials the quantified worksheets and interactive items are the most commonly used to aid in the learning experience of the students. Worksheets provided a connection to the classroom to help the students learn, while the interactive items like ropes, cones, gadgets, and rubbish aided in the learning experience by providing hands on examples and experiences for the students to work with.

How students are engaged in the program (method for involving students in subject matter):

The excursions were designed to be a mixture of guided/facilitated discussion at the start and end of the programs, with a self-directed/exploratory activity during the middle of the program. With this it was seen that the number of activities that involved the students being lectured or having a story told to them was significantly lower than the number of activities that involved the students either being guided through a hands on activity or having an exploratory activity.

Outcomes of engagement (how students presented their findings):

During some programs, the CERES educator did not ask students to present their own findings, which leads to the conclusion that the interactive parts of the programs are meant to provide the information students can take away without need for any kind of presentation. General discussion is the most common method for reflecting on the programs.

Description of Activity/Task: (Content; nature of activity, what students are doing, what

teachers are doing; interactions)

Mostly the excursions contain several sub-activities for the students to do.

CERES Staff Introduction to Lesson: (Explains activity and how it relates to previous lessons; assesses students' prior knowledge)

Depending on the CERES staff educator, the program introduction is used to assess the base level knowledge of the students by asking questions, make connections to real life whenever possible, as well as give the students an introduction to CERES.

What elements of the activity were students most engaged with:

The students enjoy the interactive elements of the activities much more than they do filling out worksheets while at CERES. Depending on age group, the students are generally not interested in group discussion because they are in a new place surrounded by new things although it is encouraged.

What didn't happen (e.g., students didn't grasp the idea of the lesson)

The students (especially younger ones) can easily be distracted by having too much to take in during the program. It's not so much that they are having too much fun; it's more so that the excursions only last for 50 minutes at a time which is not enough time to go through every topic that the programs try to cover. Pre- and post-excursion materials might alleviate some of this problem.

Applications for Pre- and Post- Teaching Materials:

The possible application for pre- and post- excursion materials discovered through this observation process were activities involving quantifying things, abstract topics, and activism based activities, group projects/work, online activities, and additional resources. Each of these activities received roughly the same number of occurrences where they could be used.

These applications are based on opinions our team has developed after participating in the programs. A few are designed to alleviate logistical problems with the programs by providing the same material in a pre- or post- format. Others are based on how our team felt certain materials could be adapted to a program but are only initial thoughts.

Of course these ideas mean little with regards to the best type of methods for delivery of pre- and post- information. We would not conclude for example that the best types of activities for changing the way of thinking of students is through activism based methods simply because it was one of the more popular applications. What we can gather from this data is that the types of suggested pre- activities or follow-up post-excursion materials depend largely upon the specific program to be addressed.

Summary of conclusions based on observation and participation in excursion programs:

- Excursions are designed inherently to require the students have a base level of knowledge about the topics covered so that the experience is more worthwhile and that too much information isn't forced on them all at once.
- Pre- materials that provide general information covering key topics of interest to specific programs would alleviate the need to address those topics during the excursions.
- The design of the excursion program is set up to have an introductory discussion, a middle block which contains lots of hands-on activities, and a final discussion. This design lends itself well to the development of post-excursion materials that could

alleviate some of the need to clarify topics or provide sufficient follow-up information at the end of the activity because the students are there for the activity rather than to learn everything there is to know about particular subject areas.

- Any information provided in pre- or post-excursion material needs to connect to real life examples because students have difficulty connecting with abstract concepts without some form of connection to their own lives.
- The excursions need to stand alone. The information included in the pre- and post-materials needs to be different from the excursions so that they do not detract from the interactive experience that CERES can give.
- The materials we design are largely dependent on the specific programs we are designing them for.
- The majority of programs observed could benefit from a simple pre- material resource that provides base level knowledge for the students.

Appendix E: Interview Protocol for CERES Staff Program Coordinators

Glenn Evans (Land Program Coordinator), Ian Culbard (Energy Program Coordinator), Shane French (Waste Program Coordinator),

Location:

The volunteer services office.

Intent:

They are coordinators of CERES programs. It would be useful to learn their perspectives on the programs such as what pre- and post- materials might be needed.

Questions/Answers:

1. What positive outcomes do you feel are offered to school groups through the (strand title) programs?
2. Are you aware of any activities or lessons that teachers frequently use to prepare their students for the (strand title) programs?
3. What is the base level of knowledge of the students on topics related to the (strand title) programs when they come to CERES?
4. What would you like to see the students know or do before they attend the (strand title) programs?
5. Is there anything specific with the (strand title) programs you think they should know beforehand?
6. Do you have any ideas for how to convey this information to students before they arrive?
7. Are you aware of any follow-up activities or lessons that teachers frequently use after the (strand title) excursions?
8. Do you have any ideas for materials that might be used after the (strand title) excursions?
9. Have you come across teaching materials that you thought were particularly effective, and if so, what did this format consist of?
10. Have you noticed any connections between the land, waste, energy and cultural programs?
11. What are the standards that CERES uses to develop educational programs? Are there any pre-existing design principles or internal policies that CERES has?
12. Would you like to address any additional information?

APPENDIX F: INFORMAL INTERVIEW PROTOCOL FOR TEACHERS

Interviewees:
Program:
Location:
Time:
Protocol:

These informal interviews will begin with a quick question asking permission to interview a given teacher. After permission is granted, explanation will be given using a generated script that highlights our goal of making excursion programs more useful to teachers here at CERES, and what we are striving to obtain from teacher interviews. After this, the questioning sequence will begin. If a teacher does not want to respond to a given question, the question will be skipped. All interviews will be kept polite and brief, and the point of not interfering with teacher duties of watching children will always be kept in mind.

