

WEBSITE DEVELOPMENT FOR THE ROYAL BOTANIC GARDENS

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Abstract

This project established recommendations for the Royal Botanical Gardens (RBG) in Melbourne to further develop the educational content of their website. Our objective was to evaluate the current website and create guidelines for its further development. From our research and interviews we determined that a new area of the website needed to be created in order to fulfill the educational goals of the Gardens.

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Table of Authorship

Section	Title Section	Primary Author(s)	Primary Editor(s)
1.	Introduction	ALL	Mike
2.	Literature Review	ALL	Rich
2.1.	The Royal Botanic Gardens Role in Society	Tom, Alex	Mike
2.1.1.	What is a Botanic Garden?	Mike	Tom
2.1.2.	Conservation and Research	Rich	Alex
2.1.3.	Gardens for Education	Alex	Tom
2.1.4.	Website Content Research	Tom	Rich
2.2.	Mission of the Royal Botanic Gardens and Goals of the Website	Rich	Mike
2.2.1	Goals of the Website	Tom	Rich
2.3.	Using Websites as Effective Tools	Mike	Alex
2.3.1.	Designing Website for Effective Information Gathering	Tom	Alex
2.3.2.	Needs for Different Users	Mike, Alex	Tom
2.4.	Learning Styles	Tom	Alex
2.5	Cognitive Effects of Web Page Design	Tom	Mike
3.	Methodology	ALL	ALL
3.1.	Determining the Goals of the Royal Botanic Gardens Website	Mike, Alex	Rich
3.1.1.	Gathering Information from our Sponsor	Mike, Alex	Rich
3.1.2.	Gathering Information About the RBG Website	Rich	Tom
3.2.	Formulate Criteria on Best Practice Web Design	Tom	Alex
3.2.1.	Comparing Similar Organizations Web Pages	ALL	Alex
3.2.2.	Evaluating Expert Sources on Web Design	Mike, Alex, Tom	Alex
3.3.	Development and Fielding of Preliminary RBG Website	Rich	Mike
3.3.1.	Interviews with RBG staff	Rich	Rich, Alex
3.3.2.	Creating a Site Map	Tom	Rich, Alex
3.3.3.	Building the Web Pages	Alex	Rich, Alex
3.3.4.	Fielding the Preliminary Web Pages	Alex	Rich, Alex
3.4	Gathering Feedback on Preliminary RBG Website	Mike	Tom
4	Data	ALL	ALL

4.1	Interviews	Tom	Alex
4.1.1	Interviews for Delivery Principles	Mike, Rich	Alex
4.1.1.1	Educational Staff	Tom, Rich	Mike
4.1.1.2	Visitor's Center Staff	Rich	Mike
4.1.1.3	Internet Service Staff	Alex	Rich
4.1.1.4	Interview Data Collected	Alex, Mike	Tom
4.1.2	Interviews to Obtain Content	ALL	Rich
4.1.2.1	Educational Staff	Tom, Rich	Mike
4.1.2.2	Visitor's Center Staff	Rich	Mike
4.1.2.3	Horticultural Staff	ALL	Alex
4.2	Evaluation Data	Alex	Tom
4.3	Accessibility Data	Rich	Tom
4.3.1	Accessibility Evaluation of Website	Rich	Mike
5	Analysis	Mike	Alex
5.1	Guidelines Overview	Alex, Mike	Rich
5.2	Guidelines for Website Development	Alex	Mike
5.2.1	Guidelines for Navigation	Alex	Tom
5.2.2	Guidelines for Presentation	Alex	Mike
5.2.2.1	Audience Identification	Mike	Tom
5.2.2.2	Guidelines for Optimal Text Size and Format	Mike	Tom
5.2.2.3	Guidelines for Optimal Text Color and Density	Tom	Alex
5.2.2.4	Guidelines for Page Layouts	Alex	Rich
5.2.3	Guidelines for Interactivity	Alex	Tom
5.3	Application of Design	Mike	Alex
5.3.1	Overall Design	Alex	Tom
5.3.1.1	Navigation	Rich	Alex
5.3.1.2	Presentation	Alex	Mike
5.3.1.2.1	Audience Identification	Mike	Rich
5.3.1.2.2	Text and Formatting	Mike	Rich
5.3.1.2.3	Page Layout	Rich	Tom
5.3.1.3	Interactivity	Tom	Mike
5.3.2	Addition of Separate Bilang Bilang Website	Rich	Mike
5.3.3	Map Page	Alex	Tom
5.3.4	Fact Sheets	Rich, Tom	Alex
5.3.5	Kids Page	ALL	Mike
5.4	Evaluation	Mike	Alex
5.4.1	Website Evaluation from RBG Staff and Outside Sources	Tom	Rich
5.4.2	Accessibility Evaluation of Website	Rich	Mike
6	Conclusions	Mike, Rich	Alex
6.1	Conclusions from Evaluations	Mike	Alex
7	Suggestions for the Future	Rich	Alex, Tom

7A	Creation of a Database for Plant Fact Sheets, Info Sheets, Pictures	Rich	Alex, Tom
7B	Addition of a Forum	Rich	Alex, Tom
7C	Interactive Games/Media	Rich	Alex, Tom
7D	Website Feedback System	Rich	Alex, Tom
7E	Digital Media	Rich	Alex, Tom
App. A	Project Description	-	-
App. B	Sponsor Description	ALL	ALL
App. C	Sponsor E-Mail	ALL	ALL
App. D	Conference Call Interview with Sponsor	Alex, Mike	ALL
App. E	Sample Website Evaluation by Tammy Payton	-	-
App. F	Website Evaluation Criteria Rubric Developed by RBG Team	Tom	ALL
App. G	Sample of Preliminary Website Review	ALL	ALL
App. H	Preliminary Timeline	Mike	Rich, Alex
App. I	Royal Botanic Gardens Programs	ALL	ALL
App. J	Interview Protocols	ALL	ALL
App. K	Concept Map	ALL	Mike
App. L	Revised Website Evaluation	ALL	ALL
App. M	Questions Concerning Teaching Approach	ALL	ALL
App. N	Royal Botanic Gardens Website Layout	ALL	ALL
App. O	Interview Answers	-	-
App. P	Website Evaluation Data	-	-
App. Q	Flow Charts for Navigation	Mike, Alex	ALL
App. R	Website Map	Mike	Alex

Table of Contents

TITLE PAGE	I
ABSTRACT	II
ACKNOWLEDGMENTS	III
TABLE OF AUTHORSHIP	IV
TABLE OF CONTENTS	VII
TABLE OF FIGURES	X
EXECUTIVE SUMMARY	XI
1. INTRODUCTION	1
2. LITERATURE REVIEW	3
2.1 THE ROYAL BOTANIC GARDENS ROLE IN SOCIETY	3
2.1.1 <i>What is a Botanic Garden?</i>	3
2.1.2 <i>Conservation and Research</i>	4
2.1.3 <i>Gardens for Education</i>	5
2.1.4 <i>Website Content Research</i>	6
2.2 MISSION OF THE ROYAL BOTANIC GARDENS AND GOALS OF THE WEBSITE	6
2.2.1 <i>Goals of the Website</i>	7
2.3 USING WEBSITES AS EFFECTIVE TOOLS	8
2.3.1 <i>Designing website for effective information gathering</i>	8
2.3.2 <i>Needs for different users</i>	9
2.4 LEARNING STYLES	9
2.5 COGNITIVE EFFECTS OF WEB PAGE DESIGN	10
3. METHODOLOGY	11
3.1 DETERMINING THE GOALS OF THE ROYAL BOTANIC GARDENS WEBSITE	11
3.1.1 <i>Gathering Information from our Sponsor</i>	11
3.1.2 <i>Gathering Information about the RBG Website</i>	12
3.2 FORMULATE EVALUATION CRITERIA BASED ON RESEARCH	12
3.2.1 <i>Comparing Similar Organizations' Websites</i>	13
3.2.2 <i>Evaluating Expert Sources on Web Design</i>	14
3.3 DEVELOPMENT AND FIELDING OF A PRELIMINARY RBG WEBSITE	15
3.3.1 <i>Interviews with RBG Staff</i>	15
3.3.2 <i>Creating a Site Map</i>	15
3.3.3 <i>Building the Web Pages</i>	16
3.3.4 <i>Fielding the Preliminary Web Pages</i>	17
3.4 GATHERING FEEDBACK ON PRELIMINARY RBG WEBSITE	17
4. DATA	18
4.1. INTERVIEWS	18
4.1.1. <i>Interviews for Delivery Principles</i>	18
4.1.1.1. Educational Staff.....	18
4.1.1.2. Visitor's Center Staff	19
4.1.1.3. Internet Service Staff.....	19
4.1.1.4. Interview Data Collected	20
4.1.2. <i>Interviews to Obtain Content</i>	21
4.1.2.1. Education Staff.....	21
4.1.2.2. Visitors Services Staff.....	21
4.1.2.3. Horticultural Staff	22

4.2 EVALUATION DATA	22
4.3 ACCESSIBILITY DATA	23
4.3.1 <i>Accessibility Evaluation of Website</i>	24
5. ANALYSIS	25
5.1 GUIDELINES OVERVIEW	25
5.2 GUIDELINES FOR WEBSITE DEVELOPMENT	26
5.2.1 <i>Guidelines for Navigation</i>	26
5.2.2 <i>Guidelines for Presentation</i>	27
5.2.2.1 Audience Identification	27
5.2.2.2 Guidelines for Optimal Text size and Format	27
5.2.2.3 Guidelines for Optimal Text Color and Density	28
5.2.2.4 Guidelines for Page Layouts	29
5.2.3 <i>Guidelines for Interactivity</i>	29
5.3 APPLICATION OF DESIGN	30
5.3.1 <i>Overall Design</i>	30
5.3.1.1 Navigation	30
5.3.1.2 Presentation	31
5.3.1.2.1 Audience Identification	32
5.3.1.2.2 Text and Formatting	32
5.3.1.2.3 Page Layout	33
5.3.1.3 Interactivity	34
5.3.2 <i>Addition of Separate Bilang Bilang Website</i>	34
5.3.3 <i>Map Page</i>	35
5.3.4 <i>Fact Sheets</i>	36
5.3.5 <i>Kids Page</i>	37
5.4 EVALUATIONS	37
5.4.1 <i>Website Evaluations from RBG Staff and Outside Sources</i>	37
5.4.2 <i>Accessibility Evaluation of Website</i>	39
6. CONCLUSIONS	40
6.1 CONCLUSIONS FROM EVALUATIONS	42
7. SUGGESTIONS FOR THE FUTURE	43
A. CREATION OF DATABASE FOR PLANT FACT SHEETS, INFO SHEETS, PICTURES	43
B. ADDITION OF A FORUM	43
C. INTERACTIVE GAMES/MEDIA	43
D. WEBSITE FEEDBACK SYSTEM	43
E. DIGITAL MEDIA	44
REFERENCES	44
APPENDIX A: PROJECT DESCRIPTION	47
APPENDIX B: SPONSOR DESCRIPTION	50
APPENDIX C: SPONSOR E-MAIL	54
APPENDIX D: CONFERENCE CALL INTERVIEW WITH SPONSOR	55
APPENDIX E: SAMPLE WEBSITE EVALUATION BY TAMMY PAYTON	56
APPENDIX F: WEBSITE EVALUATION CRITERIA RUBRIC DEVELOPED BY RBG TEAM	58
APPENDIX G: SAMPLE OF PRELIMINARY WEBSITE REVIEW	59
APPENDIX H: PRELIMINARY TIMELINE	61
APPENDIX I: ROYAL BOTANIC GARDENS PROGRAMS	62
APPENDIX J: INTERVIEW PROTOCOLS	64

APPENDIX K: CONCEPT MAP	65
APPENDIX L: REVISED WEBSITE EVALUATION.....	66
APPENDIX M: QUESTIONS CONCERNING TEACHING APPROACH.....	67
APPENDIX N: ROYAL BOTANIC GARDENS WEBSITE LAYOUT.....	68
APPENDIX O: INTERVIEW ANSWERS.....	70
APPENDIX P: WEBSITE EVALUATION DATA	73
APPENDIX Q: FLOW CHARTS FOR NAVIGATION.....	76
APPENDIX R: WEBSITE MAP.....	78

Table of Figures

1. Figure 1. Bilang Bilang Homepage	32
2. Figure 2. Interactive Map Page	34

Executive Summary

The Royal Botanic Gardens in Melbourne and Cranbourne are institutions which display a wide range of flora from around the world. Not only do both gardens display these amazing plants, they seek to educate the public about each of them. To educate the public about plants and their environment, the Royal Botanic Gardens has identified major goals which they seek to achieve. Their main goal is to educate a diverse audience on specific topics involving plants through a specific medium. The medium of choice for their mass education strategy is their website. To accomplish their goal of education, the website of the Royal Botanic Gardens features many different web pages with a wide variety of information contained on each. However, since many different topics need to be covered, their current website design and format is inadequate.

The current website is not sufficiently designed to be used as an effective teaching tool. As the website exists today, the information that is contained on it is based on general information about the physical gardens and not the plants contained in the gardens. Although there is some educational information contained on the website, the current design makes it difficult for users to find the information. Currently, the educational themes that the Royal Botanic Gardens wishes to convey to the public are not being communicated effectively. The two themes that the gardens have identified are sustainable gardening and people, plants and culture. Sustainable gardening deals with physical gardens and how to create them. Along with the physical creation of gardens, the sustainable gardening theme will involve information pertaining to the major plants that people can grow. The other theme contained on the website, people, plants and culture deals with the relationship between people and their environment.

Our goal for the project was to evaluate the design of the current website and create a new design for the website which would successfully convey the themes of the gardens. Background research and interviews were used to determine the delivery methods that would be employed to convey the information contained on the website. Along with interviews for delivery principals, interviews for content were conducted with the Royal Botanic Gardens staff. These interviews determined which information would be represented on the website. We conducted these interviews for content because we

felt that the experts working in the gardens would have the best idea as to which information is the most pertinent for each theme.

Our group created guidelines for website design from our background research and interviews. These guidelines covered how to address the navigation, presentation, and interactivity of a website. We closely followed these guidelines when we designed our initial pages for the gardens. We populated as much of the pages as possible with the content received from our interviews. Our initial website and design could then serve as a framework for future development for the RBG.

In order to obtain feedback on our design, these pages were then fielded on the RBG server. A website evaluation tool was then sent to current Royal Botanic Gardens staff as well as teachers and students. The website evaluation contained numerical scoring for different aspects of our website. From these evaluations, we could see which areas of the website scored the highest and lowest as well as a score for the overall website. In addition to this data, there was also an additional suggestions/comments section on the evaluation. After analyzing the data from the evaluations we made necessary changes to our guidelines to assess the lower scoring areas as well as comments and suggestions. The final guidelines we have created will help the RBG further develop their website and the pages we have provided. The website we created for the RBG can serve as a foundation to build from to further convey the RBG's educational themes.

1. Introduction

As technology progresses, it becomes possible to educate a wide variety of audiences through new methods. A common method being developed by educational institutions is based on web pages and online resources. Effective utilization of this method allows the information to be conveyed to a broader range of people than conventional educational techniques. The evolution in the internet allows for new research information to be shared across countries and continents. Educational web resources facilitate the communication of this information to the general public. Certain institutions such as botanic gardens and herbariums could benefit from this educational method. Botanic gardens and herbariums provide expert information on various issues. A properly developed educational website allows this expert information to be conveyed to the general public.

