LEARNING IN A BOTANIC GARDEN

THE EXCURSION EXPERIENCES OF SCHOOL STUDENTS AND THEIR TEACHERS

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ABSTRACT

The Nature of Learning in a Botanic Garden

– the Excursion Experiences of School Students and their Teachers

Classroom teachers and other educators intuitively understand that an excursion to a botanic garden is a worthwhile educational experience for their students. However there is little research that addresses the nature of the experiences students have in a botanic garden. The body of research associated with excursions to venues beyond the classroom – particularly to museums, reveals that schools excursions may be a learning experience if a range of criteria are applied to the event. This view of learning focuses on cognitive gain and often utilises methodologies that focus on quantitative measurement of specific cognitive outcomes. Recent research in museums utilises methodologies that investigate the experiences of museum visitors to develop models that can explain the nature of learning in the museum context. Results indicate that a broad definition of learning that incorporates the physical, social and personal aspects of the experience is required for the museum context.

The purpose of this study is to focus on the nature of excursion experiences of students and teachers to botanic gardens and to investigate the nature of learning in a botanic garden. Case study, survey and interview methodologies were utilised to investigate the excursion experiences of school groups visiting a botanic garden for lessons with a botanic garden educator. Findings demonstrate that school excursions to a botanic garden involve two types of learning: learning for cognitive gain and 'scheme-building' learning. Students can achieve measurable cognitive outcomes where the excursion is tightly structured with visits to specific displays to conduct specific tasks. Students also demonstrate long-term recall of plants, plant displays and specific locations at a botanic garden. These recollections are linked to specific outcomes required by the classroom teacher and contribute to students' deeper understandings of plants – notably plant structure and biodiversity. This latter type of learning has been termed 'scheme-building' learning. The study has resulted in description and analysis of the nature of learning in a botanic garden and the excursion experiences of teachers and their students visiting a botanic garden. A set of guiding principles for school programmes in botanic gardens has been derived

from these findings and endorsed by the wider national and international community of botanic garden educators.

This study makes a major contribution to enhancing understanding in three main areas. Firstly the study provides insight into the excursion experiences of the full range of school students and their teachers and to the relationship between school curriculum and an excursion to a botanic garden. The second major contribution of this study is to further understanding of the nature of learning that happens on an excursion to a botanic garden and the relationship of this learning to established learning theory. Finally the set of guiding principles derived from the research will inform botanic garden educators as they design, conduct and evaluate programmes that respond more closely to the researched needs of visiting school groups.

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I would like to sincerely thank the staff and students of the seven case study schools who allocated time to participate in this research. Visits to schools allowed me to gain an insight into both the firm opinion of classroom teachers about the relevance and worth of an excursion to a botanic garden and the impact of such an experience on their students.

Chapter One INTRODUCTION

An excursion[1] to a botanic garden is an experience that students may have during their years of schooling. This single one- or part-day excursion to a botanic garden may be comparable to a visit to a museum, zoo or field study centre where students with their teachers spend a day away from their normal classroom and engage an educator from the excursion venue to assist with the event. The Royal Botanic Gardens Sydney (RBGS) offers such an excursion service to schools and the researcher of this thesis is a botanic garden educator working with these visiting school groups.

It appears that the expected learning from the excursion could be similar to that found in the traditional school classroom where students are expected to utilise and recall factual information and their ability to do so can be reflected in the results of assessment procedures. Perhaps the learning situation at the RBGS reflects such an educational process the success of which can be measured by evaluating specific learning outcomes. Consideration of this view of learning as describing the learning that happens at a botanic garden seemed to understate the learning potential of the excursion situation and further consideration indicated that an excursion to the RBGS could also involve a broader and more personal kind of learning. Perhaps it could be said that learning in a botanic garden involves a kind of 'two tier' learning with one tier being the formal factual-type learning and a second tier relating to a broader-based type of learning.