Intent:

We are looking to gain feedback from teachers who are visiting CERES to determine how excursion materials can best be created to help enhance the learning experiences of students before they arrive to CERES, and also after they leave. These excursion programs are meant to service teachers and their students, so feedback from them is very important. We are also looking to see if these programs are being used in conjunction with the curriculum, and if not, why?

Script to Follow:

Introduction:

1. Hi, I m ____ and I am with three other students from the United States who are helping CERES enhance their education programs by creating supplemental materials for teachers. We are asking visiting teachers a few questions to obtain information on such materials and how they would be most beneficial in aiding student learning and applying their newfound knowledge.
2. Have you been to CERES before? (if so, ask why they came back, what motivated them to come back with a group of students)
3. Have you looked at any of the materials online that CERES provides as information for programs?
4. Did you do anything with your students to prepare for today's excursion?
5. What sort of materials would have been beneficial before you arrived here today?
6. Are you planning on conducting any sort of follow up after you leave CERES?
7. What could be developed for the students after they leave that will likely change their level of thinking on a given subject matter? (Make them think differently about topics)

Appendix G: Analysis of Teacher Interviews

The majority of the teachers that we interviewed taught grades 3 and 4. About half had not been to CERES before, the other half were returning from previous visits. Most were using the CERES excursions to begin their units on either environmental science or recycling. In regards to the existing online materials that CERES provides to explain the excursions, about half did not look at these materials, whereas the other half used them to gain context on what the excursions would be covering. If CERES were to provide materials for use before the excursions, most teachers wanted either something to introduce CERES and its history or a description of the activities and what topics the excursion would cover.

As for follow-up activities, teachers had a few different agendas. Most teachers were conducting some type of reflection session where students would think, discuss, and write about their experience at CERES. Some teachers were basing the rest of their work on their unit on questions that the students will bring up following CERES. One group was planting a garden within the next week using what CERES taught them about gardening. Another teacher said she would let kids look around the CERES website again to spark questions.

For all of the questions regarding post-materials, the answers became much more varied. Some teachers felt that the excursions were self-sufficient and required no post-material. Other teachers, particularly those teaching year 3, requested colouring sheets and word searches or information sheets on the bugs and worms they saw. Some requested more hands-on activities, such as building a net to catch water bugs, making a "pond" in class, or directions on how to make recycled paper. The most commonly suggested post-material was having a No Rubbish Day at school, which seems to be a pre-established sustainability activity in many schools. For one day the kids would make sure their lunches are wrapper-free and they keep any rubbish that they have created with them during the school day and throw it away at home. Sometimes schools even challenge students to practise this day once a week.

When asked what could be done to help change the students thinking about some of the topics covered at CERES, each teacher provided different answers. Home-related activities were suggested as being good for changing the students' perception by giving them simple behaviours to practise at home. However, school-related activities might be a good place to start before jumping straight to homes, simply because it is easier for the students to have an impact on the schools than it is for them at home. The materials must explain what the students would get out of practicing these behaviours. At this age, the students are after instant gratification and expect to see the results of their actions. It was suggested that the materials target individuals rather than the class as a whole since it is easier to change an individual's thinking than a whole group. Different types of materials for different learning styles were also suggested, such as songs for auditory learners, videos for visual learners, and calculating water waste for analytical students.

Claims:

Most teachers do little preparation ahead of time and expect CERES' excursions to be self-sufficient.

Most teachers use CERES to open a unit on recycling or environmental science and rely on CERES to introduce these ideas to the students.

Most teachers do not expect substantial pre-material. Most just wanted a description of the activities and the topics the lesson would cover as an introduction to the kids.

Most teachers host at least some type of follow-up activity that usually takes the form of a discussion or a written assignment about the students' experience at CERES.

APPENDIX H: MELBOURNE ZOO EXPERT INTERVIEW TRANSCRIPTION

Interviewee:

Sean Coleman (Learning Experiences Manager at the Melbourne Zoo)

Time:

11:00 AM, 25-3-2011

Location:

Sean Coleman's office.

Intent:

Sean Coleman has worked at the zoo for 2 ½ years as the Learning Experiences Coordinator. He has helped organise and implement the more conservation-based teaching materials that the Zoo offers to school groups. We sought an interview with him to get some expert advice on how to develop pre- and post-teaching material with the intent of changing behaviour and getting students to make a difference.

Questions and Answers: (Questions asked are in italics and bolded)

Q: From what we have seen, you have several types of pre- and post-excursion materials, like VELS-compatible worksheets, conservation activities, and materials promoting activism or behaviour change. Is that the case and are there other types that you could tell us about?

A: There are two types of materials, the VELS-based worksheets and the learning programs that coincide with the conservation efforts at the zoo.

Q: How long has the Melbourne Zoo been using conservation based pre- and post-excursion teaching materials for their educational programs?

A: For two years.

Q: What were the goals of each of these types of materials? What was the motivating factor for creating pre- and post-excursion teaching materials here at the zoo, and what was the hope these materials would accomplish?

A: The Melbourne Zoo traditionally offered lots of VELS curriculum-based teaching material that served to fulfil requirements posted for funding by the Department of Education. Two years ago, the zoo began to focus its efforts on conservation. Using the Connect, Understand, Act model that the zoo uses to organise all of their programs, the zoo was able to brainstorm, organise, and implement some conservation activities that visitors could contribute to. Then the education officers took the activities and found ways to work them in with the excursions that schools book.

Q: When you created these materials, did you use a particular method to aid in the creation of the teaching materials? (I.e. establish a set of design principles to aid in the creation of the teaching materials) If so, what did they include/could we see an example?