The Royal Botanic Gardens (RBG) in Melbourne is one such institution interested in web based education. The mission of the RBG is to educate the Australian community on issues pertaining to the environment and the interactions between people and their environment. The RBG has information about a wide range of differing ecosystems in Australia and around the world. Through educational programs the Gardens teach visitors about their local environment and flora. Ideally, the RBG would like to reach a multitude of different audiences through an improved website.

The literature on web design indicates that the greatest obstacle in designing effective web pages is displaying the information in a way that reaches all of the target audiences. In order to educate a variety of groups, it is important to identify how different groups learn via the web. Through educational studies on how people learn, we applied best practices for developing a website to meet the majority of the needs of people with different learning styles. Applying techniques for different learning styles allowed us to develop the content of the RBG website into an effective teaching tool. Another obstacle we dealt with is the possible restrictions to resources.

When designing a web page, different media formats can be used to deliver the information. Our sponsor has communicated to us that video and audio media are currently not feasible due to their lack of technological resources. This meant that we

will had to use text based formatting and still pictures to convey the goals and objectives of the Garden unless we can find the resources or expertise to use other forms of media.

The goal of this project was to assist the Royal Botanic Gardens in developing their current website into a more effective teaching tool. In order to make the website a more effective teaching tool, a redesign of the existing site was necessary. The design involved the addition of new interactive content as well as new information pages. While working in conjunction with the Botanic Gardens, we incorporated input from teachers and RBG staff into design guidelines for an effective website. We used background research, surveys, and interviews to gather the necessary data in order to make these recommendations. We contacted the following groups of people: RBG staff, visitors of the Royal Botanic Gardens, teachers and casual educators while we were at the RBG. Through direct contact with these groups, our team will corroborated the published research on website design.

This paper will discuss the process in which our group used to derive guidelines for improving the website of the Royal Botanic Gardens in Melbourne. By using background research discussed in section 2, in conjunction with interviews and data discussed in section 3, we designed guidelines which can be used to create an effective website. The guidelines for creating the website are located in section 5 of this paper.

2. Literature Review

The Royal Botanical Gardens in Melbourne and Cranbourne continue strive for their primary goal of education. The Gardens seek to accomplish this goal through various means, including attaining visitors to the garden, outreach to schools, and providing educational information to the general public. One way gardens present this information to the public is through websites. The RBG is concerned how well the website is structured and the educational content within it. The purpose of this project is to assist the RBG in analyzing their current design and, using this analysis, create a set of recommendations to improve the effectiveness of their website.

Through our research, we determined how to convey the goals of the Royal Botanic Gardens to the public. We analyzed current research into how websites are used as effective educational tools. In conjunction with website design, current psychological research was incorporated to determine the best methods to target all audiences.

2.1 The Royal Botanic Gardens Role in Society

The Royal Botanic Gardens fulfill many roles in society. Gardens provide a place to escape the busy outside world and relax in a tranquil environment. Also, gardens serve as an educational institution aimed at educating the public on environmental issues. This section discusses the different roles that the RBG fills.

2.1.1 What is a Botanic Garden?

A botanic garden is “a place where a wide variety of plants are cultivated for scientific, educational, and ornamental purposes, often including a library, a herbarium, and greenhouses; an arboretum” (Dictionary.com, 2005). Botanic gardens across the world provide information about plants, botany, and horticulture. Botanic gardens are known for their living collections. The living collections contain many different species of plants, some of which are endangered.

Botanic gardens often have a herbarium. “A Herbarium is a repository for dried plant specimens that are used for studies of plant classification, identification, distribution

and ecology. It is like a library but differs in that the information is stored in a biological form. The main resources of a herbarium are the pressed and annotated plant specimens, a botanical library, and the botanists and staff that work there” (Herbarium, 2005). As well as a herbarium, many botanical gardens also have comprehensive libraries.

The Royal Botanic Gardens also introduces people to the environment and how they are affected by it daily. The main goal of the RBG is to educate people. This goal is clearly seen from the expansive number of educational programs that they offer. Not only does the RBG educate people, but also perform their own research to enhance our modern day understanding of ecology and the world.

2.1.2 Conservation and Research

Conservation is becoming increasingly important with every passing year. As Hepper notes when writing of the Kew Gardens, London, “With these grim and impending threats to plant life, gardens like Kew become all the more important as oases of plant diversity and as holding grounds for the future” (Hepper, 1982, pg. 175). Botanical gardens try to ensure that all endangered species of plants have a safe place to grow. With endangered plants growing at botanical gardens across the world, they can be used for research and horticulture without causing harm to the remaining plants in the wild (Hepper). Botanical gardens want to educate people about the effects of protecting their environment. An important concept of conservation is “telling people about the need for conservation and in providing material for gardeners and scientists so that there is no longer any excuse to remove the remaining plants from the wild” (Hepper, pg. 176). The botanic gardens across the world ultimately want to convince people of the importance of practicing conservation and the negative consequences of failing to protect plant life.

Botanic gardens also serve as scientific research centers. There is an abundance of information about many plants in the libraries at botanical gardens. The Royal Botanic Gardens researches different types of indigenous plants as well as cultivated plants, (Plant Research, 2006). The research that the Gardens gather adds to the wealth of information of their library.

2.1.3 Gardens for Education

Like zoos and museums, the primary goal of most botanical gardens is to educate. As Hepper notes (1982, 161) “One of the principal roles of botanical gardens is education” and similarly Duitz (1992, 243) said that “although committed to collecting, the Brooklyn Children’s Museum’s primary focus was helping its young audience to understand themselves and the world in which they live.”

Many botanical gardens provide educational resources specifically designed for students and teachers to be used in conjunction with their visit to the gardens. At botanical gardens such as Kew, there are exhibits which try to “tell a story using words, pictures, and botanical objects in a way that is interesting and intelligible both to the ordinary visitor and to the student” (Hepper, 1982, 161). The Royal Botanic Gardens in Melbourne provides many educational services for students and teachers, including on-site programs, teacher professional development and curriculum material. The on-site educational program encourages face-to-face contact with students and students can physically experience everything the garden has to offer while their experience is enhanced with social interaction, stories, and the sensory environment of the Gardens. The programs work with the students’ curiosity and intrinsic motivation and teachers work with the students according to the individual student’s needs and interests. Putting students in an outdoor environment can provide different learning opportunities not available indoors. The use of hands on interactive exhibits and activities encourages a more active way of learning than the traditional textbook and classroom approaches (Education, 2006). The RBG Melbourne website is intended to extend and to supplement students’ and teachers’ visits to the Gardens. The education service at the Garden uses resources on the site to “enhance the learning of students from kindergarten to tertiary” (Education Services 2006).

Botanical gardens want to educate not only students, but the greater community as well. In Change and Challenge: Museums in the Information Society, George MacDonald states that museums have “a certain responsibility to try to maximize the audience that museums’ messages reach ... we must therefore be aware and responsive to the requirements of those audiences. No museum, however high the quality of its information products, can be considered successful if it fails to make those products

relevant to what concerns the society in which it exists” (Macdonald, 1992, pg. 165). Museums and botanical gardens must attract visitors but also reach out to the community in a variety of ways and with information that meets the needs of their “clients.”

2.1.4 Website Content Research

In order to develop the content for the pages of the website we gathered information from various sources inside the RBG. This content was based on two main themes: sustainable gardens and people and plants. Pages that involve the sustainable gardens included specific areas of information such as garden growing, local botany and edibles. Pages about People and Plants will include areas of information on exotic plants, peculiar uses, and plants with special abilities. We compiled this content in order to relay the key messages within each theme to the general public. The sources involved included books, fact sheets, pamphlets, library resources and staff. This information includes, but is not limited to, names of specific plants, their uses, when it grows, where its natural habitat is, its location in the Gardens, and images of the plants.

2.2 **Mission of the Royal Botanic Gardens and Goals of the Website**

According to the *Royal Botanic Gardens Act 1991*, the major goals of the Botanic Gardens are as follows:

- to conserve, protect and improve the botanic gardens and managed land and their collections of living plants
- to conserve and enhance the State Botanical Collection and National Herbarium of Victoria
- to provide for the use of the State Botanical Collection or plants or plant specimens at the botanic gardens or managed land for scientific or reference purposes, consistent with accepted international practice
- to increase public knowledge and awareness of plants and plant communities
- to provide for the use of the botanic gardens for education, public enjoyment and tourism

- To provide for the carrying out of and contribution to research into biodiversity and the conservation of biodiversity, (About Us, 2005).

Teaching ecology in today's changing world is extremely important to the survival of man. In Ecology and Education, Gro Harlem Brundtland stated that "The global environment has deteriorated to such an extent that the great life-supporting system of the planet's biosphere are being threatened" (Hale, 1993, pg. xii). This belief about the changing ecosystem warrants a need to educate the public in the area of ecology. The RBG is the best suited to undertake this task because they are experts in botany and sustain the ecosystem within their own park every day. In using their website, the RBG can reach a multitude of people and educate not only the people of Australia, but the people of the world. "To this end there is a need to raise ecological awareness generally and to promote a sound ecological base in education at all levels" (Hale, 1993, pg. 20). In her work in ecology, Hale believes that educating the public in ecological issues to be one of the most important tasks we are presented with today.

2.2.1 Goals of the Website

One of the main goals of the website is getting the public interested in the Gardens. This involves setting up an attractive web-site and presenting interesting topics that one can read about while on the web-site. The Garden's web-site is also aimed at getting the public to come to the Gardens and support their mission.

A way to get people interested in the Gardens through the website is to put interactive content on it. The website for the Kew Gardens has an interactive program called "Climbers and Creepers". This play area contains botanical games and activities for young children (Climbers and Creepers, 2005). Research done by Ellen Seiter found that, "All the favorite sites were those with video and audio streaming as well as the capability of handling large amounts of traffic", (Goldstein, et al., 2004). From this study on children, we can conclude that children prefer interactivity over lists of information. A way to improve upon the existing web-site would be to put more interactive games and learning tools on the children's section.

Addressing adults who have the willingness and ability to process larger amounts of text, another approach has to be used in order to effectively convey the intended

information. As the web-site exists now, each of the informative sites for adults consists mostly of basic text layout with some pictures. According to Henry Ellis, “Most human learning involves verbal processes. Nevertheless, the fact that a human can engage in verbal learning activities provides him with powerful ways of dealing with his environment,” (Ellis, 1972, pg. 33). With this knowledge, our group intends to incorporate more listening based information rather than text formatting. In hearing the information while a program shows you pictures of what you are learning, the information can be more readily processed and remembered.

With this data and information, the mission of the Gardens can be more readily addressed through their web-site. We used psychological research as well as the importance of the teaching of ecology to improve the representation of the Garden’s mission on its web-site. “Braudel reminds us that technology is not just the application of science, but that it includes improvements in process and tools that allow one generation to build on the knowledge of a previous generation,” (Seels, Richey, 1994).

2.3 Using Websites as Effective Tools

Today, websites are becoming widely used learning tools by various organizations and companies. Research indicates that there are certain methods of presentation that are more effective than others for online learning. This section illustrates the design of websites for effective information gathering and identifies the needs of different users.

2.3.1 Designing website for effective information gathering

The internet is a useful tool when gathering information but studies have shown that different designs can be implemented to cater to different learning models (Kaschek et. al, 2004). The differences are particular to the individual and one study (Martinez, 2001) shows that using a “whole-person” model means that there are more influences to learning than just cognitive ability. The study explains that designing a website for a specific purpose should take into account emotional aspects of learning for different learning styles. Presenting the information through several different methods would most aptly educate a broader range of people.

The main aspect of a website is text. Most web pages today are dominated by textual information. The simple choice of a typeface could hurt site usability just as much as it could improve site recognition. “Formatting text could also make the text easier or harder to deal with. The art or process of using type is traditionally termed typography. In short, typography is concerned with the aspects of text that make it readable—or if you prefer, simply usable—as well as expressive. The use of words themselves and the style of writing employed might affect the user’s experience just as much as how the text is presented” (Powell, 2002).

2.3.2 Needs for different users

Martinez (2001) used three types of learners to define the needs for the different types of users. The three learner types were Transformers, Performers, and Conformers. This project pertains mainly to the information that each learner type needs in order to effectively learn the material. Transformers are interested in holistic, specific information. Performers are interested in information in a more general view, and Conformers find they need guidance to fulfill a certain purpose or objective.

These differences establish a unique and diverse direction the RBG can use to capture all of these learners with just one website. As mentioned in (Kaschek *et. al*, 2004), the website should not be designed toward one specific learner type. This article explains how there are many different learning parameters to consider and that while the users can’t be profiled individually, there are common threads in each learning style. Information in media files can be presented in many different ways all through one webpage. A combination of media could present the same information in different ways (i.e. a video with an accompanying informative paragraph).

2.4 **Learning styles**

A learning style “describes a relatively stable response mode cultivated in the wake of learners’ perceptions of their interactions with the learning environment” (Sun, *et. al*, 2005). This response is influenced by many factors involving the individual. Recently, these factors have been found to have more to do with the “whole-person”, including emotional responses and work ethics, as opposed to just their cognitive ability

(Martinez, 2001). This study shows the variety of responses to web-based learning due to the learners' predisposition towards learning in general. It also suggests there are more ways to stimulate a user's interest based on their learning style. Ultimately, every user has a goal or particular interest in learning and the RBG website can accommodate these interests or goals generally by presenting many ways to learn their information.

2.5 Cognitive Effects of Web Page Design

Two important considerations for web page design are text density and screen density. Text density is defined as "the richness of contextual detail presented on the screen" and screen density "refers to the amount of expository information presented on an individual page" (Beverly, 2000, pg. 46). Research has suggested that presentation of lengthy text is best done with low text density. The research continues describing how text on web pages should be presented in "short chunks and should be edited to simplify content" (Beverly, 2000, pg. 46).

Research on screen density has suggested that higher screen density is preferred by most users but this was refuted shortly after by bringing to light the possibility that "most users prefer to move quickly through text, and accessing a greater number of screens is more work" (Beverly, 2000, pg. 46).

3. Methodology

The main goal of this project was to assist the Royal Botanic Gardens in restructuring and adding new content to their website to project the themes that they have identified as their mission. While working in conjunction with the Botanic Gardens, we incorporated input from teachers and RBG Staff into developing guidelines for a more effective website. We used surveys and interviews to gather the necessary data in order to make these recommendations.

3.1 Determining the Goals of the Royal Botanic Gardens Website

The goals of the RBG website are defined for us by our sponsor, specifically the Education Department at the Melbourne Gardens and the Information Technologies department. These two sources are especially important because they provided the background information necessary for the improvements to the current website. Along with most of the actual information that was added to the website, they provided us with the corporate mission and key objectives of the RBG as a whole, which the website must reflect.

3.1.1 Gathering Information from our Sponsor

The main focus of gathering information from our sponsor was to decide which material will be necessary to add to the website to further the goals of the RBG. Our project liaison Gary Shadforth and his Education Department provided much of the necessary information; however, there are a number of other departments within the Melbourne Gardens which provided needed materials as well. These departments included the Visitor Services Department, Marketing Department, and Plant Sciences Department.

Prior to our arrival we were in touch with Mr. Shadforth via e-mail and conference calls. Upon our arrival to the RBG, we met with Mr. Shadforth, and he clarified the goals of the webpage and the RBG mission for us. He also provided some initial content. This content included books and other literature that focused on plants and their environments. However, more content came from other sources at the RBG. He indicated that the main target audiences of these web pages are students, teachers, and

interested general public. Mr. Shadforth also indicated that the Gardens can currently only support basic text and pictures as web presentation formats due to a lack of expertise in other forms of web media. However we were free to incorporate any additional media we feel is necessary so long as our team can effectively implement such media.