In turning to the literature available on school excursions to botanic gardens, a bank of descriptive reports was located in the discourse of other botanic gardens educators found in conference papers and in the magazine *Roots* both published by the non-government organisation Botanic Gardens Conservation International (BGCI). This body of literature, reviewed in Chapter Two, provided an insight into the issues of concern to

[1] The term 'excursion' is the wider term used by curriculum documents in New South Wales to refer to visits beyond the classroom whilst the term 'field trip' generally refer to secondary science and geography excursions.

botanic garden educators but did not provide insights into the school excursion experience or the nature of learning in a botanic garden.

A large number of research studies have tested the conditions required to promote factual recall or cognitive gain from field work (e.g. Orion et al 1997, Farmer & Watt 1995) and it appears that application of a well-defined set of conditions will result in desired learning outcomes being achieved by student involvement in field work. However, while this research informs one type of learning experience students may have at a botanic garden, it does not appear to address the broader learning experience that may also occur at a botanic garden.

Further study of the literature revealed a small but current research literature on the nature of learning in other excursion venues such as field work sites, museums and science centres (e.g. Lai 1999a, Falk & Dierking 1997, Wolins et al 1992). This research suggests that there is a different type of learning that occurs in these venues. Lai (1999a) suggests that the learning outcomes of geography excursions are much wider than those intended by organising teachers. The work of Falk & Dierking (1997) demonstrates that museum experiences form part of the long-term memories of individuals. Hence it appeared that a need for research of the nature of learning had been identified in wider museum literature and it seemed highly relevant to investigate the excursion situation at the RBGS to assist in this endeavour.

It was this sort of professional practitioner inquiry that accumulated in the need for research of the school excursion situation at the RBGS. Clearly there was a need to communicate with students and teachers to gain an insight into their experiences of the school excursion to the RBGS. Hence the research questions of this thesis can be expressed as:

1. What is the nature of the excursion experiences of students and their teachers at the RBGS and how do these experiences relate to other field work experiences?

2. What is the nature of the learning experience of students at the RBGS and how does this learning relate to wider understandings of learning?

3. Can the experiences of botanic garden educators, classroom teachers and students involved in school excursions to the RBGS be used to form a set of guiding principles for school excursions to botanic gardens?

This thesis explores a new area of educational practice quite unlike the majority of sites of practice for conventional education professionals. Hence the methodological approach adopted by the study needed to allow trends, commonalties and generalisations to emerge from the data itself rather than to impose a particular theoretical framework on the research situation. The generative methodologies proposed by Glaser & Strauss (1967) provide a process for working through data collection and analysis to promote theory building directly from the data itself. This process will be described further in Chapter Three and the trends that emerge from the data are described at the ends of Chapters Four, Five and Six. The generalisations that can be made from the presentation of the data are drawn together in the concluding chapter.

Research of the excursion experiences of school students and their teachers to a botanic garden reflects a wider trend in museum education research to examine the lived experiences of targeted groups of visitors to cultural institutions e.g. Kelly (2002), Falk & Dierking (2000). It appears that this trend is a practical manifestation of wide acceptance of the constructivist notion that we all hold our own, uniquely personal views of the world. Hence learning experiences can be viewed as being unique to a particular individual. This methodology contrasts sharply with that of quantitative approaches adopted by researchers investigating the cognitive gain resulting from excursions or field trips (e.g. Valsala et al 2001, Farmer & Wott 1995). This thesis holds that factual recall is not the only feature of the excursion experience hence research in this area needs to utilise methodologies that explore rather than enumerate students' learning. Personal meaning making can be researched through a methodology that yields personal

descriptions of events and explorations of individual experiences. These methodological issues will be explored further in Chapter Three.

This thesis intends to create a base-line set of data derived from the personal experiences of both the students and the teachers that are involved in the school education programs offered by the RBGS. This set of data will provide the basis for the two major contributions of this thesis to the work of educators at the RBGS and in botanic gardens across the world. Firstly the research establishes that learning experiences form the basis of the recalled experiences of students and teachers on excursion to the RBGS. The thesis will examine the nature of the learning that happens in a botanic garden and establish it as a unique out-of-class learning experience. The second contribution of this research is a set of guiding principles for school programs that have been derived from the data and scrutinised by a reference group of botanic garden educators from Australia, England, Europe and the USA.