The Connect, Understand, Act model is an internal policy of the Melbourne Zoo that should not be replicated. An example of the model being used to create one of the learning programs at the zoo (The Endangered Challenge) is as follows:

1. The zoo identifies an animal-threatening process, such as coltan mining in the Democratic Republic of Congo and its destruction of the habitats of mountain gorillas.
2. Then the zoo **connects** people with this threatening process through the animals that they have at the zoo. The zoo does not have mountain gorillas, but they have a similar species of gorilla that acts as an ambassador. The excursion leaders anthropomorphise the gorillas by talking to students about their unique names and personalities.
3. They then get visitors to **understand** the problem by explaining the threatening process. They show students satellite pictures of the overwhelming amount of the cell phones that are thrown away each year by the United States. They explain that there is a mineral used to make cell phones called coltan, and this mineral is often found around the gorilla's habitats. Thus the large demand for more cell phones contributes to the demand for more coltan, which means more mining into natural gorilla habitat.
4. The last step is to follow up with an **action** that the students can do to help alleviate this threatening process in some way. In the case of the gorillas, the zoo provides a satchel that is pre-postmarked so that students can send in their cell phones to be recycled. They also encourage students to start a drive at their school, and if they get more than 12 cell phones the zoo will come personally to pick up the cell phones. The zoo gets two dollars for every phone they recycle. One dollar goes to help the gorillas and the other goes to the DRC to help pay for the food rations of the people who stop poachers from getting to the gorillas.

Q: Are the materials specific to certain programs here at the zoo, or are they more general for a wide range of programs?

A: The relationship of the materials to the programs at the zoo is a bit complex. The materials are a part of learning programs here at the zoo. Learning programs are the equivalent of the excursion programs at CERES. For example, the most successful booking at the school is "The Endangered Challenge." This program incorporates many different conservation campaigns, such as the "Don't Palm Us Off," a program to end palm tree deforestation for the orangutans, and the "Calling on You," the aforementioned program for the gorillas. This program also speaks to students about the hunting of the tree kangaroo in Papua New Guinea, and the illegal trafficking of pets from one country to another. Though these last couple of programs do not have conservation campaigns associated with them, they still serve to spread awareness about these endangered species. All of these are included under "The Endangered Challenge" heading, which runs about 50 minutes.

Q: Can you provide any advice on creating these teaching materials for pre- and post-excursions at CERES? (Difficulties in creating these materials, ways around difficulties, etc.)

A: The conservation learning programs had to be age appropriate and easy for the students to do for them to be effective. When forming the "Wipe for Wildlife" campaign, the zoo quickly realised that they could not just ask the students to go home to their parents and say, "We have to buy 100% post-consumer recycled toilet paper." Since the students are not the household decision-makers, this would provide a very low return rate. Instead, they encouraged students to start a campaign at their school to switch to recycled toilet paper, and in this way they are affecting a greater population than just their family. In the "Seal the Loop" program, the zoo uses recycled plastic to create bins used at piers to collect old fishing line so that fishermen do not throw lines into the water. Since the students probably are not the ones fishing down at the pier, they ask the students to bring a bag of recyclable plastic with them to the zoo so that the zoo can take that plastic and use it to make the bins. This is an example of the pre-visit activity. The corresponding post-visit activity is to host a "rubbish-free day" at the school, which hopefully should inspire a rubbish-free week, and then a year, etc. In this way the students are still helping the cause in a way that is much more applicable to their lives.

Another thing to note is that the zoo was at first concerned that these new materials might not fulfil all of the same curriculum requirements that the older materials were accounting for, and thus would provide less of an educational value for schools. However, as the zoo went through and analysed these conservation-based programs, they found that they were actually doing more for the VELS curriculum than they had been with the older materials.

Q: Have you discovered that one mode of delivery for teaching materials works better than others?

A: There is a shift towards online delivery with the teaching materials. The zoo is starting "to use the internet smarter than they have in the past." They are creating a website called "Act Wild" to act as a hub for their pre- and post-excursion activities. This website will have a colourful and fun design and web activities that introduce the zoo's animals and anthropomorphises them, but will also include resources like the "Calling on You" program with the ability to print out a label with the address of the recycling plant for your cell phone. The site will also have activities for what students can do within their own communities to help, and will include a moderated forum where students can talk about current conservation efforts and issues facing their favourite animals.

Q: How and when do you inform teachers about availability of materials?

A: During the learning programs at the zoo, the excursion heads talk about the conservation activities and what the students can do to help. Between this and the "learning experiences" tab on the website, this is the main way that they inform teachers about their materials. The zoo makes sure to distinguish between information that can be presented in the classroom and information presented while they are at the zoo. They have to use the time with the students at the zoo as wisely as possible, and repeating too much information makes the visit seem less worthwhile for the teachers and the students.

Q: Which types of materials seem to be most used by the teachers? Do you know why? What information do you have about the extent of use of these materials? What strategies have been adopted to encourage more usage by teachers?

A: Two years ago, the zoo would mail out an evaluation survey to teachers who had booked with the zoo. The results was a return rate of 5%, and of these most were only returned because the teachers had a bad experience and were using it as a way of complaining about the zoo. The feedback was impartial and insignificant. Later, the zoo set up an online survey for every learning program that the zoo offered. The teacher would be linked to the appropriate survey after booking with the zoo. This created a huge influx of data that was far too specific for the programs and was too much to sift through. Finally, they set up an online survey that was split between the early years, the middle years, the later years, and the secondary programs. This has worked well for providing the zoo with relevant feedback.

Evaluation of the ongoing programs has proven to be difficult, so the zoo is trying to implement some forms of imbedded evaluation. For example, there's one post-activity that involves giving a host tree to a school. With this tree comes a poster with four different jobs that the students can sign up for (botanist, scientist, investigator, etc.), and also an email address for the zoo that the students are encouraged to send pictures of the tree and status updates of the habitat that is evolving around it (Have bugs moved into the tree? Birds? Other plants? Etc.). By sending an email to this address, the zoo can see which schools are really applying what they learned and getting into the conservation activities.

APPENDIX I: HEALESVILLE SANCTUARY EXPERT INTERVIEW TRANSCRIPTION

Interviewee:

Dianne Gordon

Time:

11:00 AM, 29-3-11

Location:

Discovery learning building

Intent:

The intent of this interview was to gain a deeper perspective of the creation process that yields pre and post excursion materials. Dianne has been working first hand for a number of years to develop teaching materials for both the Melbourne Zoo and the Sanctuary, so she is very well versed in the processes. After the interview with the Melbourne Zoo, another perspective on the pre and post materials creation process was sought out, and to see if similarities exist.