Key information that we received from Mr. Shadforth include:

- Internal documents concerning the purpose and development of the webpage.
- Internal documents concerning the goals or mission of the gardens as they apply to the webpage.
- Pedagogies used by the RBG

3.1.2 Gathering Information about the RBG Website

Another source helpful in determining the design goals of the website was the Digital Media Officer, Samantha Vukanovic. She is the person responsible for maintaining the current website and has access to all the technical information, requirements, and policies regarding the presentation of the RBG's web pages. We met with her shortly after we arrived and she provided us with some of the basic technical information about the current RBG website. We continued to work with her throughout the project to ensure that our website corresponded to the requirements and desires of the RBG's Information Technologies Department. The Information Technologies department also provided other critical information about the current website. This information included current templates, hit counts, and download numbers as well as other web page rating statistics that the RBG currently monitors. These statistics and technical data were important for us in resolving how best to make improvements in the new website.

3.2 Formulate Evaluation Criteria Based on Research

Following the research on best practice of web design, we found that the RBG website could be restructured to better serve their educational goals. We compared the websites of similar organizations as well as print sources on web design to generate criteria that will help us evaluate the RBG website. Previously developed website

evaluations also aided in developing our own criteria. We used these criteria to evaluate the mock webpage we developed.

3.2.1 Comparing Similar Organizations' Websites

In order to effectively design the RBG's website we evaluated the websites of similar organizations. Evaluation of the other websites helped us determine the most effective way of conveying information to the general public. The sites reviewed were of other gardens, zoos and aquariums. These pages have similar goals to the RBG's educational webpage and comparing the ratings of these sites versus the rating of our pilot page was one way we could gauge how effective our site is.

In order to evaluate these web pages we developed criteria based on sources related to website rating. One of the sources used was developed by Payton specifically for educational websites, (Payton, 2006). A sample evaluation is included in Appendix L. Payton's evaluation tool is similar to other evaluations of educational web pages. Another such evaluation is SBC Knowledge Network Explorer's Blue Web'n Website Evaluation Rubric. This tool is an online survey that rates educational web pages on the same criteria as Payton's evaluation but in a different format. Based on these sources, we formulated a general list of evaluation criteria:

- Quality - The material is clear and concise. It has pertinent information to the topic and shown in a professional manner. It does not have contradictions or typos.
- Organization - The material is organized into sizable categories, but no extremely large categories. The information is interactive, whether it is with links leading to other pages or flash media. The paragraphs are separated, signifying a change in subject or focus. Titles are of larger font and accurate to the paragraph(s) that follow.
- Content - The content of the material is appropriate for the target audience. The content is diverse, giving information on many topics.
- Accessibility - The information is easily accessible (i.e., not having to click through several pages to get to the desired page). Follow up links are hyperlinked properly (i.e., do not lead to a blank page). The material that is relative to each subject is linked together as well.

- Aesthetics - The text is of proper size and color so that it is easy to read (perhaps a different font). There are not ads on the sides of the website.

These specific areas allowed us to evaluate each website and the specific methods they used to convey their information. These criteria metrics were turned into a questionnaire to evaluate the RBG's website. This questionnaire was circulated amongst the RBG staff and visitors and the results of which was compared to the evaluations we performed of the similar organizations. These results can be found in Appendix P.

3.2.2 Evaluating Expert Sources on Web Design

Expert sources were used to determine the best practices for web design. Web based books and print sources have specific guidelines that describe the most effective methods of presentation for different types of information. These sources served as the guidelines for the physical design of the website.

From print sources, we gathered data on best practices for web design. We used Powell's *Web Design Complete Reference* book as our guide. We found this to be the most comprehensive source of information on best practice web design. These practices included guidelines, standards and effective design tactics. Each area of web design was addressed in our mock page. Best practice techniques discussed in his book included text layout, font styles and sizes, color schemes, and website navigation layout. For text layout, Powell recommended using multiple short paragraphs that briefly state the information over a number of separate web-pages as opposed to a single page with longer paragraphs of text. Font style and size is also related to text layout. Legible fonts with a minimum of size 12 should be used for bodies of text. Headers and titles should be larger in size than the body of text. Different, more unique font styles can be used for headers and titles to grab the users' attention. According to Powell color schemes must have good contrast in order to be legible on a computer screen. Black text on a white background is the best method of presenting large bodies of text. However, any dark text on a light background is acceptable. Powell mentions that websites need to be easily navigable and describes differing methods of presenting navigation.

Another expert source was the Information Technologies Department at the RBG. As professional website designers and maintainers, the staff in the Information

Technologies Department was able to give our team guidance on the best format and structures for the webpage. By liaising with the Digital Media Officer, Ms. Vukanovic, we were able to incorporate these best practices into our pilot website.

3.3 Development and Fielding of a Preliminary RBG Website

One of the main aspects of this project was creating a website map (Appendix R). The website map laid out the basic structure of the RBG site and with this structure; general layouts were made for the different web pages. These layouts were developed using our research on best practice, as well as input from Samantha Vukanovic. The website map allowed us to visually represent how the web pages would be arranged. Content gathered from staff was incorporated into the appropriate layouts as per the site map. The final mock page was coded and with help from the RBG web development team it was posted online for people to view, and, ultimately, for review.

3.3.1 Interviews with RBG Staff

Interviews were conducted with the RBG staff to determine both delivery methods and content for the website. . The actual interviews will be discussed in more detail in section 4.1. The interviews helped us determine presentation methods and layouts for the website. Interviews for delivery methods were conducted with members of the RBG staff as well as casual educators. The RBG staff and teachers had a good idea of how our information should be presented and towards which audiences. A list of the questions asked to determine the delivery methods can be found in Appendix M.

Interviews were conducted with various members of the RBG staff to determine the content to be used to populate our web pages. The RBG staff are relative experts on the information and know which information would be most pertinent to address the key messages of the pages.

3.3.2 Creating a Site Map

A site map gave a general structure to the whole website. A site map is a visual representation of how the websites are connected to each other. In a site map, lines represent links from one web page to another. The top of the site map for this project was

the Home Page of the RBG website. It then breaks down into four categories. These categories are a map of the Melbourne Gardens, a list of the plants on the website, a section on Sustainable Gardening, and another section on People, Plants and Culture. Each of these categories has relative subtopics.

The map of the Melbourne Gardens has links relating each section to a collection in the Gardens. Sustainable Gardening's subtopics express the key messages of gardening and its benefits to the environment. People, Plants, and Culture covers the benefits of biodiversity and cultural influences from plants.

The map is an interactive display of where each collection is in the Garden. Each collection was marked on the map and listed on the side. In our research, we found that interactivity between the user and the interface is more engaging. This is also a very easy way of navigating the website, which the RBG website development team stated that they wanted.

The Sustainable Gardening section was broken up into gardening, foods and edibles, and kids' projects. These sections convey the key messages that the RBG educational department gave us. This was also tailored to a variety of age ranges.

The People, Plants, and Culture section covered the key messages given to us by the RBG educational department. These subtopics are broken down into exotic plants, peculiar uses, fire in the environment, aboriginal people, special abilities, and gardens in urban areas. These topics are all about how plants affect every part of our lives. From the RBG staff, we've found that people are more interested in things that pertain to their everyday life and we present this information in a way that will inspire further learning.

3.3.3 Building the Web Pages

After the interviews, the web pages were constructed by compiling the content and transforming it into the layouts for each page. The pages were designed in HTML format which is compatible with the current RBG website. We designed the pages using our own web development skills; however, we also utilized members of the web development staff to assist us in coding the pages. We closely followed the site map we

created when making the pages and linking information to other areas of the site. A detailed description on the construction of the website can be viewed in section 5.3.

3.3.4 Fielding the Preliminary Web Pages

The preliminary web pages were hosted on the RBG server hidden from general public. In order to get visitors to our web pages, we supplied them with a specific web address. We also provided them with the website evaluation criteria previously discussed and gathered their feedback on our website. The web pages we have designed will be made available to the general public upon completion of the new RBG website design. This will be completed by the RBG's information technology department.

3.4 Gathering Feedback on Preliminary RBG Website

When evaluating the content and presentation of the website, we gathered feedback from the different visitors that the website may have. To compile this feedback we used input from teachers, students, and RBG staff. Methods of obtaining this feedback involved website evaluations for RBG staff, students, and teachers.

Important sources of feedback were the staff members at the RBG. The departments were able to give us feedback about the information presented based on their expertise, as well as their opinion on the general layout of the web pages.

After we created the mock webpage, we distributed our criteria that we used on the other educational websites to the RBG staff for them to rate our website. We inserted an open ended question onto the distributed questionnaires so that the staff will be able to make suggestions for us to consider in relation to the development and/or content of the website. These comments from the RBG staff helped us in creating the final recommendations.

4. Data

During the course of the project two types of data were collected. The first was interview data collected from a number of different departments. These interviews were conducted for two purposes, to provide insight into the principles of delivering information and to provide actual content to populate web-pages. The second type of data was website evaluation survey responses. These responses provided a numerical rating of the mock website we designed.

4.1. Interviews

Our team conducted interviews with various groups to collect data to put up on the website as well as for delivery principles. These interviews were useful in creating our guidelines. The staff was very helpful in answering our questions. The basic principles that were covered focused on what their messages were, who their audience is, how they communicate their message, why they communicate it the way they do, and what they would look for in a website by the RBG. The responses are covered below.

4.1.1. Interviews for Delivery Principles

We conducted interviews with different members of the staff at the Royal Botanic Gardens. While each department differs in specialty and expertise their views on how to reach the public were remarkably similar. This includes what information should be presented, how in depth the material is, and the different audiences to cater to. The data collected as a result of these interviews was so similar it is presented here in a single section. The responses to interview questions can be viewed in Appendix O.

4.1.1.1. Educational Staff

The education department is responsible for the various school programs that are conducted at the RBG, several of which involve the Ian Potter Foundation Children's Garden. We conducted interviews with Gary Shadforth, Christine Joy, Janine Standfield, and various casual educators. Gary Shadforth is the educational department manager and oversees what programs are going on. He is also partly responsible for the development

of the Ian Potter Foundation Children's Garden. Christine Joy and Janine Standfield are educational coordinators. They run and have designed some of the programs offered at the RBG. The casual educators are teachers who work part time at the Gardens running programs for school children. Most work as part time teachers for schools or in the education departments of other organizations when not employed at the RBG.

4.1.1.2. Visitor's Center Staff

The visitor's center staff is responsible for all of the other activities at the RBG. This includes all of the guided tours and information services offered to the general public. These information services include the maps and information sheets available in the visitor's center. We interviewed Ros Semler and Matt Jones from the visitor's center. Ros Semler is the visitor programs officer. She's responsible for developing different programs and fact-sheets available to the general public. She also had a part in developing the Ian Potter Foundation Children's Garden as well as writing several of the informational placards displayed in the Gardens. Matt Jones is the head of the help desk at the visitor's center. His job is to answer questions as well as direct people to more information. Both of these resources have vast amounts of information pertaining to visitors of the RBG.

4.1.1.3. Internet Service Staff

The Internet Services (IS) department of the RBG is responsible for keeping the website updated and for managing the content information system. We conducted interviews with Samantha Vukanovic and Peter Neish. Samantha is the digital media officer. Her main job is designing new pages of the website as well as updating it regularly. Samantha was the main contact for technical aspects of this project. Peter Neish is a programmer that works for the RBG. He was one of the few people that helped design the current RBG website. These two resources have helped us determine what is technically feasible for the RBG's new web design.

The IS staff also helped us determine the means by which the current website was designed. Peter Neish was part of the development of the current website. We asked him a set of questions about how the IS staff put together the current website. He told us that

the web design was outsourced to another company for development. The company created guidelines for the Gardens to follow, and they have used it exclusively ever since. The guidelines created are not specific to the website and may be used for any RBG document. The corporate guidelines are very basic and give specific fonts, text sizes, colors, and logos to use and the scenarios in which they are used.

4.1.1.4. Interview Data Collected

Many of the topics that were covered in each of the interviews showed a trend in each department's thinking. These trends tended to be universal regardless of age, making it easier to apply to our design. Some of them were even so obvious that almost every one of our interviewees told us the same thing. For example, all of the interviewees said that people don't like to read long paragraphs of text, nor do they like to sift through many pages to find one small bit of information. Also mentioned in the interviews was text size. Interviewees said that text should not be too small to be easily read and standard size font is best. The interviewees said that they believed people enjoyed pictures as opposed to text. The educational staff stressed the importance of interactivity to teach a lesson. This was also mentioned by the Visitor Center Staff. They suggested the addition of exercises and activities to the website in order to help people learn more easily

An important source we discovered during our interviews was the education pedagogies used by the education staff to reach people in the most appropriate way. One of the teaching methods is the idea of the "Hand, Heart, Head" pedagogy. This method explains that a person learns best first through doing. Each of the separate departments knew about this pedagogy and pointed us to it. The educational staff uses this idea with getting the kids to get their hands dirty as soon as possible. After this happens, there is a connection made with the person and what they are learning. This is the "Heart" phase. The "Heart" phase gives way to the "Head" phase, where the person starts to understand the information and start looking for more information on their own.

One last recommendation was the use of stories, poems, and songs to teach a lesson. Many of the interviewees thought that this was a more engaging and fun approach to learning, especially for children. From their experience, it has helped with getting people more involved than just lecturing them.

4.1.2. Interviews to Obtain Content

We conducted interviews with the following staff at the Royal Botanic Gardens to gather the content that was added to the website. Interviews involved many different staff members from different departments within the Royal Botanic Gardens. The data that we collected during these interviews covered the information about plants and the Royal Botanic Gardens that would be the most pertinent to the different web pages on the site.

4.1.2.1. Education Staff

From the education staff, we interviewed Gary Shadforth, Christine Joy and Janine Standfield. These staff members provided us with literature, related websites, internal documents, educational handouts, and forms of digital media. The sources that were provided gave us the necessary background to start populating the website with information. Each of the staff members indicated to our group that the most pertinent types of information to add would be the weird, odd, and wonderful. This information would grab the attention of web users more easily than strict data, facts and textual information.

4.1.2.2. Visitors Services Staff

Interviewees from the Visitors Service staff included, Matt Jones, Joanna Fyfe, and Dean Stewart. Matt Jones is the Customer Service Coordinator previously mentioned in section 1.2.1.3. Joanna Fyfe is the Visitor Programs Officer for the Royal Botanic Gardens in Cranbourne. She is responsible for developing different programs for the Cranbourne Gardens as well as developing fact sheets that are distributed to visitors of the gardens. Dean Stewart was the Aboriginal Liaison Officer for the Royal Botanic Gardens in Melbourne. He was the person responsible for Aboriginal Heritage Walk. He was also the link between the Royal Botanic Gardens and its Aboriginal heritage. Each of the people we interviewed gave us more information related to the plants that should be added to the website. Also, Dean Stewart gave us information on the Aboriginal

heritage of the gardens. From the information he presented to us, we added a section to the website dedicated to Aboriginal heritage and information.

4.1.2.3. Horticultural Staff

The horticultural staff that we interviewed provided us with more content on the types of interesting plants and their uses that would be essential to add to our website. Interviews with the horticulture staff included Jeremy Prentice, Dermot Molloy, and Chris Jenek. All of these staff members are nursery technicians who are responsible for the growth and development of the plants contained in the glasshouses. Their input was invaluable to our website because they are the staff members who grow the plants before they are planted in the main exhibits.

Another group of horticulture staff that we interviewed consisted of Renee Wierzbicki and Teresa Lebel. Renee Wierzbicki is the horticulture technician that is responsible for the growth and upkeep of the herb garden. Teresa Label is the mycologist who works in the Herbarium keeping track of the mushrooms and fungus that are located in the garden.