This thesis holds that for school students learning in botanic gardens is two-tiered. First tier learning relates to short-term learning outcomes set by visiting classroom teachers and second tier learning refers to that sort of learning that forms part of the personal knowledge schemes of the learner. Evidence obtained from school groups visiting the RBGS suggests that both types of learning occur at the RBGS. The overwhelming inference that can be made from this research is that a botanic garden is a highly successful[2] location for learning. Plants and places encountered by school students form part of both the intended short-term learning outcomes and students' personal long-term recollections. Indeed the learning experiences students have at a botanic garden can be said to be unique in their clarity of focus and relevance to students of all ages.

The proposition that learning in a botanic garden is two-tiered requires consideration of definitions of learning that can be found in the wider body of education literature and research that will be discussed in Chapter Two. The proposition that learning in botanic

[2] 'highly successful' in the sense that students' excursion experiences with plants and environments at the RBGS are meaningful and form part of their long-term memories

such as zoos, field study centres, science centres and museums. The body of research relating to learning in out-of-class situations will be reviewed in Chapter Two.

It is not the intention of this research to explore the evolution of the role and definition of the modern botanic garden and the reader may be directed to other works (e.g. Wyse Jackson & Sutherland 2000) for discussions on this matter. This thesis adopts the following definition of a botanic garden.

> "Botanic gardens are institutions holding documented collections of living plants for the purposes of scientific research, conservation, display and education" (p27 Wyse Jackson 1999).

A number of researchers in museum education include botanic gardens in their definition of a museum (e.g. Falk & Dierking 2000, Hein 1998) and indeed some aspects of research of museum education may inform this thesis. Hence a botanic garden may be viewed as a museum in the broadest sense of the word.

Falk & Dierking are emphatic that learning happens on any visit to a museum (2000) and comment that clearer conclusions can be drawn about the learning potential of museums if the learning intentions of the visit are known to the researcher. Research of teachers' purposes for excursions (e.g. Mitchie 1998, Hearder 1994) indicates that learning is a component of teachers' expectations for their students. The small body of research that has canvassed the recollections of school students involved in excursions (Lai 1999b) indicates that their recollections can be linked to the expected learning outcomes set by their classroom teachers. This thesis will survey the learning intentions of teachers and their relationship to the recollections of accompanying students to shed further light on learning in a botanic garden.

It is the intention of this thesis to use the data generated by the study to indicate areas of theory that may be relevant to school education programs in botanical gardens. A limited number of researchers have applied a range of education theories to the learning that

happens outside the school classroom. Hein (1998) proposes the use of constructivist perspectives to explain learning in museums. Other researchers have described the need for theory to explain the experiences of visitors to museums (Ansbacher 1998a). A handful of researchers have proposed theoretical perspectives to explain their research of school excursions. This research includes Lui's theory of experiential learning for school excursions in geography (1999b). These theoretical perspectives on the nature of learning will also be explored in the literature review. Once these areas of theory are identified in the Literature Review it may be apparent after reviewing the data presented in Chapters Four, Five and Six that further research may be required to provide relevant theory to inform the experiences of school students on excursion to a botanic garden.

The next chapter will situate this research in the wider body of work relating to education in botanic gardens and other museums. Once methodological issues have been considered in Chapter Three, the next three chapters will present and discuss the data relevant to the excursion experiences of teachers and their students at the RBGS. Chapter Seven will present the guiding principles for education programs in botanic gardens and Chapter Eight will summarise the findings of the thesis relating to the excursion experiences of teachers and their students on excursion to a botanic garden. This final chapter will also describe the nature of learning in a botanic garden as a two-tiered experience placing botanic gardens in a unique position to provide an opportunity for meaningful learning for its young visitors.