Questions and Answers: (Questions asked are in italics and bolded)

How do you determine how much information the student should come in with? You don't want to overwhelm students since and don't want to detract from the program, so how do you manage this balance?

We don't overload teachers with material. The general process starts off with a brainstorm of ideas teachers can do before they arrive. After brainstorming and coming up with many ideas, only about four are selected, where two ideas will be incorporated into teacher notes and the remaining ideas will be made available on the pres visit activities section of the website

When brainstorming, we start with content of what we want to deliver in the specific programs, the aims and objectives, and then sit down to figure out what students should know before they arrive, or what would be most helpful for students to do before they arrive.

People come here to be simplistic. People (teachers) come here either at the beginning of their unit of work as an introduction, the middle of a unit to support what they are doing, or end of a unit of work to consolidate what they have done. So any activities we want students to do to support the content needs to be applicable across the board. We often get teachers who don't want to do pre-visit work. That is why we don't do a lot of focus on them because we find that most teachers don't use pre-visit information. I think that is

shifting for the post visit because we are integrating that more into the program as an assessment and an evaluation of the program.

Australian Endangered Species example: We want students to have a background in threatened processes for different engendered species. We want them to have a think about the animals that are endangered. We want groups to make a choice on animal so that the program is focused more than a general overview. Generally, teachers don't want to do this. Prepare students before a session is a good teaching practise.

Has given the students a choice so the students are buying into the animal and they commit to following through after that. Then aims of the program are achieved and not just a cheesy introduction.

Aims of a program are to inspire kids, get them connected, get them tuned in, give them opportunities for ownership and choice, encourage research, and start higher order thinking processes. Then staff thinks how programs connect to VELS, how program relates to Connect Understand Act model, think about value vs. effort. So that is what underpins the processes.

How did you find out that teachers were not using pre-excursion materials?

We evaluate all of our programs. We get a low return rate for evaluations despite format the evaluation comes in. A question states "have you used pre and post materials." From this, we have quantified the no responses.

Kids used to walk around with bits of paper to fill out trails around the zoo. We want kids to connect with the animals and the issues. They can do their research while at school from the website. There is nothing that kills interaction more than a kid with a pen and notepad. Putting that question into your evaluation of the session will let you know what teachers are using.

Have you done anything to encourage teachers to use materials?

Pre-visit phone calls are utilised to understand what background kinds are coming into the program with, and what expectations the teachers have. By placing these phone calls, teachers can make sure the students understand vocabulary and key topics that are incorporated into a given program.

Does this decline in the number of teachers using pre-materials that you mentioned apply to post materials as well?

Because we are changing post activities we are offering, the ideas are more useful to teachers after their visits. There probably is an increase is teacher usage after the program because this is the action part. Kinds are more likely to come away with a clearer idea of what they are doing here. They can do more research back at home on what they learned during the program. Actions that continue on after the visit.

Going along with the idea you mentioned of the days being over where kids walk around a notepad and pen to take in the excursion, why are the VELS worksheets still on the website, and what about them keeps them on the site?

They are for the teachers, really. They are teachers information to help them plan and to see where we fit in. They are also there to help them with their assessment and to justify their excursion to principles or subject coordinators.

But do you feel the conservation based activities are more useful for education?

They are more inspiring and they tick off on their curriculum and also on hart felt commitment to conservation. From the department of education standpoint means the kids are doing something differently that they wouldn't have done otherwise as a result of the excursion.

Can you explain how the uptakes of conservation actions are measured?

Wipe for Wildlife is easy to measure. We don't know if schools are going to do it or not, so they collect expressions of interest from schools. She then asks how schools are doing and what is happening so she can log their progress. It is time a consuming process to do. A lot of conservation actions are all about catching up with the teacher.

Can you describe some of the pre-materials for Wetlands and Waterways?

Examples were shown on the computer. Refer to website for more information on the examples. They are just suggestions for teachers to do with their kids.

You mentioned before that you are trying to steer away from the written materials. Is that in regards to filling something out on a trail, or was that ever in the pre and post visits? Are you trying to avoid the written materials?

Yes, the whole lot. Kids use Act Wild or video mash-ups instead of doing a lot of reading, and I suppose that is due to the ways in which kids are learning these days. Instead of reading from slabs of text, they are jumping through websites and looking at bits and pieces. For us, it is about changing what we offer in response to changes in the ways kids are learning these days.

How is it that you ensure you are meeting some of these requirements or priorities, or is it just a matter of looking at their website and picking our key ideas?

We are part of the Strategic Partnership Program (CERES is too) that provides regular information sessions about what their priorities are. This is so you are not faced with this grate ugly website. They help guide you into what is important.

How do you determine what is needed for a program, this perceived need?

It could be done through VELS or discussions with teachers. It could be feedback from someone who stated that we could have done X, so taking with teachers.

If you were looking at a program to create pre or post materials for, would you try to incorporate various ideas of that program? Proposed materials you would try to instil in the school children a way of changing their way of thinking?

Give them opportunities for action.

And for pre materials, would it be a brief introduction into the subject matter that is going to be presented during the excursion?

It might be something, well I am thinking of about the Creek River Sea program. The action that we are going to have imbedded into it is going to be a commitment to using phosphate free detergent. That is going to be our next big community program where kids can login to the website and say they are going to be involved in that.

What do you do now here at Healesville?