4.2 Evaluation Data

The collection of evaluations helped us numerically rate our website. These evaluations were distributed to the various departments as well as some outside sources and provided external opinion of the website. This gave us the idea of how the public will view our web design. These evaluations were collected and categorized by whether the person surveyed work at the Gardens or not. They were further separated by whether they were a teacher, a student, or just general public. The evaluation also asked if they were a home gardener. The following is the data collected.

From the evaluations that we received, we have obtained two different types of data. The first type is quantitative data. The quantitative data we received from the evaluations were the numbered scores from the evaluations. The qualitative data from the evaluations were the suggestions and comments made at the end of the evaluation. A copy of this evaluation is can be seen in Appendix L.

This evaluation was given to 14 RBG staff members, 19 students, and 3 other sources outside of the gardens. Of them, 9 staff members, 4 students, and 2 of the other outside sources answered the evaluation. The evaluations were broken up into four sections. These sections were design, content, technical elements, and themes. Organized tables of the data can be seen in Appendix P. The numbers will be analyzed in a later section. Comments and suggestions were given by 10 of the 15 evaluations received. 4 of the evaluations were paper copies, and 11 were electronic copies.

4.3 Accessibility Data

While we were not able to fully address all issues regarding handicapped accessibility to our website, we did use a basic accessibility evaluation to assess where our pages stood in regard some of the basic concerns. We used the preliminary website evaluation criteria found on the Web Accessibility Initiative webpage hosted by W3C. This evaluation tested a websites compliance with six basic standards for accessibility that covered text tags for images, font sizes and color contrasting, subtitles for audio or video content, screen resolution, and mouse-less navigation.

We found that our webpage has a number of initial problems; however, it is about 70 percent compliant with current standards. Our website failed to meet two out of six basic standards for accessibility. These problems include the lack of text tags explaining the numerous images and banners on the pages and the need to side scroll when the page is resized to less than maximum. However our pages are compliant with regards to text resizing, color contrasting, and mouse-less navigation. We did not have time or the programming expertise to run through a full compliance evaluation; thus it is possible that our pages are considerably under the 70 percent compliant rating we arrived at.

To give our data perspective we also assessed three other websites with the same tool. These websites were MSN.com, The Royal Botanic Gardens in Sydney, and the current RBG Melbourne website. We found that MSN.com was 100 percent compliant and did not fail to meet any standards in the preliminary evaluation. RBG Sydney failed to meet only one standard as the text on the home page did not contrast well with the background when set to grayscale. The current RBG Melbourne site also only failed 1 standard as there are no text tags attached to the images posted.

4.3.1 Accessibility Evaluation of Website

The data from the accessibility evaluations show that our website is slightly lacking in terms of handicapped accessibility. The lack of text tags and the need to resize the window when it is not maximized leave our website inaccessible to certain users, especially the visually impaired. Current comparable websites are somewhat more accessible and the main stream news homepage we assessed is fully accessible. While a more in depth evaluation could potentially point out a number of issues beyond those found, our data shows us that the barriers to accessibility are largely technical and not conceptual. The standards we failed to meet were in regard to technical coding aspects of the site and not the structure or presentation. The same was true of the current RBG websites for the gardens of Sydney and Melbourne. This leads us to conclude that the addition of text tags to pictures and banners and by recoding the page such that it resizes when not maximized, our page can easily be made fully compliant as per the preliminary evaluation standards.

5. Analysis

After gathering data, we have determined which principals and methods would be best in designing a website. These design methods and principals were used in designing the website for the Royal Botanic Gardens. Through our background research and data gathered, we have derived guidelines for the RBG to follow when designing their website. This section will also cover how we applied these guidelines when creating our pages for the RBG. Evaluations from RBG staff, outside evaluators, and accessibility evaluations of the website will also be discussed to assess the guidelines we have created.

5.1 Guidelines Overview

Below is an overview of the guidelines we have developed. Each is discussed in greater detail in the next section.

- Navigation
 - Users must be able to move through site with ease
 - Website should not become overcrowded with information
 - Utilize side navigation, top navigation, or a combination
 - Website should navigate from general concepts to specific information and vice versa
 - External links should open in new window
- Presentation
 - Pages should be developed according to target audiences
 - Use optimal text sizes and formats
 - Use bold headings, legible text, and a unique style
 - Utilize optimal text color and page density
 - The color orange is helpful for memory
 - Solid contrasting colors should be used for volumes of text
 - Page layouts
 - Use pictures to eliminate white space
- Interactivity
 - Engages the users

- Use different types of interactivity
 - Activities
 - Games
 - Media
- Follow the Hand, Heart, Head philosophy of the Royal Botanic Gardens

5.2 Guidelines for Website Development

Many factors are involved when making a website and this section will discuss the most important guidelines to follow when making a website. These guidelines have been formulated by distinguishing correlations between our background research and the interviews we have conducted. The main areas of these guidelines will include principles in navigation, presentation, and interactivity.

5.2.1 Guidelines for Navigation

Navigation is an integral part in constructing a well designed website. As discussed in Section 3.2.2, the information on the website needs to be easily accessible to the users, with a logical progression from the home page to specific web pages. Navigation should be easily visible on any page the user views. Sidebars or drop-down menus are two styles that provide clearly visible navigation throughout the website. However, care must be taken to ensure that the menus do not become over populated and too confusing to the user. It is important that navigation remains clear when moving between pages within the website. Navigation should go from the most general information to the specific, as well as moving back from the specific to the general information. Wherever possible, external links should open in another window, in order to maintain the source page's visibility. Having good navigability within the website will increase the comfort level of the user and help them find the information they want with ease.

5.2.2 Guidelines for Presentation

Another key aspect of designing a website is presentation. Before presenting information, the target audience of the information must be identified. Information on the website must be presented in a manner appropriate to, and relevant to, the target audience. We have also developed guidelines to follow regardless of the target audience with respect to the usage of fonts, colors, formatting, page density, and page layouts.

5.2.2.1 Audience Identification

The content of a website should cover material that is relevant to, and expresses the goals of, the organization. The organization must identify the targeted audience in order to determine what material is relevant. The presentation of the material will change for different target audiences. Various groups of users respond differently to various presentations. For example, children prefer more colorful web pages with lots of pictures, whereas adults are more interested in reading information that is presented in a professional manner.

5.2.2.2 Guidelines for Optimal Text size and Format

When deciding on which type of texts to use, many different aspects need to be addressed. Choosing the size for the main paragraph text on any website is essential. The data that our group collected discussed in Section 4.1.1.4, found that size 12pt font is the overall best. This was noted in Powell's book discussed in Section 3.2.2. Writing in a paragraph format requires a text size that is not too small to read. However, it also requires a size that is not so large it takes up unnecessary space on the page. Using paragraph headings and titles is essential when displaying information in paragraph style. For headings, a different text size should be used. The main title text for each web page should be large and easy to read. A text size that is at least 24pt is recommended for the main title. Large text size for headings and titles, along with a bold font make each of the different sections easy to identify and will capture the readers eye.

5.2.2.3 Guidelines for Optimal Text Color and Density

Choosing a color for the text and background is vital in presenting information on a website. Our research shows that using a dark colored text on a light background will be the easiest to read. This data is corroborated in Section 3.2.2. Light colors on a light background are too difficult to read and decipher. Also, light colors on a dark background should be avoided for large sections of text. These color combinations strain the eye and make the text too difficult to read. Good color choices to use for text are sharply contrasting dark colors such as black, navy blue and maroon. The preferred background color for sections of main text is white. However, light pastel colors or light grey are also acceptable depending on the nature of the web page. The color orange has been linked to helping people remember information better than any other color. Colors that should be avoided for main sections of text are yellow, red and green. Dark colors such as black, navy blue, and maroon should be avoided when choosing a background.

Another factor taken into account is the page and text density. Page density is defined as how much information (i.e., text, pictures, menus, etc.) there is on the screen at one time, whereas text density is defined as how much text is on the page relative to the size of the page. Our research found that people did not like to look at pages with high text density, nor did they enjoy pages with low page density. Research indicated that people would rather click through several web pages than to spend more time on any single web page. This research is discussed in Section 2.4.2. Our solution was to find a way to promote high page density while limiting the text density. The information we provide on the page needs to be clear, concise, and short, in order to keep the reader's attention. We found that increasing the number of pictures on the web page increases the page density, while keeping the text density down.

5.2.2.4 Guidelines for Page Layouts

When designing web pages, the layout of information on the page is extremely important. When designing the layout of a web page, it is important to take into consideration other aspects of the guidelines. Navigation, page density, and presentation methods are important in designing the layout of a page. Background research regarding these topics is presented in Section 2.4.2.

In placing a navigation toolbar, it is most useful to have either top navigation, side navigation, or a combination of both. This is important because it gives a consistent look to the website and thus makes each page more navigable. Having a banner or logo at the top of the page above the navigation toolbar will maintain the image of the website. Along with maintaining the image of the website, the banner provides a unique look to the site. This allows the website to stand out and be distinguishable from other websites which may provide similar material.

Having navigation and banners gives a general template to follow for creating all of the pages on the website. The next step in creating the page layouts depends on the information being presented on the page. It is important to utilize good page and text density techniques (See Sections 5.1.2.3). It is important to have a title that stands out from the rest of the page and clearly identifies the page's key message. From interviews and background research, we found that it is essential to use many pictures on web pages. People do not like to read through long paragraphs of text.

When designing page layouts, it is crucial that page and text density guidelines are followed. Along with these guidelines, good navigation techniques will provide a general template to follow for the website and adding pictures will enhance the visual appeal of your pages.

5.2.3 Guidelines for Interactivity

Interactive content on a website helps in the learning process. Interactivity engages the user and anchors the information to a specific task they did, making the information more personal to them. This was a large part of our interview data presented in Section 4.1.1.4. This allows the user to recall information more easily and makes it

easier for them to relive the experience. Interactive items also encourage the user to look for their own answers and this stimulates further learning. Interactive items include games, activities, and maps with links on them. Interactive activities provide a better opportunity for the user to learn through doing, as opposed to learning through memorization.

5.3 Application of Design

Through the guidelines discussed above, we have created our own sample web pages for the RBG. This section will describe how we followed the guidelines to create the pages and discuss some of the key components of our pages which highlight specific areas of the guidelines. Evaluations from RBG staff and outside sources as well as accessibility evaluations of our website will be examined to determine the success of our design.

5.3.1 Overall Design

The overall design of our website should focus on navigation, presentation, and interactivity. It is important for users to be able to navigate through the website easily and find the information they are looking for and we designed our pages accordingly. The information on our pages is presented in a manner that is most suitable for its intended audience and closely follows the guidelines we have created. We have also provided interactive content on our web pages to engage our users.

5.3.1.1 Navigation

When first assessing the RBG's current website, we had found that navigating through the website was not easy. To address the issue of navigation, we created flow charts to show the logical navigation of different types of users through the website (See Appendix Q). From the flowcharts we found that the new pages we had designed would be difficult to integrate into the current RBG website. The current website already contained an abundance of information and we felt that trying to add more pages would

further impair navigability. We drew the conclusion that a new area of the website could be created to solve this issue. This new area is called “Bilang Bilang” and contains all of the educational web pages we have created for the RBG. A more in depth description of this area is provided in Section 5.4.2. This new area will receive users directly from the RBG homepage or from people who specifically know of its existence. It will also be accessible from many other pages on the current RBG website through links. (See Appendix Q for flowcharts)

We have created plant fact sheets to also address the issue of navigability by linking specific information to general concepts. The plant fact sheets contain specific information plants on the RBG website and provide a cornerstone in the flow of information. Links on the fact sheet will direct users to pages that present more general concepts that relate to that specific plant. For example the fact sheet for the basil plant has links to pages in other areas on how to grow herbs and what herbs are useful for. Other links direct users to the collections that contain that plant and also to the interactive map. This allows users navigate through the site by a plants physical location in the Gardens as well. The plant fact sheets will be integrated in the current RBG website and not the separate Bilang Bilang area.

Another aspect of the website which made navigation easier was the addition of an interactive map page. The map page will direct the user to pages containing plant collection information and plant fact sheets. From these pages the user will then be able to link to the educational Bilang Bilang pages. The details of the map page will be discussed later in this section.

With the combination of the plant fact sheets, map page, and Bilang Bilang pages, the user will be able to navigate from the current RBG website to Bilang Bilang, to plant fact sheets, and vice versa. Bilang Billang will allow users to find the information they want, as well as related information in other areas of the RBG website.

5.3.1.2 Presentation

The presentation of information on our web pages closely followed the guidelines we have produced. We have identified the audiences for each of the pages and have designed the pages accordingly. We followed our guidelines for page density, the use of

text and colors. The layouts of our pages were designed to incorporate all of the guidelines we have created above.

5.3.1.2.1 Audience Identification

Although the website is directed at the general public, certain areas of the website have been aimed at more specific groups including teachers, children, and gardeners. A children's section of the website was created that contains activities and information more suitable for younger age groups. The language on these pages as well as the size and amount of text has been adjusted for children. The activities included are entertaining yet simple so that children can easily understand the instructions and can complete them.

For teachers links from areas on the Bilang Bilang site to appropriate school programs associated with the themes of that page have been provided. This allows teachers who become interested in a certain topic area on the website to make a connection with the RBG for more in depth information.

Lastly to promote home gardening and to give useful information to interested home gardeners a large section entitled "Grow It Yourself" has been included. This section contains more specific information pertaining to good home gardening practices and suggestions on which plants to grow and when to grow them.

5.3.1.2.2 Text and Formatting

The text on our site followed the guidelines derived from our research. Simple yet eye catching fonts were utilized that give the site a definitive look and feel but are still easily legible. Paragraphs of text were kept short and only key points were presented within each section. Bold section titles and sub-titles were used that grab the user's attention and draw them into the information presented. Larger text sizes and differing styles make these headers stand out on the pages. Throughout the pages the text colors were adjusted to ensure good contrast is maintained with the background. Along with the fonts used, the appropriate color choices promote easy readability on all pages. The fonts, sizes and colors used were all controlled using style sheets. This made it easy for us to make changes quickly and will help the RBG make changes easily in the future.

5.3.1.2.3 Page Layout

We designed the page layouts while closely following the guideless we have created. The page layouts were designed around our usage of both side and top navigation. In addition to the navigation bars, we created banners to keep a consistent feel to the website. (See image below)



Figure 1. Bilang Bilang Homepage

On each individual page, pictures were positioned appropriately next to related content on the page. On many pages we used tables to organize our information. Tables help keep information aligned and give a professional look to the page. We kept our information organized so that there was a logical flow of information. On some pages, there are additional boxes containing links to related information on the topics discussed on the page.

5.3.1.3 Interactivity

The two main interactive components of the web pages we designed are the map page and activities. Overall, most pages do not contain interactive content mainly because we were not provided with interactive material appropriate for these pages. However, in order to reflect the important ideas of interactivity on our website, we created several sections of the website address interactivity. The map page and the “For Kids” pages were our main focal points of interactive content. However, a third section, “Grow It Yourself!” area also encompasses interactivity to a certain extent. This section is aimed at giving helpful and useful information on gardening and encourages people to grow things themselves. This is not traditionally what is perceived as interactive content on a website, however, the idea of getting people active in gardening applies to the concept of interactivity.