Chapter Two LITERATURE REVIEW

2.1 Introduction

The purpose of this literature review is to place this thesis within a growing body of literature and research of education in botanic gardens. This literature review will demonstrate that the body of work from botanic gardens has strong links with research in other museums and also with the wider literature of mainstream educational research. Each section of this chapter will explore the literature on a specific aspect of education in botanic gardens. This work will then be linked to the wider body of literature of education in other museums and of mainstream education research. The three sections of this chapter are:

1. Education in botanic gardens
2. Research of school excursions to botanic gardens and other museums
3. Theoretical aspects of education in botanic gardens and other museums

The literature base from which a sense of the issues, concerns and practice of botanic garden educators can be derived is located in two main sources: proceedings of international congresses for botanic gardens educators and from a biannual publication entitled *Roots* published by the Botanic Gardens Conservation International (BGCI). From time to time articles about education in botanic gardens can be found in *Public Garden* the journal of the American Association of Botanical Gardens and Arboreta. Occasionally other sources of information can be found in journals or conference proceedings relating to museum education or to teaching science and environmental education.

Close study of the body of work relating to education in botanic gardens reveals that it is

a literature of case studies with an educational rationale based upon international scientific and environmental policy documents[1]. This literature of case studies is characterised by its tight focus on these documents and their implementation rather than being an eclectic mix of anecdotes about education programmes operating in specific botanic gardens. It appears that BGCI as the organising body for international congresses and the education newsletter *Roots*, is highly successful in promoting the focus of botanic gardens and botanic gardens educators on global conservation of plants. Rather than being a didactic process, BGCI encourages wide consultation in determining the education agenda by adopting participatory processes to generate themes for international congresses and for issues of *Roots*.

Study of the literature of botanic gardens education reveals a discourse of practice that is more likely to report than discuss and to model rather than critique. The body of literature is characterised by its descriptive nature and by its representation of education programmes in botanic gardens from around the world. This global view provides insights into a highly diverse field of educational practice and presents a multitude of approaches to education in botanic gardens. This literature review provides an opportunity to consider the role of education in botanic gardens and its relationship to established areas of education practice as well its own attempts to describe and define itself.

2.2 Education in botanic gardens

2.2.1 Two centuries of public education

A traditional association between botanic gardens and education can be traced to the earliest university botanic gardens of sixteenth century Europe (Davis1996, Boden 1989, Walters 1979). These early gardens were the focus of study of medicinal plants and then, with the rise of modern natural science, botanic gardens provided the material for botanical study of plants and plant classification. The great world explorations of the

[1] These documents include: World Conservation Strategy: Living Resource Conservation for Sustainable Development (IUCN, UNEP & WWF 1980), Caring for the Earth: A Strategy for Sustainable Living

seventeenth and eighteenth centuries brought a bounty of exotic plants back to the botanic gardens of Britain and Europe expanding opportunities for both scientific and horticultural study of plants. With the rise of concern for public education in the nineteenth century, botanic gardens broadened the focus of education to include programmes for the public and their access to the plant collection.

Education programmes in botanic gardens are located within a tradition of science and specifically natural science and botany. A modern interpretation of this traditional focus reflects the late twentieth century call for 'science for all'. Leaders in botanic gardens (e.g. Ingram 1992) share the perception that the general public must be informed about science to enable informed decisions about issues such as genetic engineering and the conflict between agriculture to feed a world population and conservation of natural habitats.

> "Botanic Gardens have a vital role to play in public education, and have the capacity to become the shop windows for the whole of plant science .... places where the public may be informed about plants and where young people may be inspired and have their plant science education enhanced" (p121 Ingram 1992)

A leading role in the professional development of classroom teachers in science has been taken by botanic gardens in America's midwest (Rossman 1996, DeBuhr 1996, Grall Reichel & Rossman 1995). This recently demonstrated leadership in science education in botanic gardens is due to a range of factors including "living collections, staff expertise and tradition of hands-on approaches" as well as "foundations in inquiry and experiential learning" (p37 Grall Reichel & Rossman 1995). Literature relating to learning science beyond the classroom reinforces this perception that venues such as botanic gardens and other museums "provide students with captivating science experiences" (p 433 Ramey-Gassert 1997).

(IUCN, UNEP & WWF 1991), Convention on Biological Diversity (UNEP 1993), Global Strategy for Plant Conservation (UNEP 2002)

The past three decades has seen an increasing emphasis on the need for education for plant conservation – especially in the USA. Peter Raven, the Director of Missouri Botanical Garden elucidates a view of education shared by many botanic gardens that "botanical gardens should be active (in) the illustration for a general public of how we depend entirely on plants and how we must value, preserve and use them" (p9 Raven 1997). Roy Taylor, President of the Chicago Horticultural Society, in his address to the Royal NZ Institute of Horticulture in 1992 provides one of the first insights into a perception of a botanic garden as a focus for change in community attitudes and values.