I do the same sort of thing that Sean does. I am part of the senior leadership team. We don't have a director, so we are all together running the property. We have a lot of meetings for operations and strategic issues as well. I manage my team and guide the direction of my team. We are very hands on here in a way that is not possible with a bigger team lime over at Melbourne. If I need to sweep out a classroom, then I will. We are very hands on with our animal training. We are getting a lot of new animals and I have had to direct that because we have not had decent succession plans for animals that are getting older and need to be retired. We got stuck one point with not having special animals for our session and not being able to shift senior managers in the animal department in seeing the importance of that. I represent us in the sanctuary with other senior managers and have had to do a lot of work with them to show them the value of what we do. As a result we have a lot more animals, but they need conditioning for interaction with sessions. We spend time with the animals to get them ready for sessions. This requires us to work very close with the keepers here.

Program development is a small part of my job. I teach a lot. Moving the team forward.

Is design principles and templates the best approach you have come across?

It is a kind of approach. Other people would like fewer layers to the design process, but at the moment I think this is a very good approach. Teachers do value having something that is consistent in terms of layout for all programs. We try to keep designs to three pages.

What are the other contributions to the design principles other than the general mission of the organisation, or is it program specific?

It is very program specific, but we have used in the past a organised template that is structured with an introduction, objectives, links to VELS, pre visit activities, what will happen at the sanctuary, post visit further resources.

APPENDIX J: TEMPLATE FOR PRE-EXCURSION TEACHING MATERIALS

In this section is a copy of the template used for the created pre-excursion materials.

Introduction to CERES Community Environment Park:

Located on the banks of the Merri Creek, CERES is a 4.5-hectare urban park that presents a working model of a sustainable community. All waste and water at CERES is recycled, and much of the site is powered by solar and wind energy. Complete with examples of green technology in action, ecological building design, community enterprise, a cultural village, and beautiful mosaics and sculptures, CERES seeks to offer a new way of being to its visitors.

The excursion programs that CERES offers are hands-on, interactive experiences built upon the real-life resources and displays at the CERES Community Environment Park. All CERES staff are dedicated to providing the most engaging and informative activities for students. For a map of CERES, visit: http://www.ceres.org.au/sitemap

EXAMPLE Program Pre-Excursion Materials

Teachers: If you have booked programs within the Example Strand, you may want to prepare your students by engaging in some of these pre-visit activities to get them thinking about Example and its impact on the environment.

- (Insert 3-4 activities or films that the teachers could use during their classes to introduce their students to the excursions which they will participate in while at CERES.)
- *Calculate individual and school ecological footprints at the website of EPA Victoria. http://www.epa.vic.gov.au/ecologicalfootprint/calculators/default.asp

After engaging in these activities, generate some pre-visit discussion by using these thought-provoking questions:

- (Insert 4-6 thought-provoking questions which will help create a base level of knowledge and curiosity for the students when they arrive here at CERES.)

*Do not suggest this resource for students if you plan on booking the Ecological Footprint excursion activity.

APPENDIX K: PRE-EXCURSION TEACHING MATERIALS

In this section there is a copy of the created waste pre-excursion material followed by a copy of the land pre- excursion material.

Introduction to CERES Community Environment Park:

Located on the banks of the Merri Creek, CERES is a 4.5-hectare urban park that presents a working model of a sustainable community. All waste and water at CERES is recycled, and much of the site is powered by solar and wind energy. Complete with examples of green technology in action, ecological building design, community enterprise, a cultural village, and beautiful mosaics and sculptures, CERES seeks to offer a new way of being to its visitors.

The excursion programs that CERES offers are hands-on, interactive experiences built upon the real-life resources and displays at the CERES Community Environment Park. All CERES staff are dedicated to providing the most engaging and informative activities for students. For a map of CERES, visit: http://www.ceres.org.au/sitemap

Waste Program Pre-Excursion Materials

Teachers: If you have booked programs within the Waste Strand, you may want to prepare your students by engaging in some of these pre-visit activities to get them thinking about Waste and its impact on the environment.

- Watch The Story of Stuff, a 20min. film which looks at the shortcomings of the current system in which resources are obtained, processed, used, and disposed. http://www.storyofstuff.com/
- Find out where local recycling and waste services are using Recycling Near You. http://www.recyclingnearyou.com.au/
- Visit the website of Planet Ark to learn about campaigns that encourage community involvement to address our environmental impact. http://www.planetark.org/about/
- *Calculate individual and school ecological footprints at the website of EPA Victoria. http://www.epa.vic.gov.au/ecologicalfootprint/calculators/default.asp

After engaging in these activities, generate some pre-visit discussion by using these thought-provoking questions:

- What are all the different types of waste your school produces?
- What are all the different types of waste produced at home?
- How do your shopping habits contribute to the waste stream?
- What is recycling?
- How can we reduce the amount of waste we produce every day?
- How can waste be used as a resource?
- How do we become more conscientious consumers?

*Do not suggest this resource for students if you plan on booking the Ecological Footprint excursion activity.

Introduction to CERES Community Environment Park:

Located on the banks of the Merri Creek, CERES is a 4.5-hectare urban park that presents a working model of a sustainable community. All waste and water at CERES is recycled, and much of the site is powered by solar and wind energy. Complete with examples of green technology in action, ecological building design, community enterprise, a cultural village, and beautiful mosaics and sculptures, CERES seeks to offer a new way of being to its visitors.

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Land Program Pre-Excursion Materials

Teachers: If you have booked programs within the **Land** Strand, you may want to prepare your students by engaging in some of these pre-visit activities to get them thinking about **Land** and our impact on the environment.