5.3.2 Addition of Separate Bilang Bilang Website

The Bilang Bilang area of the website was created in order to maintain and not overcrowd the current RBG website. The term “Bilang Bilang” is an Aboriginal word refers to a woven bag used to carry things. The word highlights the importance of the link between Aboriginal heritage and the Royal Botanic Gardens. This connection is furthered by pages containing information on Aboriginal peoples in the Victoria area on the website. We chose the name “Bilang Bilang” from a number of other title suggestions given to us by the education staff. We felt this name was suitable because the website is use like a *bilang bilang*. Our website contains many different types of information similar to how a bilang bilang is used to hold many things. The name is also very unique which helps draw the attention of web surfers and is more likely to be remembered.

The Bilang Bilang pages were created to present the educational content that communicates the key themes and messages of the RBG. As prior mentioned, the Bilang Bilang pages were kept separate from the current RBG website. These pages will contain information on topics identified by the RBG and will also provide links to plant fact sheets.

5.3.3 Map Page

As mentioned above, the creation of the interactive map page helped navigability and interactivity on the website. The map page was created by taking a digital image of RBG Melbourne, and adding links to each collection contained in the Gardens. The numbers on the map correspond to the collections, listed on the right. When the user places the mouse over the number on the map, the icon changes color and the name of the collection appears in a small box. If the user places the mouse over the name of the collection on the right, the collection name is underlined and the corresponding icon on the map changes color, identifying its location in the gardens. Both the numbered icons and the collections names are links, and will direct the user to pages containing information on the selected collection. The collection pages will have links to plant fact sheets about the plants in that collection.



Figure 2. Interactive Map Page

The map page provides a visible representation of the Royal Botanic Gardens in Melbourne previously unavailable on the RBG website and will be integrated into their current website. This type of interactive content is intended to draw interest by engaging viewers and relating physical location in the gardens (something tangible) to the educational material posted elsewhere (something intellectual).

5.3.4 Fact Sheets

Adding factual information on specific plants to the website was one of the main topics that were discussed in our interviews with the current Royal Botanic Gardens staff. Our group decided to create fact sheets that would display basic information about the plants located in the gardens. Some of the types of information that is located on the fact sheets would be; where the plant may grow in the wild, its location throughout the garden, its uses, any interesting facts that maybe associated with the plant, some frequently asked questions about the specific plant, images of the plant and links to other sites that may have information on the specific plant. These areas of interest allow people to access quick information on each plant in the garden.

Each of the fact sheets contains a link to the collection of plants that it is located in. Having links such as these will make our website to be more integrated and navigable. A website viewer will be able to access the fact sheets directly from the Royal Botanic Gardens website if they are looking for quick factual data. The link that is contained in the fact sheet will send the website viewer to the interactive map page which will physically show the viewer where the plant is located. Along with the link to the interactive map page, other links that will be on the fact sheet will direct the website viewer to other information pages on the Bilang Bilang web pages. This approach to website navigation, the addition of multiple links within a single page allows a web viewer to tailor how they want to navigate through the site. They can start out looking at the most specific data and information, and then move to the more general themes and concepts that are located elsewhere.

5.3.5 Kids Page

Our website design includes a page specifically designed for younger audiences. In designing this page, we took into account the different learning styles of the viewers. From our research we established that a page with interactive content and smaller text densities would be the most successful in conveying the information to the younger audience.

To make the website more appealing to the younger audience, the addition of multiple pictures and activities is essential. In the “For Kids” section of our website, we added an activity that children could complete at home. In addition to this activity, we provided a list of pages that will be added in the future which will contain activities for children as well. There is also a link to student programs at the gardens which will be suitable for this audience.

5.4 **Evaluations**

Two types of evaluations were done on our website. One of the evaluations was designed to give us feedback on the content, technical elements, themes, and design of our website, whereas the other evaluation measured the accessibility of our website. These evaluations gave us feedback on the strong and weak points within our design.

5.4.1 Website Evaluations from RBG Staff and Outside Sources

From the evaluations that we received, we have obtained two different types of data. The first type is quantitative data. The quantitative data we received from the evaluations were the numbered scores from the evaluations. The qualitative data from the evaluations were the suggestions and comments made at the end of the evaluation. Data from these evaluations is located in Appendix P.

We analyzed the data by overall scores, as well as by home gardeners and occupation. We added the section scores to obtain a total score for the evaluation. This score was out of 100 points.

We looked at the total scores and took an average of all of the scores and found a final score of 74 for our website. Looking at our evaluation, an average website would most likely receive a score of 60. We determined this by selecting the average number of 3 for each part of the evaluation. Based on the numbers, our website is above average. Our score may have been lowered because there were two evaluations which with significantly lower scores. Looking at the comments for these evaluations, it appears that the evaluators were under the impression that the website was complete, and therefore evaluated it accordingly.

We averaged the scores of all the evaluations for each section. We took this number, and divided it by the total possible score for each section to receive a percentage score. This number helped us identify which sections scored the best and the worst on the evaluations. The section which received the lowest score in the evaluation was the “themes” section. We believe that this is mainly due to the fact that the website is not complete, and many of the pages do not have content. It is difficult to accurately address themes without all of the necessary content. Therefore, content received the second lowest score since many of the pages were left incomplete. Overall, the design and technical elements of the website received good scores (See Appendix P).

In addition, we also sorted the data by occupation to find any trends between occupation and evaluation score. The teachers gave us higher scores overall (See Appendix P). We believe we received higher scores from them because these teachers were members of the educational staff with whom we had a lot of direct contact with during the project. They had a good grasp of the project goals and creating the website to serve as a foundation for future growth. Students gave us the second highest scores overall. It is probable that this happened because of our personal connections to the students and their familiarity with the extent of our project. The last group of unspecified occupations gave us the lowest scores. We suspect that this is because we did not clearly explain that the website is not supposed to be a finished product. We think that some of these evaluators assessed the website as if it were a completed website instead of a framework. One of the evaluators even compared our website to a completed botanic gardens website.

We took a similar approach with home gardeners to identify any trends in this data as well. We found that home gardeners gave our website lower scores than non-home gardeners. Looking at the connections between occupation and home gardeners, all of the home gardeners were classified as “other” in occupation with the exception of two teachers. As previously mentioned, the teachers gave us the highest scores. Excluding these two home gardeners lead us to the same conclusions. The content in the gardening sections wasn’t extensively populated, so we think the gardeners didn’t find this information as helpful as they had hoped.

The comments and suggestions we received were very constructive. From some of the evaluations we found that it was unclear what Bilang Bilang was and who the intended audience was for our pages. Evaluators had mixed thoughts on the name Bilang Bilang and some felt that it needed more of an explanation, specifically on the Bilang Bilang home page. There were also minor grammatical and phrasing issues as well as differences between American and Australian English. Overall however, most people thought that the appearance of the website was good and the website will serve as a good framework from which the RBG can build from.

5.4.2 Accessibility Evaluation of Website

The data from the accessibility evaluations show that our website is slightly lacking in terms of handicapped accessibility. Current comparable websites are somewhat more accessible and the main stream news homepage we assessed is fully accessible. While a more in depth evaluation could potentially point out a number of issues beyond those we have found, our data shows us that the barriers to accessibility are largely technical and not conceptual. The standards we failed to meet we in regard to technical coding aspects of the site and not the structure or presentation. The same was true of the current RBG websites for the gardens of Sydney and Melbourne. This leads us to conclude that with more time and more careful coding of website, our page can easily be made fully compliant as per the preliminary evaluation standards.

6. Conclusions

In general, we found that our guidelines for website design and layout were adequate for creating an effective site that the Royal Botanic Gardens could build upon. Below is an overview of the guidelines we have developed:

- Navigation
 - Users must be able to move through site with ease
 - Website should not become overcrowded with information
 - Utilize side navigation, top navigation, or a combination
 - Website should navigate from general concepts to specific information and vice versa
 - External links should open in new window
- Presentation
 - Pages should be developed according to target audiences
 - Use optimal text sizes and formats
 - Use bold headings, legible text, and a unique style
 - Utilize optimal text color and page density
 - The color orange is helpful for memory
 - Solid contrasting colors should be used for volumes of text
 - Page layouts
 - Use pictures to eliminate white space
- Interactivity
 - Engages the users
 - Use different types of interactivity such as:
 - Activities
 - Games
 - Media
 - Follow the Hand, Heart, Head philosophy of the Royal Botanic Gardens

One of the most important points of our project is that our website was designed as a starting point and not as a finished product. It is a framework that serves as a foundation of structure and style which can be expanded at a later date. Our website design was structured around the themes that were identified by the Royal Botanic Gardens. While we were unable to add all the possible content, the Royal Botanic Gardens is now in a position to fill in the gaps in the information to further communicate their themes and goals.

Many pages within the website are not complete and need to be further populated. The content that is on the web pages needs to be edited and strengthened by staff of the gardens that have the appropriate expertise in each of their fields. We found that most people who viewed our website did not realize that it was incomplete and thought the content was too sparse. However, the website received more favorable feedback in the areas of design and technical elements. Our project team chose to focus its efforts on the website presentation and technical elements as these are the areas in which most staff at the RBG does not have expertise.

Although we have left the RBG with an effective framework, the staff is capable of adding future content. Our group has identified this content that could be added before the site is made public. Children's activities will be very important. Interactivity is a key component to learning and at the moment there is not enough interactive content on the website. Similarly, in the gardening section more content about actually growing gardens should be added. Another area of content we have identified as being important to add are the plant fact sheets. From our interviews with staff at the Visitor Center we found that currently plant fact sheets are created on a regular basis and displayed in the Visitor Center. However, they are not available online and these fact sheets are extremely valuable for people looking for specific information about plants. When adding future content to the website, the RBG should follow the guidelines outlined in section 5.2 of this paper.

In order to maintain the effectiveness of the website, it needs to be updated. Our research showed that the current RBG departments have access to the website so they can update pages appropriate to their department. This is very important and should be

continued. However, we recommend that more staff become involved in posting content on the website.

6.1 Conclusions from Evaluations

Based upon the evaluations described in section 4.2, there are some areas of the current website design that need to be improved. Many of the evaluations that we have received have given us a better idea of how some of the concepts and design methods could be reworked. The evaluations identified areas of the current design that could be improved including the Bilang Bilang title, the content on each of the pages, and many aspects of the design which could be redone.

One of the recurring complaints about the website was the title page itself. The evaluators felt that there needed to be a better explanation of exactly what “Bilang Bilang” means and how it is related to the website. For this recommendation, a better explanation of what “Bilang Bilang” means could be added to the main homepage. In this explanation, the connections between the word, bilang bilang, and what it means to our website could be added. This would provide the website with a better introduction and could possibly catch the interest of people that were turned away by the lack of explanation.

Another of the common complaints about the website was that it did not specifically state which pages were designed for which audiences. This could be due to the fact that the titles and headings of each of the pages were somewhat misleading to the general public. The titles that were used for each of the pages were influenced by the education staff at the Royal Botanic Gardens. Because the titles came from educators who worked in the gardens and had extensive background knowledge of the information contained on each of the pages, the titles of each page were misleading to evaluators who had no prior knowledge of the gardens or the website. A way to fix this problem could be the renaming of the pages in question. For example, the “Grow It Yourself” page could be renamed “Gardening Information”. This title change would more accurately describe what information was contained on the page. This title change would still catch the attention of the younger audience as well as serious gardeners who are looking for specific gardening information.

7. Suggestions for the Future

While what we have given the RBG is a solid base to build from, there are many avenues the RBG can explore to expand the scope of their website. We did not have the time or expertise to explore these options in detail; however we believe that these ideas could be valuable additions. The list below presents these ideas.

A. Creation of Database for Plant Fact Sheets, Info sheets, Pictures

The creation of a structured database is essential to the sustainability and continued growth of the website. Currently much of the content which makes up valuable web materials is available electronically in some form. This includes info sheets, maps, and pictures. However, none of this material is in a central, structured database and finding this content can prove difficult. Creation of a centralized structured database of appropriately labeled content would be extremely valuable especially in maintaining the webpage.

B. Addition of a Forum

Online forums are popular methods of sharing information for groups with common interests and spreading information through the Gardens. A gardening forum would make the RBG's website a central location for spreading gardening ideas. This will also lead people to check the website more often. The forum may also give the RBG feedback on the current gardening areas of the website. It will be full of new ideas for additions that can be made to the site.

C. Interactive games/media

Interactive media is a better way to engage users to learn more from the Gardens. Flash games or videos are entertaining and especially engage younger audiences. These games can be aimed at kids. These games should be short, eye catching, and full of educational content.

D. Website Feedback System

The addition of a website feedback system will help the RBG in the expansion of the website by giving them data of what the public wants. Adding an online feedback system would allow the Gardens staff to assess whether or not the website is continuing to be effective or when sections should be updated.

E. Digital Media

Different forms of online media such as photo galleries, panoramic views, and virtual tours, will catch people's attention and encourage people to visit the Gardens. A virtual tour of each collection would make a nice addition to the collections page and provide another interactive item to the website. These tours might also entice people to come to the Gardens and experience it themselves.

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Appendix A: Project Description

The WPI Project at Royal Botanic Gardens Melbourne 2006

In 2006, three WPI students undertook a project to evaluate the teacher resource materials that are provided in association with school education programs. They made recommendations on the formats of these materials and on the nature of the teacher resources we should provide based on the feedback gathered from a sample of teachers who had recently participated in programs with their students.

The RBG is interested in providing information for teachers and students on their website. At this stage the resource materials that have been developed are available as pdf files. The RBG is interested in not only providing such material on the website, but also providing an array of information related to plants that would be of educational interest to the public as well as school students. The website would be a resource base for anyone wishing to learn about plants and their connections with people and the environment. This information would have some connection with education programs but would also be valuable independently.

Themes

Through 2005, the RBG has been looking at our education offerings with a view to strategically plan what we will provide from 2006. The project will focus on two major themes, sustainable gardening, and people, plants and culture. The corporate plan for incorporating these themes includes:

- Fostering activities that result in sustainable home gardening practices
- Achieving a broader community understanding of the essential relevance of plants to people
- Increasing community knowledge of and commitment to the conservation of native plants and habitats
- Improve understanding of the respect for the natural and cultural heritage of the Royal Botanic Gardens

The context of the sustainable gardening theme will involve the values of sustainable gardening. The context of people and plants will involve plants affecting every part of our lives.

The key messages of sustainable gardening include:

- Sustainable home gardens contribute to liveable cities.
- Sustainable home gardens use less water.
- Good gardens take time.
- Australian plants are great for Australian gardens
- Choose the right plants for your local conditions
- Some serious environmental weeds started as garden plants, which escaped
- Good food comes from plants

The key messages of people, plants and culture include:

- An understanding of plant biodiversity benefits our community
- Cultural expressions illustrate how plants enrich people's lives
- Exploring the diverse and living cultures of Indigenous Australians can show us the connections that exist between plants and people
- Urban habitat remnants are important for conserving biodiversity
- Fire is an important tool for conserving biodiversity in remnant bushland

This will involve some rationalization of current programs as well as developing some new ones. Information and teacher resources would be developed to match each of these themes

Audience

Our website would need to reflect these themes and also be in a format that is accessible to a range of users such as:

- students seeking project information
- teachers seeking learning resources that will link with their curriculum guidelines
- Adults seeking practical information related to plants and gardens.

Our challenge is to make our website informative, relevant, usable and accessible to the education and broader community.