> "The garden can become a fulcrum for change and can give new meaning to economic development, social change, education and conservation awareness. Through such activities an increase in conservation ethics and science literacy can be achieved in our communities.... I believe gardens should accept the challenge of participating in change within our communities. This should be at the regional, national and international level." (p111 Taylor 1993)

Corresponding sentiments from British botanic gardens at that time did not appear to be as clear. A study of Directors of British botanic gardens by Dixon (1991) reported that only 38 per cent of respondents considered that the garden for which they had responsibility had any role in increasing environmental awareness. By 1996 Davis reported that "the impact of environmentalism has been so great that even the older and scientifically active gardens are re-evaluating their objectives, often taking a more conspicuous conservationist role" (p231 ibid). In the wider community it appears that the traditional view of science as deterministic and reductionist is being replaced by 'new science' (Prigogine & Stengers 1985) that views its practice as more in keeping with an 'ecological age' (Gang 1990).

Willison, editor of *Roots*, expresses the challenge for botanic gardens:

> "The modern botanic garden is a creature of the scientific age. Yet as we move towards the new millenium it is clear that this orthodoxy is ripe for challenge. A new environmental paradigm, articulating a new relationship between science and sustainable development needs

to be in place. It is critical that botanic gardens are at the heart of this debate." (p2 Willison 1996)

It appears that the modern botanic garden maintains its focus on public education about plants with a growing emphasis on considerations of global policies and how these may be translated into effective action for plant conservation. The next part of this section investigates international policy statements that have been applied to botanic gardens. The theoretical and practical application of this policy to education in botanic gardens will then be considered.

2.2.2 Towards education for sustainability

Global recognition of the plight of natural ecosystems and the consequent decline in numbers of living species has lead to the development of international statements and policies by agencies of the United Nations. The most recent of these policies that relate to botanic gardens is the *Global Strategy for Plant Conservation* (UNEP 2002) with its long-term objective "to halt the current and continuing loss of plant diversity" (p1 ibid).

This global strategy has five areas of sub-objectives:

- understanding and documenting plant diversity
- conserving plant diversity
- sustainable use of plant diversity
- promoting education and awareness about plant diversity
- capacity building to support plant conservation. (UNEP 2002)

To compliment this policy document, the BGCI signed a Memorandum of Understanding with UNEP in February 2003 to formalise the role of botanic gardens "to assist in the coordination and support of the development and implementation of ... the GSPC" (BCGI 2003a). "A global policy framework for botanic gardens worldwide to contribute to biodiversity conservation, particularly as it relates to the implementation of the Convention on Biological Diversity and its Global Strategy for Plant Conservation"

(BGCI 2003b) has been provided by the International Agenda for Botanic Gardens in Conservation (BGCI 2000).

The International Agenda for Botanic Gardens (IABG) describes the "global mission of botanic gardens worldwide in conservation:

- Stem the loss of plant species and their genetic diversity worldwide.
- Focus on preventing further degradation of the world's natural environment.
- Raise public understanding of the value of plant diversity and the threats it faces.
- Implement practical action for the benefit and improvement of the world's natural environment.
- Promote and ensure the sustainable use of the world's natural resources for present and future generations." (p10 BGCI 2000)

Close inspection of these statements reveals that the educational role of botanic gardens has broadened from promoting public understanding to that of facilitating 'practical action' and 'promoting' sustainable use of the world's resources. Education in botanic gardens appears to be linked to the conservation projects of a botanic garden, incorporating a traditional focus on imparting information as well as encouraging involvement in real, action-oriented projects.

It appears that this document encourages botanic gardens to adopt education strategies that

- inform the public about plant conservation
- are action oriented
- develop a custodial attitude towards the natural environment
- incorporate a futures perspective.