- For younger students: read or watch the Dr. Seuss story of "**The Lorax**" or watch the animated film "**Fern Gully**" which both explore the nature of habitat destruction and deforestation
- For older students: watch "**Dirt! The movie**" to understand the connections between humanity and the land.
- *Calculate individual and school ecological footprints at the website of **EPA Victoria**. http://www.epa.vic.gov.au/ecologicalfootprint/calculators/default.asp

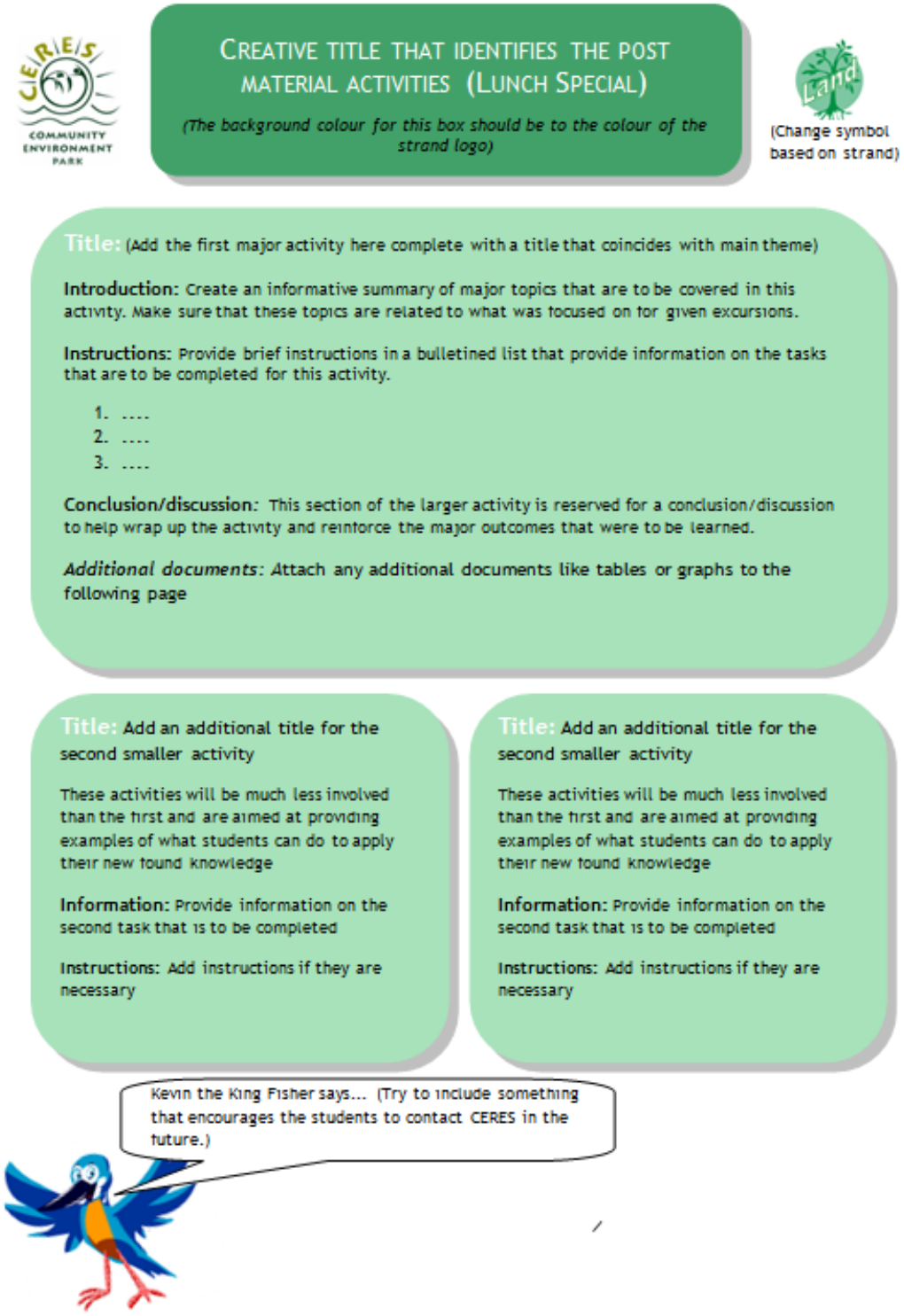
After engaging in any of these activities, generate some pre-visit discussion by using these thought-provoking questions:

- What are the sorts of resources that living things need to survive?
- What is needed to get the food you eat from the farm to the shops?
- What does it mean to say that something is 'organic'?
- How might your individual actions be affecting life on the planet?
- What are some ways that we can help make the planet healthier?

*Do not suggest this resource for students if you plan on booking the Ecological Footprint excursion activity.

Appendix L: Template for Post-Excursion Teaching Material

In this appendix there is a copy of the template used to create the post-excursion materials.



APPENDIX M: POST-EXCURSION TEACHING MATERIAL

This appendix contains the post- excursion materials for both the waste and land excursion strands. The at school activity for each strand comes before the at home activity material.

WASTE: AT SCHOOL ACTIVITIES

Lunchbox Detox

What are you eating for lunch? What kind of packaging does your food have? What was is made of?

As you found out while at CERES, most of your packaging does not decompose very easily and builds up in the rubbish tips. Let's see how much rubbish you produce during the week just from lunch.

Keep track of what you are using to bring your lunch to school every day for a week, and then record this information in the chart provided. See if the number of packaged items you bring each day decreases over the course of the week. Are the things you are using recyclable or are they creating rubbish? Plot your packaging usage over the week on a graph to get a better picture of how much of each item is being used. Notice the totals of each item you are using. What effect are you having on the environment around you by using those items for your lunch?

No Waste Here!

Try having Rubbish Free Fridays to help lessen your impact on the environment. This means bringing your lunch to school without any packaging, serviettes, or other rubbish-creating materials. Create a Golden Lunchbox award and compete against the other classes in your school to see which class has the most rubbish free lunch.

Travelling Food

The next time you eat your lunch, look at where your food comes from. The closer the food is to where you live, the more sustainable it is! This is because trucks and aeroplanes used to transport food give off a lot of CO_2 emissions.

Keep track of where your food is coming from. Mark on a world map where your food comes from. Does the food you get really need to travel that far? Find ways to get the same food for less food miles. Use different coloured stickers or thumbtacks to track each week's progress.