Tasks

- Undertake research to compare the RBG website with sites of comparable organizations in Australia and internationally that also provide educational information.
- From the research, consider ways to further improve or develop RBG website in the area of educational content
- Gather content including information, activities and images from RBG and other sources that would be appropriate for the website
- liaise with members of the RBG Education and Visitor Services staff at Melbourne and Cranbourne in order to identify objectives, use and content of current program materials

Outcomes

At the end of the project a report will be compiled that includes:

- A suggested or preliminary RBG Education website. This will be developed in consultation with RBG staff and through investigation of websites of comparable organizations in Australia and around the world. This would demonstrate a structure that would reflect the suggested themes and audiences
- Content incorporated into the website that may be sourced from the RBG or through other research. This content may in the form of text, photos, illustrations or interactive elements. It would relate to the suggested themes and audiences.
- Recommendations based on research on what makes a successful website. These recommendations would relate to features such as:

- Information about the RBG
- Information about plants and the environment and their connections to people. (What do people want to know and in what form would they like it?)
- Information about programs provided by the RBG
- Structure and navigation of the site

These recommendations would also be reflected in the mock website.

Parameters

The RBG has on staff a Digital Media Officer who is responsible for the structure and maintenance of its website.

The WPI students will need to liaise with the DMO to operate within the style guidelines. The students are encouraged to investigate innovative, interactive features that could be included on the site but would need to be aware that extra time and expertise outside the project might not be feasible.

However, students may make recommendations on the inclusion of further features based on research and investigations on how people like to receive their information on the web. This may come with suggestions on how further development might be resourced.

Appendix B: Sponsor Description

Our IQP project for D Term 2006 will involve working with the Royal Botanic Gardens in Melbourne, Australia to help develop their educational website. The Gardens has a long and involved history and has changed in many ways since its foundation in 1846. Currently there are four major divisions of the organization that comprises the Royal Botanic Gardens in Victoria. These divisions include Plant Science and Biodiversity, Corporate Resources, Melbourne Gardens, and Cranbourne Gardens. The Gardens employ many different types of people in various capacities from botanists to landscapers. Previous IQP's that have been done in conjunction with the Royal Botanic Gardens have included working with their educational kits for teachers and students. Our main focus is to turn these kits into comprehensive web pages.

The Royal Botanic Gardens in Melbourne was founded in 1846 after a site on the Yarra River was chosen by Lieutenant Governor Charles La Trobe. The site was originally a swampy marshland but after much work and preparation, the foundation was laid for what would be one of the most notable botanic gardens in the world.

In 1857, the Melbourne Garden's first Director was appointed. Ferdinand von Mueller was chosen to be the director and would later become one of the most accomplished botanists in the 19th century. His work was so influential that he was knighted in 20 different countries. Mueller's main contribution to the Royal Botanic Gardens was the multitude of plants he collected and planted.

After Mueller, in 1873, William Guilfoyle was appointed to the Directorship of the Gardens. Guilfoyle's contribution to the Gardens was its sweeping lawns and picturesque landscapes.

In 1970 a second garden was established in the nearby city of Cranbourne. The Gardens at Cranbourne were designed to display more of the natural flora and fauna of the Australian variety than Melbourne had at the time. The site that the Cranbourne Gardens are located on is the current home of the Boonerwurrung people. The Boonerwurrung people were indigenous to this area of Australia and continue to live near the site today.

As the gardens have developed over the years, the site has been expanded many times. Between 1970 and 1995 areas were added which contained clay loam soils. This

made expansion easier and allowed for many different species of plants to be added to the Gardens.

During the early years of the gardens in Cranbourne, a separate council was formed to run this site. In 1991, the Royal Botanic Gardens Act was enacted which centralized the management of both sites of the Royal Botanic Gardens.

Today's Gardens are the home to 51,000 plants and over 12,000 species of plants. The Garden's are also home to various species of animal, including black swans, bell birds, cockatoos and kookaburras. The RBG's message reaches various areas in Australia, but they have programs that are centered in Melbourne that educate the people in the region. RBG is also reaching out to other people through their website.

Approximately 40 botanists, bryologists, ecologists, and other specialists conduct research at the Royal Botanic Gardens in the various divisions. Many of these scientists have published papers, which are cited on the website under the scientist's name. In addition to these scientists, they have at least another 60 employees and another 100 volunteers to help around the 38.9 ha Gardens. The RBG holds a collection of over a million different plant species.

The RBG is a nonprofit organization, and it is open to the public. The RBG gets most of its money from generous supporters however the various programs the RBG provides for the visitors also generate revenue. One of these generous supporters is the State Government. The RBG encourages donations by mentioning in their website how the donation is considered tax deductible. The RBG also receives a lot of its help from volunteers. The RBG gladly accepts volunteers to carry out various tasks around the Gardens.

The Royal Botanic Gardens in Melbourne is one piece of a network of gardens, herbariums, and ecological research centers which all fall under the auspices of the Royal Botanic Gardens Board, a corporate board of seven trustees appointed by the Governor in Council. Each member serves a term of only 4 years but can be re-appointed. Also under the administration of the Board are the Royal Botanic Gardens Cranbourne, the National Herbarium of Victoria, the State Botanical Collection, and the Australian Research Center for Urban Ecology. Because the gardens and the associated centers are publicly owned the Board reports directly to the Minister for Environment of Victoria, currently

the honorable Johnstone William Thwaites, who also happens to be the Deputy Premier of Victoria. The minister makes recommendations on appointments to the RBG and on policies regarding the RBG to the Governor in Council.

The RBG is run by a director who, having been appointed by the Governor in Council, serves a term of up to five years. The director is the CEO of the Board and oversees the day to day management of its responsibilities. Another key person in running the Royal Botanic Gardens is the chief botanist who is responsible for managing the State botanical collections and the research programs related to it. Managing all these resources is done through the use of 4 operational divisions each with a divisional director. The four divisions are Plant Science and Biodiversity, Corporate Resources, Melbourne Gardens, and Cranbourne Gardens.

The Plant Science and Biodiversity division is primarily responsible for the State Botanical Collection. It also undertakes research and special projects as well as providing plant identification and authoritative advice services. The division comprises three branches: the Collections; Plant Sciences; and, Library. The Collections Branch oversees the Herbarium, the Plant Sciences Branch manages research and plant identification, and the Library maintains a collection of botanical literature and art work.

The Corporate Resources Division manages all the business and financial affairs of the Royal Botanic Gardens. It comprises 4 specialized branches, Business and Finance, Marketing and Communications, Human Resources, and Information Services. Together each contributes to keep the RBG running smoothly and efficiently.

The Melbourne and Cranbourne divisions perform very similar roles in that they are primarily set up to manage their respective gardens. Each has a Horticultural Branch as well as an Infrastructures Branch to oversee the day to day maintenance of the parks and their plants. However, each has some unique branches assigned to it that differentiate their roles by more than just location and collections. The Education Services Branch, which is responsible for planning and executing a broad range of educational programs from kindergarten through adulthood, resides at the RBG in Melbourne. In Cranbourne, the Ecology Branch conducts research into the conservation of bush lands and wetlands of Australia.

The Royal Botanic Gardens wishes to improve the current educational offerings on their website. They wish to focus on the four main themes of: sustainable gardens; the living environment; the living heritage of the Royal Botanic Gardens; and, people, plants and culture. Currently, the website contains resources for students and teachers in PDF format. However, the RBG would also like to provide the general public with information on various plants as well as the connections between people and the environment. The website will need to have information available in formats that are accessible to students seeking information for projects, teachers using the learning resources and adults seeking general information about plants and gardens. The ultimate goal is to make the website informative, relevant, usable and accessible to both the educational and greater community.

The previous WPI project with the RBG developed a set of educational programs for the Royal Botanic Gardens. The team explored the current educational materials offered by the Gardens and through their research provided recommendations for improvement. The desired outcome was to create more effective educational materials to bring more students to the Gardens to learn. At the conclusion of their project, educational kits were created and posted on the RBG website. These kits provided the recommended materials for teachers to conduct lessons in their classrooms.

Our framing of the issue looks at all of the different factors involved in making the website more effective. Our goal is to represent the information contained in the teachers' kits on the website and determine how it can be presented in a format suitable for the target audiences. As technology changes, it may be possible to address specific problems such as ecology and public education via the web in a more effective manner. We plan to compare the RBG website with similar websites to develop the ideal presentation of information for the Gardens. We will research different techniques and styles of teaching and learning to enhance the websites effectiveness.

Appendix C: Sponsor E-mail

2/9/2006

Gary Shadforth

Gary.Shadforth@rbg.vic.gov.au

Subject: Royal Botanical Gardens IQP Team Introduction

Dear Mr. Shadforth:

The team that is coming in March to work with the Royal Botanic Gardens on our Interactive Qualifying Project (IQP) comprises 4 members: Michael Bruninghaus, Alex Papanicholas, Tom Jenket and Rich McCann. Each member of the group brings different skills to this project. Michael is a Biology major who has had coursework in Plant Morphology and Development. Alex has had experience in website construction and design. Tom has had extensive experience in creating, managing and working with project groups. Rich has been continuing his training in group dynamics through the U.S Air Force ROTC program.

The group expressed a special interest in this project because we are excited by the opportunities that changing technologies and improvements in web-design present to meet public demands for information in a more effective manner. Among other things, the team plans to evaluate various websites to develop ideas and guidelines for the presentation of information on the RBG site. The team also plans to examine the research on different presentation techniques and learning styles to enhance the website's effectiveness.

Our team would like to schedule a telephone conference call with you to discuss specific questions and our overall approach. We would like to know when might be the best time to reach you. Our ideal time would be a Tuesday night around 8:00 pm EST / 12:00 pm Wednesday your time. If you would let us know as soon as possible, we would be most grateful. You can reach us by e-mail at iqprbg06@wpi.edu or by phone at +1 603-387-2380. Our advisors for this project are Kevin Clements and Paul Davis. You can reach them at clements@wpi.edu and pwdavis@wpi.edu respectively.

We look forward to working with the Royal Botanical Gardens this coming term.

Sincerely,

The Royal Botanic Gardens IQP Team

Appendix D: Conference Call Interview with Sponsor

Interview Questions:

1. Do you have a web designer?
2. Are we going to be responsible for uploading the content on the website?
3. Is the website technically capable of handling streaming media?
4. Do you already have pictures available for uploading to the website or are we going to have to take them ourselves?
5. What local schools will be available to use for focus groups, interviews and surveys?
6. What types of data do you already have? (hit counts, download numbers)

Appendix E: Sample Website Evaluation by Tammy Payton

Name of Site _____ Date _____

URL: _____ Time _____ a.m./p.m.

1 = Poor 5 = Exceptional

Design

Navigability is good. Links are clearly labeled. Can move from page to page easily.	1	2	3	4	5
This site offers interactivity. The visitor engages with the site.	1	2	3	4	5
This site uses appropriate page format. Pages are not inordinately long.	1	2	3	4	5
Can easily find information.	1	2	3	4	5
This site is aesthetically appealing. Good use of graphics and color.	1	2	3	4	5
This site is aesthetically courteous. Text and background colors do not clash.	1	2	3	4	5

Content

Has a proper title.	1	2	3	4	5
Additional resource links are included.	1	2	3	4	5
Information is useful.	1	2	3	4	5
Rich content and will likely be revisited.	1	2	3	4	5
How this website compares in content to similar websites.	1	2	3	4	5

Technical Elements

All links work.	1	2	3	4	5
Thumbnail graphics used. Graphics download quickly.	1	2	3	4	5
Alternative text page is offered when heavy graphics or frames are used.	1	2	3	4	5
Image links and image maps have a text alternative.	1	2	3	4	5
Can see meaningful information within 30 seconds.	1	2	3	4	5

Credibility

Contact person is stated with their e-mail address.	1	2	3	4	5
Announces when this page was last updated.					
Links have been kept current.	1	2	3	4	5
Resource links used to develop content are included.	1	2	3	4	5
States the name of the host school or institution.	1	2	3	4	5

Total Possible Points = 100

Appendix F: Website Evaluation Criteria Rubric developed by RBG Team

Criteria metrics:

- Quality- The material is clear and concise. It has pertinent information to the topic and shown in a professional manner. It doesn't have contradictions or typos.
- Organization- The material is organized into sizable categories, but no extremely large categories. The information is interactive, whether it is with links leading to other pages or flash media. The paragraphs are separated, signifying a change in subject or focus. Titles are of larger font and accurate to the paragraph(s) that follow.
- Content- The content of the material is appropriate for the target audience. The content is diverse, giving information on many topics.
- Accessibility- The information is easily accessible (i.e. not having to click through several pages to get to the desired page). Follow up links are hyperlinked properly (i.e. don't lead to a blank page). The material that is relative to each subject is linked together as well.
- Aesthetics- The text is of proper size and color so that it's easy to read (perhaps a different font). There aren't ads on the sides of the website.

Appendix G: Sample of Preliminary Website Review

Monterey Bay Aquarium

<http://www.mbayaq.org/>

- Quality- **Helpful.** This site was very clear and accurate in its information on different marine life at the aquarium. The website didn't have any typos or contradictions. The website is very professional but it also has different ways of giving information to different age groups. It has a lot of games and activities for kids.
- Organization- **Helpful.** This website is appropriately organized. Its tabs are well labeled and under each tab there is relative information. The topics aren't too big either. Even the creature descriptions are short and to the point. These short descriptions have the right amount of information in them though. The media was extremely interactive with several different live web cams, videos, and pictures. The amount of information in this website is amazing.
- Content- **Helpful.** The website's information is right on with what they do. The paragraphs are properly structured, making it easy to read and easy to find information.
- Accessibility- **Helpful.** The website is easily accessible. The organization in it makes it easy to find what you're looking for. They even have a menu with all the animals for the different habitats. All of the inter-links in the website lead to related material.
- Aesthetics- **Helpful.** The website was very appealing. None of the text was hard to read. All of the titles were easily distinguishable. There weren't any ads or anything on the sides of the sites. They did have a lot of pictures, which was a great thing to have with the all the different animals they have.

San Diego Zoo

<http://www.sandiegozoo.org/>

- Quality- **Helpful.** They've got a lot of interesting facts about the animals that they have there. The website is very professional. The education section is aimed precisely at that; educating. All of the subject matter on the page was very specific to the topic of the page.
- Organization- **Helpful.** I found that the tabs on the top made it easy to get around the website. There were short paragraphs for the different animals. There was also other information about the animals. The website utilized different forms of media. There were a lot of pictures but there were also some videos. The titles of the paragraphs were accurate to the subject and

content of the paragraphs. The subjects were easy to distinguish on the page.

- Content- **Needs Improvement.** The website needs to expand on the extent of their content. They could have so many more animals up there, but don't. Also the facts up there aren't necessarily in any order.
- Accessibility- **Helpful.** There were links in the middle of the paragraphs for words that the reader may not have understood. The links led to the proper site for the explanation. All the links are linked to the relative information of that hypertext.
- Aesthetics- **Helpful.** The website had a color scheme, which was subtle, but worked to their advantage. The tabs were interactive, having a little flash image connected with them. There weren't ads on the website, which distract the user. The text was also readable.

Sea World San Antonio

www.4adventure.com/seaworld/tx/default.aspx

- Quality- **Helpful** – The information posted on the site was very helpful. The part of the site for teachers could be extremely helpful in putting together lessons. The information for students was easy to read.
- Organization- **Helpful** – The web page was very well put together. It was clear as to which path to use to get to the appropriate information.
- Content- **Helpful** – The content on the web-site was very complete and informative. There was a multitude of information available for every type of web-goer.
- Accessibility- **Helpful** – Each area of the web-page was easily accessible and clear as to what information was contained in each link.
- Aesthetics- **Helpful** – The web page was easy to read and well organized with colors and pictures. The pictures and each type of presentation were well organized and didn't distract.