The Agenda goes on to state that "the role of botanic gardens is as an advocate for the maintenance of biodiversity and therefore botanic gardens need to reorient their

education programmes and incorporate a vision for a more socially and environmentally sustainable future (p34 BGCI 2000). The document has set global targets for implementing the International Agenda and one of these relates to education:

> "Public education programmes on conservation, sustainability and the environment are created and/or strengthened." (p50 BGCI 2000).

According to the document the success of this target can be determined by:

> "the number of public education programmes operated by botanic gardens on a national, regional and international level; percentage of visitors to botanic gardens aware of environmental and conservation priorities and the role of botanic gardens; attitudes of the general public to plant conservation and environmental protection." (p50 BGCI 2000)

This sharp focus on a global policy of plant conservation for botanic gardens can also lead to framing questions that define the essence of a botanic garden such as questions about the role and purpose of the living collection of plants. Oikawa and Kendle (2001) question the traditional emphasis on eclectic collections of plants, which over the years (and centuries) lose their original purpose and meaning. Furthermore the authors report that more recent emphasis on collections of rare and threatened plants has been criticised as playing virtually no role in global attempts to conserve the world's flora. Hence the role of the living collection of plants is seen as problematic in the wider botanic garden's arena.

One of the proposed solutions to this dilemma appears to be the promotion of public education as the primary justification for a living plant collection rather than its traditional role of supporting scientific and horticultural research. Oikawa & Kendle (2001) conclude by promoting the role of botanic garden educators within the institution "perhaps most urgently, the living plant collections which are becoming confused in terms of direction and role, would benefit from much greater commitment of and communication with education officers" (p82 ibid). The authors report that botanic garden educators appear to be more familiar with education for sustainability and hence

may be able to inform policy and practice in management of the living collections of botanic gardens.

It appears that global policy documents maintain the traditional link between botanic gardens and public education. However the educational role of the modern botanic garden has broadened to become closely linked with the task of curbing the global threat to natural environments. Traditional approaches to science education, based on the asymmetrical notion of transmitting information from the garden to the public need to be re-focussed to incorporate the pedagogy implied in education for plant conservation and sustainability.

a. Education for sustainability: theoretical perspectives

Education for sustainability has been a dominant theme in the three international conferences for botanic gardens educators held since 1996. Keynote speakers at these conferences include leading environmental educators John Fien and John Huckle who provide insights into the theory and rationale for environmental education and more specifically education for sustainability.

Huckle (2001) challenges botanic gardens educators "to consider the role you may play in the social construction of unsustainable natures and to engage with colleagues and communities seeking to reconstruct nature in more sustainable forms" (p28). Fien (2001) considers issues involved in moving education programmes beyond the traditional nature-based work of many botanic gardens' education programmes to incorporate education for sustainability. He acknowledges the role of nature-based programmes in providing students with "self-confidence, and esteem and a sense of oneness with nature" (p13) but calls for consideration of an educational situation that can be seen to ignore the social context of the learner the environmental problems and issues of her community. He comments that nature study can be seen as a form of escapism with little apparent links to the action-orientation often required of citizens involved in working towards sustainability.

Fien and Tilbury (1998) list several 'emphases' in education for sustainability:

- linking studies of the natural and social world
- emphasis on environmental citizenship
- development of ethics and values education
- incorporation of a futures perspective.

The authors state "education about bio-diversity and other nature-based themes needs to be immersed in concepts of human rights, equity and democracy" (p22 ibid). Closely associated with this approach are the notions of environmental citizenship and ethics. Such education involves the development of a 'politically literate' citizenry (Huckle 2001). The implied pedagogy for this form of education is that of promoting active involvement in real issues-based situations and inviting critical consideration and change to personal lifestyles (Gough 1987).

In her summary of the 1996 international conference themes Ashwell (2001) provides further insight into approaches to education for ethical and behavioural change.