Label Fable

The next time you go shopping, look around at all of the products that claim to be environmentally friendly. Not all of these claims are actually true. For example, a product might claim to be biodegradable... but it might take over 1,000,000 years! Truly environmentally friendly products will bear a seal from a trusted eco-friendly source, such as Planet Ark or Environmental Choice Australia.

Kevin the Kingfisher says, "Send pictures of your progress to education@ceres.org.au. We would love to see your work!"

		Monday	Tuesday	Wednesday	Thursday	Friday	Total
Example: Drink Cartons		3	3	2	1	1	10
Juice Boxes							
Paper							
Cardboard							
Milk or Juice Cartons							
Recyclable Plastic							
Non Recyclable Plastic							
Glass							
Aluminium Foil							

WASTE: AT HOME ACTIVITIES

The D.U.M.P. Awards

Environment Victoria's annual D.U.M.P. Awards (Damaging and Useless Materials from Packaging) are awarded to companies whose products have the most excess or non-recyclable packaging. This is to help these companies realise that they are wasting many resources.

Now it's time for you to hand out your own D.U.M.P. awards! Search around your house and find the packaging of a few different items. Is there more material being used than is necessary? Is the packaging made of recycled materials? Compare all of the packaging on the items you found. Which one do you think should be the winner of the D.U.M.P. award?

Now that you know which product deserves the D.U.M.P. award, see if you could come up with a way to fix the packaging. Try making the packaging smaller, out of a more recyclable material, or even have them packaged together rather than individually. By using some of these ideas and some of your own, see if you can redesign it.

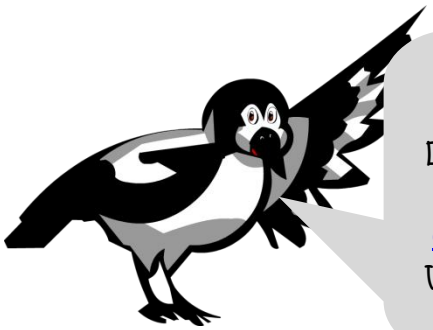
Clean Up Your Home!

Consider ways to give new life to all of the unused or old items you have at home. Donating your items to charity or running a garage sale are good ways to provide others with the things they want and need.

Finding broken items around your home that can be recycled will clear up space and also means that those items won't be sitting in a rubbish tip leaking toxins into the environment.

Bigger Is Better

Buying food in larger quantities is not only cheaper, it's also more sustainable. Instead of buying potato chips in small bags, you should try buying a large bag of chips and putting those in a reusable container. Ice cream tubs make great reusable containers!



Maggie the Magpie says, "Send pictures of your D.U.M.P. award and what you came up with to education@ceres.org.au. We would love to see your work!"

Recycling Detective

If a plastic material has a recycling symbol imprinted on it, such as the ones shown below, this means that it is made out of a plastic that can be recycled.

This symbol is used in Australia to identify the type of plastic used to make the material. However, sometimes plastics from other countries make it into Australia. These plastics don't always have the imprinted recycling symbol and may not be recyclable, even if the label says that they are.

Become a detective and find plastics in your home that have the imprinted plastic identification symbol. Then try to find plastics that don't have the symbol. Do these plastics have labels that say they are recyclable? Don't be fooled!

Land: At School Activities

Which Soil to Use

Plants need three major things to grow properly; Air, water, and nutrients from the soil. If you were going to make your own garden, what kind of soil would you use to give your plants the most nutrients possible to help them grow big and strong? Let's find out!

For this activity, you will need: four paper cups, four seeds of the same kind of plant (we recommend peas or beans), and three different types of soils to fill the cups with. (We recommend potting soil, clay, and sand.)

1. Fill three of the cups with the soils you choose (a different one in each cup) and fill the fourth with a mixture of the soils.
2. Place a seed in each of the cups making sure that each seed is in about the same place in each cup. The second knuckle on your index finger works as a good marking.
3. Place each cup in a location where they will receive about the same amount of light.
4. Every other day, measure out an equal amount of water to place in each cup. While doing so, record any observations that you notice such as sprouts from the seed.

After three weeks of watering and tender care, see what plant has grown the best. What kind of soil was the plant growing in? Have a think about the reasons why this might be so.

Now that you know what soil has the most nutrients for the plants, use that soil to start up your own garden!

A Photo a Day…

If you have a garden or are planning to make one at school, pick one particular plant and take turns being the daily photographer! Take a photo of the plant every day from when it's first planted to when it's fully grown. Make a photo collage showing the growth of your plant over time and use this to understand the lifecycle of your plant!

Kevin the Kingfisher says, "Send pictures of your progress to education@ceres.org.au. We would love to see your work!"

The Pressing Issue: Pressing leaves

Search in the area around your school for all types of plant life: green leaves, colourful flowers, plant buds…

Keep a journal where you describe all the types of plant life you find, and draw a picture of what you found in the journal as well. After finding these plants, go back to school and see what else you can learn about them. Preserve the most interesting and beautiful plants by pressing them into the journal alongside your notes. To press the plant, place it between two pieces of wax paper and squish it between the two heavy textbook, and let it sit to dry out for 2-3 weeks.

Taking note of trees and plants around you is one way of connecting with nature!

Table for Plant Growth Observations

	Potting Soil	Clay	Sand	Potting Soil and Clay
Day #1				
Day #3				
Day #5				
Day #7				
Day #9				
Day #11				
Day #13				
Day #15				
Day #17				
Day #19				
Day #21				

Record all Measurements in mm

Land: At Home Activities

A Home for Worms

Did you know that you can create a worm bin right at home? It is really easy, takes little time, and requires a few items you can find around your home. Your household will love all the organic compost that results; perfect for plants you are growing at home. Start composting your own organic waste today!

Just follow these few steps to create your own worm bin in no-time.