Appendix H: Preliminary Timeline

Objective	Week						
	1	2	3	4	5	6	7
Assess Goals of the RBG Website	X						
Evaluate Resources Available	X	X					
Develop Web Pages		X	X	X			
Gather Data				X	X	X	
Promote Web Page	X	X	X	X	X	X	X
Analyze/ Compile Data					X	X	X

Appendix I: Royal Botanic Gardens Programs

Early Childhood Programs:

- 1st Term: Wonderful Water (Children's Garden)
- 2nd Term: Food for Life (Children's Garden)
- 3rd Term: Homes and Hideaways (Children's Garden)
- 4th Term: Minibeasts (Children's Garden)
- A Garden of Rhythm and Rhyme (To begin in 2005)
- Spring, Autumn, and Aboriginal Trails
- Literature in the Gardens
- Plants the Dinosaurs Ate
- Christmas

Primary Education Programs:

- Food Forest
- Sustainable Gardening
- The Magic Garden
- Plant Magic
- Minibeasts
- Introduction to the Gardens (P-6)
- Aboriginal Trails (P-6)
- Literature in the Gardens (P-6)
- The Waterhole by Graema Base (P-6)
- Where the Forest Meets the Sea (P-6)
- Christmas in the Gardens
- LOTE Programs (P-6)
- Plants and Animals (3-6)
- An Island on the Yarra (3-6)
- Into the Rainforest (4-6)
- Three Friends of Winter (4-6)
- Plantworks (5-6)
- Stars of Melbourne (5-6)

Secondary School Programs:

- Sustainable Gardening (Children's Garden; 7-9)
- Water 4 Life (Children's Garden; 7-10)
- Searching for Eden (Children's Garden; 7-10)
- Plant Adaptions (9-VCE Biology Unit 1)
- Behind the Scenes (VCE Biology)
- Plant Sex (VCE Biology Unit 2)
- Outdoor and Environmental Studies (VCE Unit 3)
- Geography Field Investigation (VCE Unit 3)
- Gondwana Greening (VCE Biology Unit 4)
- Plants and Animals (7-8)
- Plantworks (7-9)
- Into the Rainforest (7-9)
- Changing Landscapes (7-10)
- Nature of Melbourne (7-10)
- Stars of Melbourne (7-10)
- LOTE Programs: Indonesia, German, French (7-12)

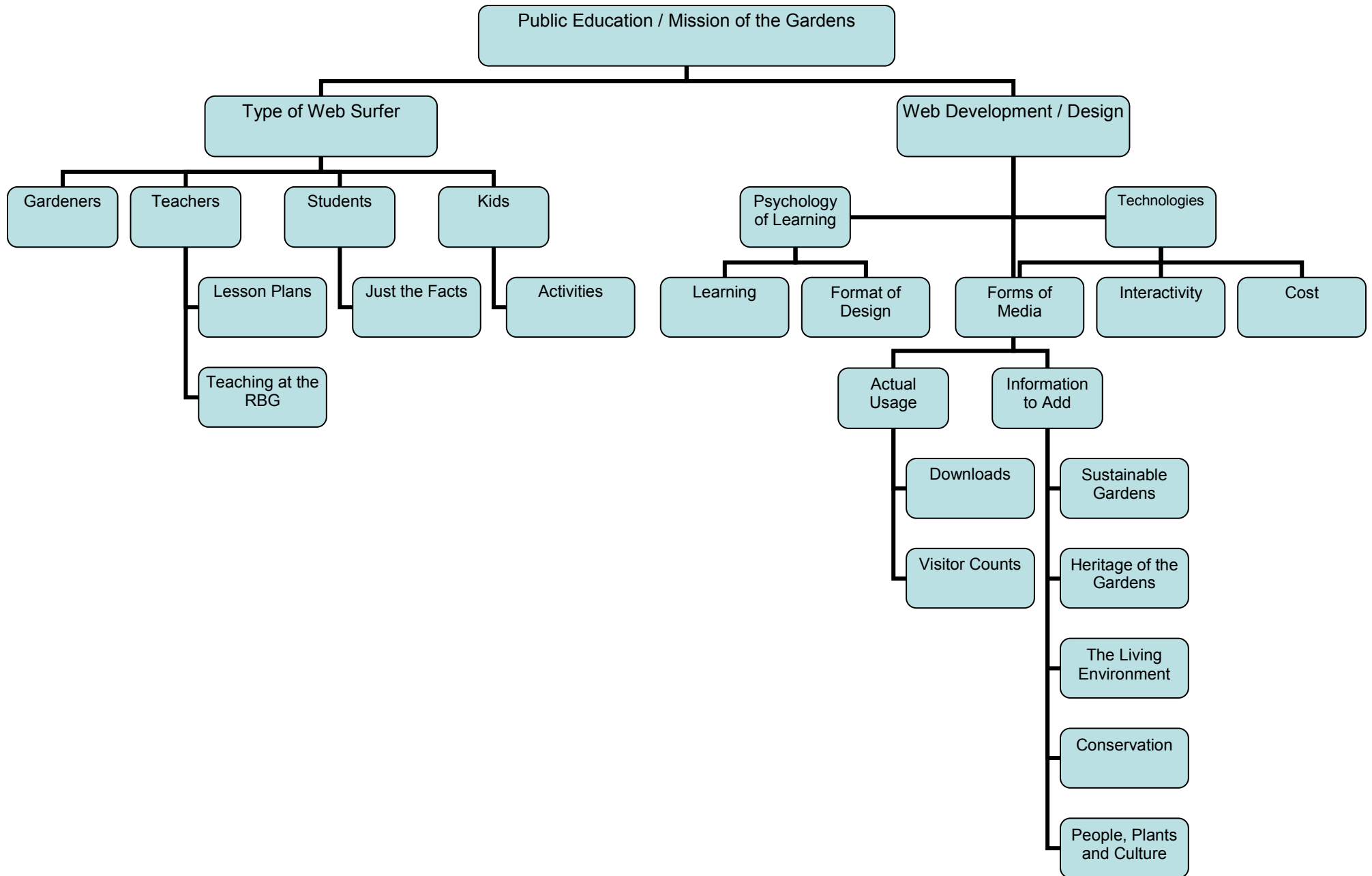
Appendix J: Interview Protocols

General Interview Protocol

Guidelines to Follow:

- 1) Greet the person being interviewed.
- 2) Introduce ourselves.
- 3) Thank person for taking the time to speak to us.
- 4) Ask permission to take notes or record the interview.
- 5) Explain our project to the interviewee.
- 6) Ask appropriate questions depending on the expertise of the interviewee.
- 7) Take a detailed record of questions asked and the responses given.
- 8) Again, thank person for taking the time to speak to us, as well as sharing information with our group.
- 9) Conclude conversation with interviewee.

Appendix K: Concept Map



Appendix L: Revised Website Evaluation

Name of Site Bilang Bilang Page Date _____
 Profession _____ Are you a Gardener? Y/N

1 = Poor 5 = Exceptional

Design

Navigability is good. Links are clearly labeled. Can move from page to page easily.	1	2	3	4	5
This site offers interactivity. The visitor engages with the site.	1	2	3	4	5
This site uses appropriate page format. Pages are not inordinately long.	1	2	3	4	5
Can easily find information.	1	2	3	4	5
This site is aesthetically appealing. Good use of graphics and color.	1	2	3	4	5
This site is aesthetically courteous. Text and background colors do not clash.	1	2	3	4	5

Content

Has a proper title.	1	2	3	4	5
Additional resource links are included.	1	2	3	4	5
Information is useful.	1	2	3	4	5
Rich content and will likely be revisited.	1	2	3	4	5
How this website compares in content to similar websites.	1	2	3	4	5

Technical Elements

All links work.	1	2	3	4	5
Thumbnail graphics used. Graphics download quickly.	1	2	3	4	5
Uses appropriate pictures for the text Provided on the page.	1	2	3	4	5
Image links and image maps have a text alternative.	1	2	3	4	5
Can see meaningful information within 30 seconds.	1	2	3	4	5

Themes

This site shows the value of sustainable gardening.	1	2	3	4	5
This website encourages sustainable home gardening.	1	2	3	4	5
This website gives me a broader understanding of how plants affect everyday life.	1	2	3	4	5
The information expresses the concern for conservation of native plants and habitats.	1	2	3	4	5

Additional Comments and Suggestions:

Appendix M: Questions concerning teaching approach

Questions Concerning Teaching Approach

- 1) Who is your audience?
- 2) What is your primary message?
- 3) How do you communicate it?
- 4) Why do you do it that way?
- 5) What would you look for in a website?

If you have any further input, please feel free to contact us.

Thank you

Appendix N: Royal Botanic Gardens Website Layout

Map Page

- Interactive Map Page
 - Contains a map of the Royal Botanic Gardens in Melbourne
 - Clicking on different parts of the map will bring the user to the page associated with the selected collection

Plant Facts Pages

- Name
- Basic Background Information
- Where & How It Grows
- Location in the Gardens
- Uses
- Interesting Facts/Stories (e.g. animal connections, historical)
- FAQs
- Images of the plant
- Links to further information

Sustainable Gardens

- How to Grow a Sustainable Garden
 - Soil Management
 - Mulching / Composting
 - Worms
 - Pest Control
 - Plant Planning
 - Indigenous Plants
 - When to Plant Which Plants
 - Rotation Plan
 - Companion Planting
 - Planting Techniques
 - No Dig Bed
 - Water Wise Gardening
 - Propagation
- Kids Pages
 - Mini Beasts
 - Yummy Vegetables I Can Grow
 - Poisonous Plants
- Growing Herbs for Everyday Uses
 - Cooking
 - Medicinal
 - Aromatherapy
 - Pest Repellants

People, Plants, and Culture

- Indigenous Connections to the RBG
 - Victorian Aboriginal People
 - Kulin People
- Plants and Their Journeys
 - Why Plants Migrated to their Current Location
 - How did the Plants Migrate
- Weird and Wonderful
 - Carnivorous Plants
 - Peculiar Uses
 - Strange Behaviour
- Plants Revenge
 - Poisonous Plants
 - Spikes and Spines
 - Funny Smells
 - Stinging Plants

Land Management

- Role of greenspaces in cities
- Fire
- Weeds

Appendix O: Interview Answers

Question 1: Who is your audience?

Gary Shadforth: Secondary school children.

Christine Joy: Mainly primary school children.

Janine Standfield: Primary school children.

Ross Semler: General public.

Matt Jones: Visitors of the Gardens.

Eleanor Bridger: The general public.

Casual Educators: Primary and secondary school children.

Question 2: What is your primary message?

Gary Shadforth: Educational message of the Gardens.

Christine Joy: Getting children interested in plants.

Janine Standfield: Education about Plants and their effects on everyday life.

Ross Semler: Factual information regarding events and programs.

Matt Jones: Information about plants and activities in the Gardens.

Eleanor Bridger: The Gardens is an educational institution.

Casual Educators: Educational information about the Gardens. Gardens is special place for all.

Question 3: How do you communicate it?

Gary Shadforth: Programs involving the Children's Garden.

Christine Joy: Uses activities to engage kids into learning

Janine Standfield: Teaching through doing in the Children's Garden

Ross Semler: Pamphlets, fact sheets, and email.

Matt Jones: Pamphlets and fact sheets, as well as email.

Eleanor Bridger: Through all of the written material available at the RBG.

Casual Educators: Interactive activities, touching, feeling, observations, ask questions, lead them to an answer, get involved, music, poems, songs.

Question 4: Why do you do it that way?

Gary Shadforth: The programs are centered on the students and address them the most precisely.

Christine Joy: The interactivity of the programs helps the children learn more.

Janine Standfield: The kids learn better with programs than with just literature.

Ross Semler: Easily accessible pamphlets give people the opportunity to learn more.

Short, brief, colorful pamphlets are used to give a visual connection to the Gardens. The FAQ's are presented to guide people into information about the Gardens.

Matt Jones: Short, concise information and try to engage people to ask and seek more information.

Eleanor Bridger: The pamphlets, fact sheets, and other material get used regularly by the visitors of the Gardens.

Casual Educators: Real learning, hands on = minds on, helps in remembering.

Question 5: What would you look for in a website?

Gary Shadforth: Colorful, easy to read, and easily navigated pages should be presented.

Christine Joy: Engaging web pages with activities for kids to follow. She mentioned that it should follow something like the scribblygum page.

Janine Standfield: Something similar to scribblygum. Interesting factual information. Eye catching information. Activities for children.

Ross Semler: Engaging activities and pages with colorful themes. The pages should be easily navigated as well.

Matt Jones: Factual information for the interested public.

Eleanor Bridger: Solid factual information with an interesting look while maintaining the RBG's identity.

Casual Educators: Photos of students actively engaging themselves, teacher's information on programs, conservation messages, question and answer style, make it appealing.

Appendix P: Website Evaluation Data

<i>Evaluation</i>	<i>Occupation</i>	<i>Home Gardener</i>	<i>Design</i>	<i>Content</i>	<i>Technical Elements</i>	<i>Themes</i>	<i>Total</i>
1	Teacher	yes	26	17	22	16	81
2	Teacher	no	26	17	20	13	76
3	Other	yes	21	16	19	14	70
4	Other	yes	16	8	13	4	41
5	Other	no	23	20	20	16	79
6	Other	yes	26	20	22	17	85
7	Student	no	30	22	20	15	87
8	Student	no	25	16	19	9	69
9	Other	yes	23	16	15	15	69
10	Other	yes	23	20	21	16	80
11	Student	no	27	22	18	9	76
12	Student	no	26	20	20	16	82
13	Other	yes	19	8	18	6	51
14	Teacher	yes	29	22	23	17	91
15	Other	yes	16	15	19	16	66
Averages			23.733	17.2667	19.26666667	13.2667	74.0714
Percentage			79.11%	69.07%	77.07%	66.33%	74.07%
STDEV			4.2337	4.46361	2.604026187	4.19977	13.3784