> "As teachers we are used to being the purveyors of knowledge. As environmentalists we are accustomed to inhabiting the moral high ground. Therefore on two accounts we must beware of the tendency to view ourselves as 'good', the public as somehow 'bad' or 'ignorant' and our role as changing their attitudes and behavioural (sic) so that 'they' can become more like 'us'. This approach may appear particularly rational – however, it is also presumptuous and inappropriate if the sustainable world we envisage is to be peopled by active, critical-thinking citizens participating in a just society." (p15 ibid)

It appears that the theoretical approach to education in botanic gardens calls for a more participatory, action-oriented approach. The next section explores examples of education programmes that model this approach.

b. Education for sustainability: education practice in botanic gardens

The notion that botanic gardens world-wide should embrace education for sustainability appears to be taken up by the global network of botanic garden educators. Some of the most dynamic applications of education for sustainability are found in the writings of botanic garden educators from South Africa and India. The programmes produced in both countries are the subject of reports that span almost a decade proving their resilience and perseverance in difficult social and economic climates.

For educators in South Africa a prime concern arising out of their struggle for participatory democracy is effective participation of its citizenry. In Ashwell's words

> "We believe that, within the context of our botanical gardens, the provision of quality education programmes can contribute to the development of an informed, critical and confident citizenry equipped to participate in decision-making about our shared resources towards a sustainable future." (p34 Mkefe & Ashwell 2001)

Ashwell proceeds to outline the education strategy that assists the South African network of eight botanic gardens to work towards the achievement of the social justice goals they share. The programmes are characterised by facilitating access to the resources of botanic gardens by all members of the community, collaboration with other environmental and science education organisations, professional development of staff and other education providers to build local expertise, working with local communities to improve living conditions.

Educators in India visualise goals relating to preserving indigenous knowledge of medicinal and food plants. Pushpangadan (2002) relates the role for botanic gardens in India to "safeguard the interest of the local regions as well as the people" (p18 ibid). This role for botanic gardens is seen as a way of implementing the Convention on Biological Diversity. This legal instrument provides a mechanism for "traditional societies, individuals or countries to ... share the financial benefits accrued from the use

of biological resources and associated knowledge systems of the tribal/local communities" (p18 ibid).

The ethnobotanical project in India (Shanavaskhan, Binu, Rajasekharan, Thomas & Pushpangadan 2001) can be characterised by active participation by the local community to improve living conditions, knowledge sharing to build expertise in the local community, empowerment and support of participants to be agents of change in their own communities and creation of legal systems to protect the local knowledge from exploitation. It is clear that the educational roles of the botanic gardens in both of these countries embodies the 'emphases' for education for sustainability promoted by Fien & Tilbury listed in the previous section.

This part of the literature review has provided insight into the range of emphases given to the educational role of botanic gardens. Botanic gardens can be viewed as being providers of scientific information about plants reflecting a more traditional approach to education. Botanic gardens can also participate as change agents within local communities, working towards goals of sustainability and promoting a more active citizenry. The education programmes within botanic gardens can be located along this continuum – from the more traditional science focus to the location of programmes of action for community change. Often this continuum can be found within an individual garden demonstrating the wide range of education programmes operating within a single botanic garden. The next part of this section of the literature review explores the range of case studies relating to education programmes within botanic gardens.

2.2.3 Education programmes in botanic gardens

This part of the literature review explores descriptions of practice in botanic gardens education and the literature of case studies built by and for botanic garden educators. While this body of work cannot be characterised by a paradigm of critical reflection on practice, the case studies themselves stand as an unspoken challenge to their readers to consider their own practice in the light of the reported practice of peers.

a. Descriptions of practice in botanic gardens education

References that define and guide practice in botanic garden education are rare, the few examples include a set of guidelines for developing environmental education programmes in botanic gardens (Willison 1994). This document is a product of wide consultation with botanic garden educators from around the world and aimed to assist individual botanic gardens to set up environmental education programmes. The guidelines reflect a concern for management and administration of programmes while the need to communicate practice is met by use of case studies.

A second example of communication of practice in botanic garden education was made in 1996 with Ashwell's summary of good practice in botanic garden education:

- "Firstly, our programmes need to be sensitive to context. They may be inspired by ideas from afar, but they need to acknowledge local political, social and economic imperatives, and the ecological environments in which they are located.

- Secondly, good education is characterised by integration – of areas of learning, of sociocultural and ecological systems and issues, of theory and practice, and of institutions of learning and real life situations.