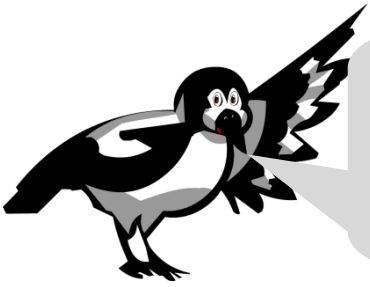
1.) First, find a polystyrene container that is about a half metre by half metre. Make sure to drill small holes on the bottom and on two sides of the container. The worms need to be able to breathe!
2.) Place some sort of catch basin under your container to collect any liquids.
3.) Provide bedding for the worms by putting either damp newspaper or fine gravel in the bottom of your bin.
4.) Obtain a small sample of soil so that you have about 4cm of soil on top of the bedding.
5.) Buy worms from any qualified worm dealer, and place them softly into their new home.
6.) Make sure you are adding about 250-500 grams of food scrap to the work bin each week so the worms have plenty to eat.

Now you have your very own worm bin. Make sure that worm bedding is changed every 3-6 months so the worms have a nice place to rest. Once you are done composting, just deposit worm castings into any local planter box or garden.

My Wheat Friend

A wheat friend is a sculpture made out of a stocking that has been filled with wheat seeds and twisted and bent into the shape of a person.

All you need is a stocking and wheat seeds. Start by adding wheat seeds to the bottom of the stocking creating "feet" by twisting and bending it properly. Working your way all the way to the head and once finished tie the top of the stocking closed. To give life to your new friend, lightly water the stocking with a spray bottle. Germination should take place in the first week.



Maggie the Magpie says, "CERES has loads of worm bins and resources to help with your new found compost pile."
http://www.ceres.org.au/

A Greenhouse for All

Have you ever wanted to build your own greenhouse? Here is your chance. Follow this easy step-by-step guide to create a lush greenhouse right in your own living room.

Plan out the size of the greenhouse that you want to build and find an appropriately sized tray.

Construct a tent over the tray made out of clear plastic wrap and sticks.

Create an access point to water the contents of the house. Choose your favourite flowers to live in the house, and watch as they grow.

APPENDIX N: PRE- AND POST-EXCURSION TEACHING MATERIALS EVALUATION SURVEY

Below is a copy of the questions we advise CERES to use to evaluate the pre- and post-excursion material.

1. If you have used the pre-excursion materials available on the website, how would you rate the formatting, content, and relevance of the materials? Please mark your responses to the following statements.

The scale ranges from 5 (Strongly Agree) to 1 (Strongly Disagree).	Strongly Agree	Agree	Neither Disagree or Agree	Disagree	Strongly Disagree
• The content presented was relevant to the student's studies...	⑤	④	③	②	①
• The content was aimed at the right level for my class	⑤	④	③	②	①
• The teaching materials were well presented	⑤	④	③	②	①
• The materials were easily adaptable as a pre-visit lesson	⑤	④	③	②	①
• The resources provided were appropriate for students.....	⑤	④	③	②	①

2. Do you have any comments about the ease of use of the materials or any improvements you would like to suggest?

_____

_____

3. If you used the post-excursion material available on the CERES website, which materials did you look at?

☐ Waste- In School (Lunch Special) ☐ Waste- At Home (Dinner Special)

☐ Land- In School (Lunch Special) ☐ Land- At Home (Dinner Special)

4. How would you evaluate the relevance, content, and formatting of the post-excursion materials? Please mark your responses to the following statements.

The scale ranges from 5 (Strongly Agree) to 1 (Strongly Disagree).	Strongly Agree	Agree	Neither Disagree or Agree	Disagree	Strongly Disagree
• The content presented was relevant to the student's studies...	⑤	④	③	②	①
• The content was aimed at the right level for my class	⑤	④	③	②	①
• The teaching materials were well presented	⑤	④	③	②	①
• The materials were easily adaptable as a post-visit lessons	⑤	④	③	②	①
• The resources provided were appropriate for students.....	⑤	④	③	②	①

5. Do you have any additional comments or suggestions for improvement of the post-excursion materials?

_____

_____

_____

APPENDIX O: SUMMATIVE TEAMWORK ASSESSMENT

We have found that as time passed, our teamwork monitoring developed to the point where we were able to identify specific actions we could take to reach a higher level of productivity. In the middle of the term, we decided to start conducting a team meeting at the end of each day to discuss what had been accomplished during the day so that we could create an agenda of what needed to be done on the following day. This daily meeting was an opportunity not only to assess the work that we had done that day, but also to critically reflect on our effectiveness as a team and determine ways we could adjust in order to increase our productivity.

We also increased our team productivity by deciding on an effective solution for paper editing - a rotating schedule of passes in which each member of the team would have a chance to make revisions to sections and which usually ended with the original author of the section receiving the completed documents for final review. When it came to assignments that couldn't be broken up, we would all work together in a room by ourselves to make changes as needed. For example, when working on the Power Point presentation, each of us would work on the presentation as a whole, even making changes to slides that we personally wouldn't be speaking about.

As a team, we developed systems to address the opinions and feelings of individual team members. In particular, we found that calling frequent team meetings made for an effective way of dealing with internal conflicts. During these meetings we attempted to assuage the often critical nature of our opinions to maintain the respect that each member of the team deserved. Another way that we resolved internal conflicts, particularly in regards to the format and contents of the paper, was by asking for help from our advisors to determine effective solutions.

For future teamwork experiences, when making decisions we need to work on finding an effective way to compromise. Many arguments ended by one or more people submitting to a different opinion than they had originally. In the future, we could work towards more solutions that please the whole group. By getting the team to list the pros and cons of each side of an argument, we could use the pros of each side to come to a decision that leaves both sides feeling justified.

We have learned that in order to be an effective team, we need to:

- Listen to each other carefully and repeat what someone is saying to ensure we understood
- Be flexible, especially when working creatively, such as when creating the pre- and post-excursion materials
- Create a schedule each day to keep ourselves organised and to keep track on who is working on what
- Encourage each other to create sound arguments when trying to present our opinions
- Only take on a task if we are sure we can finish it