Figure 1 Total Evaluation Data

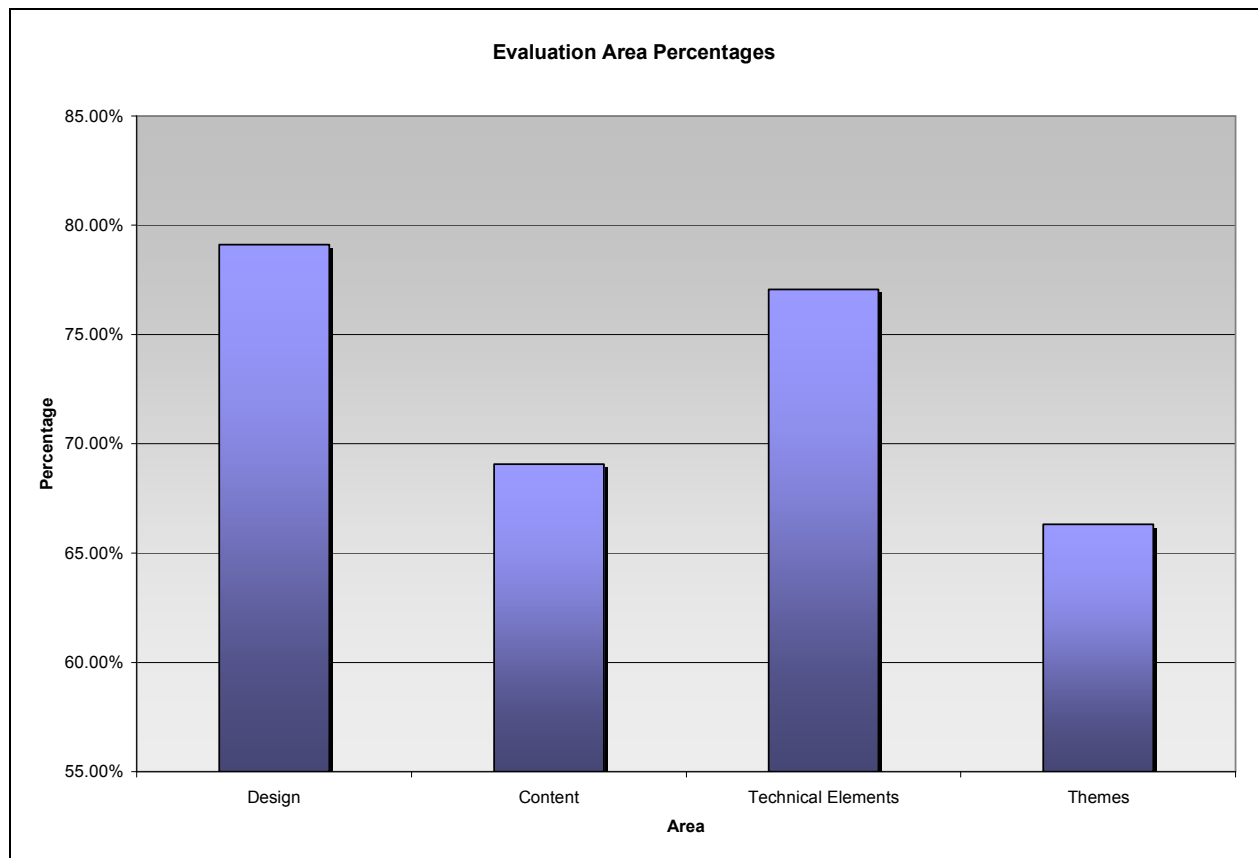


Figure 2 Scores by Category

<i>Evaluation</i>	<i>Occupation</i>	<i>Home Gardener</i>	<i>Design</i>	<i>Content</i>	<i>Technical Elements</i>	<i>Themes</i>	<i>Total</i>
5	Other	no	23	20	20	16	79
3	Other	yes	21	16	19	14	70
4	Other	yes	16	8	13	4	41
6	Other	yes	26	20	22	17	85
9	Other	yes	23	16	15	15	69
10	Other	yes	23	20	21	16	80
13	Other	yes	19	8	18	6	51
15	Other	yes	16	15	19	16	66
Subtotal	Average		20.88	15.38	18.38	13.00	67.63
	Percentage		0.70	0.62	0.74	0.65	0.68
7	Student	no	30	22	20	15	87
8	Student	no	25	16	19	9	69
11	Student	no	27	22	18	9	76
12	Student	no	26	20	20	16	82
Subtotal	Average		27	20	19.25	12.25	78.5
	Percentage		0.9	0.8	0.77	0.6125	0.785
2	Teacher	no	26	17	20	13	76
1	Teacher	yes	26	17	22	16	81
14	Teacher	yes	29	22	23	17	91
Subtotal	Average		27.00	18.67	21.67	15.33	82.67
	Percentage		0.90	0.75	0.87	0.77	0.83

Figure 3 Evaluation Data by Occupation

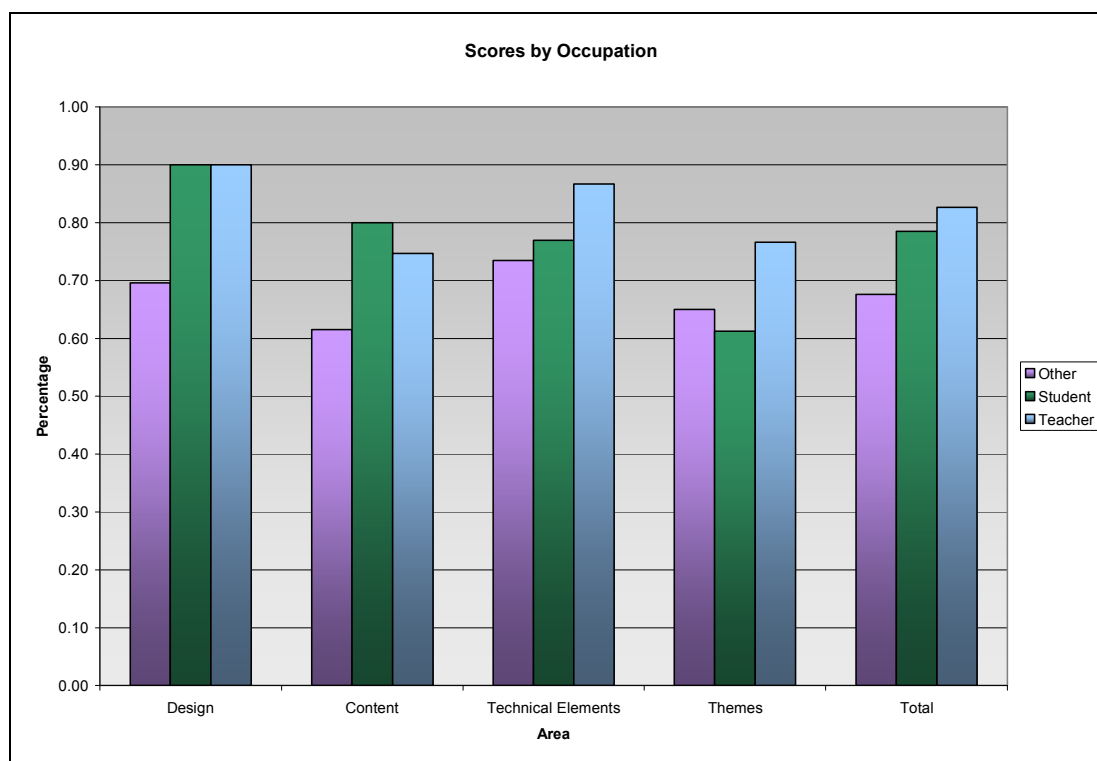


Figure 4 Scores by Occupation

<i>Evaluation</i>	<i>Occupation</i>	<i>Home Gardener</i>	<i>Design</i>	<i>Content</i>	<i>Technical Elements</i>	<i>Themes</i>	<i>Total</i>
5	Other	no	23	20	20	16	79
7	Student	no	30	22	20	15	87
8	Student	no	25	16	19	9	69
11	Student	no	27	22	18	9	76
12	Student	no	26	20	20	16	82
2	Teacher	no	26	17	20	13	76
Subtotal	Averages	no	26.17	19.50	19.50	13.00	78.17
	Percentage		87.22%	78.00%	78.00%	65.00%	78.17%
3	Other	yes	21	16	19	14	70
4	Other	yes	16	8	13	4	41
6	Other	yes	26	20	22	17	85
9	Other	yes	23	16	15	15	69
10	Other	yes	23	20	21	16	80
13	Other	yes	19	8	18	6	51
15	Other	yes	16	15	19	16	66
1	Teacher	yes	26	17	22	16	81
14	Teacher	yes	29	22	23	17	91
Subtotal	Averages	yes	22.11	15.78	19.11	13.44	70.44
	Percentage		73.70%	63.11%	76.44%	67.22%	70.44%

Figure 5 Data by Home Gardening

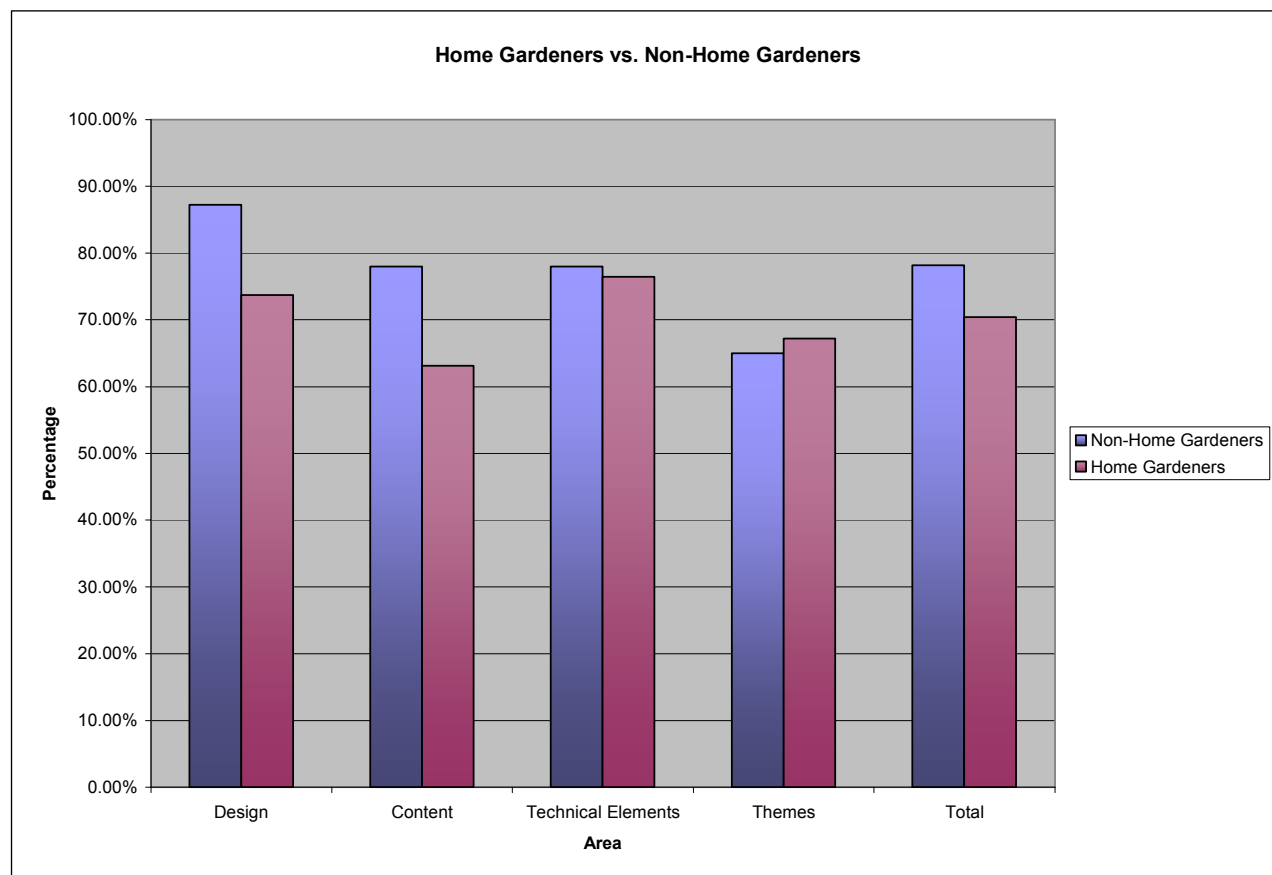
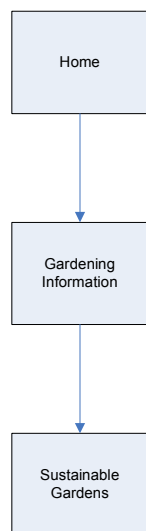
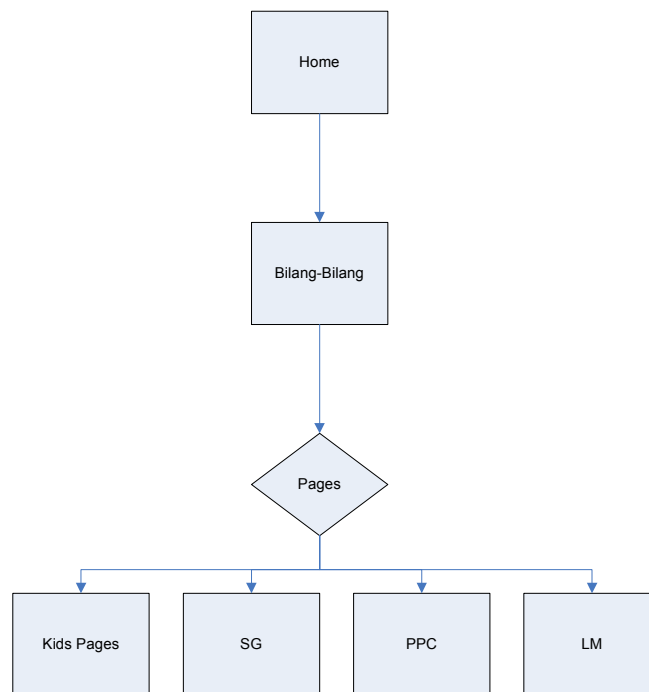


Figure 6 Scores of Home Gardeners and Non-Home Gardeners

Appendix Q: Flow charts for Navigation**Gardeners****Students****Figure 6** Flow Chart for Gardeners and Students

Teachers

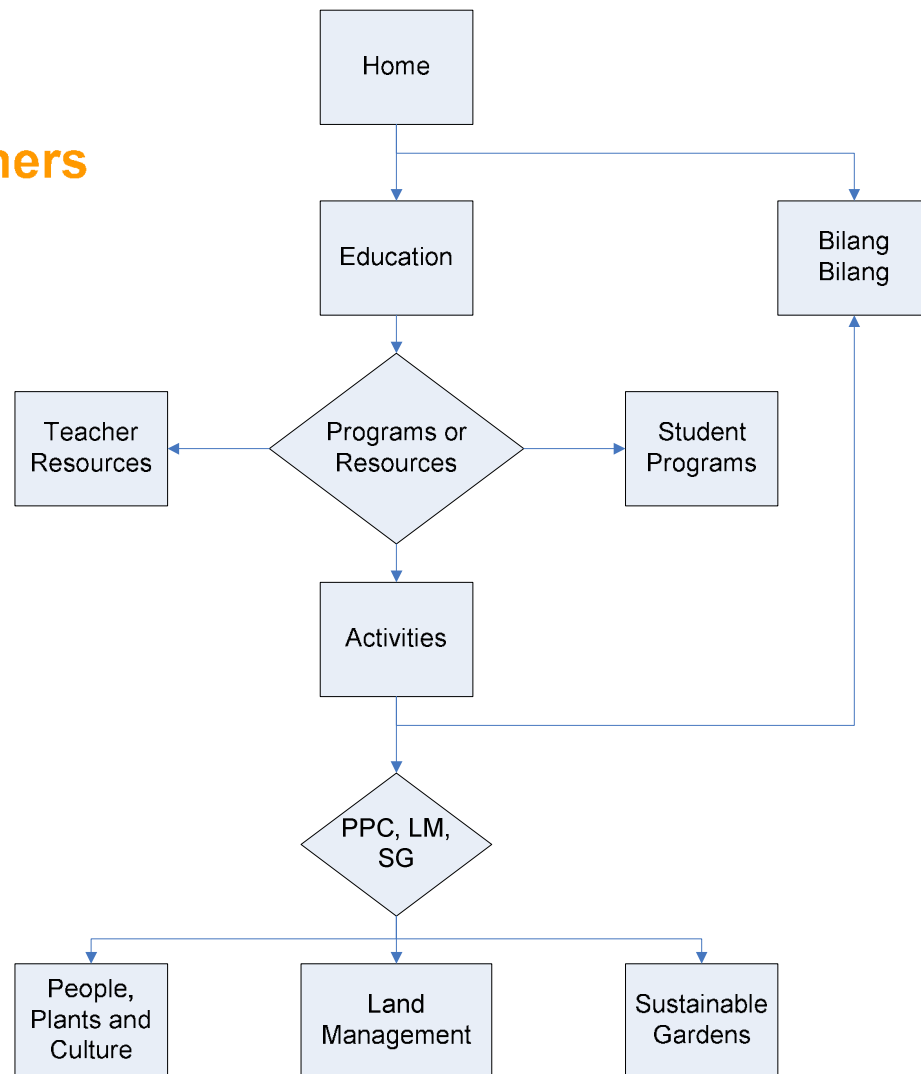


Figure 7 Flow Chart for Teachers

Appendix R: Website Map