- Because it takes place within a changing environment, good education is dynamic. It requires participants to engage in ongoing evaluation, both individually and together, so that themes, methods and approaches remain socially relevant.

- Good education acknowledges the apparent contradictions and conflicting schools of thought which arise in different contexts, understanding that it is these tensions which maintain the dynamic and responsive nature of teaching and learning.

- Finally ... good education *starts with* rather than *results in* (article's emphasis) action to address issues of common concern. Through such action, learning is automatically contextualised, useful and collaborative. It requires the clarification of ideas, values and

understanding – and generates ever-changing social situations in which we learn by experience to engage in the processes of participatory democracy." (p17 Ashwell 2001)

This articulation of good practice incorporates the notion of Fein & Tilbury (1998) 'emphases' in education for sustainability discussed in the previous section of this chapter and goes on to incorporate the need for education that is both relevant to the local context of a particular botanic garden and informed by global policy. Ashwell views the need to evaluate as a means of continually providing a 'reality check' for relevance of programmes to the local community. For Ashwell education programmes constantly change to reflect the processes at work in the community of which botanic gardens are a part. This approach to botanic gardens education promotes perceptions of co-learning, cooperation and a more symmetrical relationship between botanic gardens and their communities.

b. Education programmes in botanic gardens – a literature of case studies

The literature is rich and diverse with case studies from the oldest botanic gardens (e.g. Cappelletti et al 2001, Tjon Sie Fat 1992) to the most recent (e.g. Huiling 2002, Stirton 1998) and from most of the world's countries including Africa, India, China, Singapore, Mexico, USA, South America, Europe, Russia and Australia. The case studies in this section are grouped as whole-garden education programmes and specific programmes for school groups.

Whole-garden education programmes

Study of this literature reveals a wide range of strategies and activities that can be viewed as education programmes in botanic gardens. According to Heywood "this diversity in the types and facilities offered by different gardens makes it difficult to generalise" (p21 Heywood 1992). This thesis reports on the widest possible range of strategies, activities and programmes that are viewed by their author as contributing to the educational role of their particular botanic garden.

It appears that the basic strategy for education in a botanic garden is use of plant labels and 'exhibition'-type labels in garden beds (e.g. Davis 1996, Almond et al 1989, Boden 1989, Walters 1979). Another area of practice is to create plant displays for specific educational purposes e.g. displays of tropical plants housed in glasshouses or ecological plantings such as plants of arid areas (e.g. Davis 1996, Bisset 1992). Other common thematic plantings in botanic gardens include medicinal plants, rare and threatened plants and plant taxonomy. Associated with this educational role of the plant collection is the use of sculptural elements and displays "to explore the interactions between art and the environment" (p236 Davis 1996) and "the means of conveying sensitivity towards plants to a much wider audience" (p126 Ingram 1992).

Education programmes may include the development of publications including plant information, self-guided walks and teacher information kits (e.g. Cappelletti et al 2001, Almond et al 1989). Some botanic gardens with associated scientific research publish scholarly journals to communicate research to other scientific institutions. The literature also addresses the use of computer technology as an education strategy e.g. development of CD roms (Linares 2001).

Face-to-face education programmes conducted by botanic garden staff are also common in botanic gardens. These programmes include sessions for school groups (e.g. Jones, 1992, Suhirman 1992) and delivery of lectures and courses (Wedge 2001, Ingram 1992). Many gardens have guided tours of their plant collections conducted by trained garden staff including volunteers (e.g. Ruellan 2001, Almond et al 1989). Botanic gardens may also offer on-site interpretation where staff stationed at displays can interact directly with visitors by answering questions or discussing objects or other parts of the display (e.g. Davis 1996).

As discussed in the earlier part of this review botanic gardens may also be involved with education programmes that take the message of the garden into the community. These outreach programmes include community garden projects (e.g. Jones 1992) and tours to isolated communities (Young & Stewart 1989). Botanic gardens may also form

partnerships with other institutions to achieve educational outcomes (e.g. Wedge 2001, Tjon Sie Fat 1992).

In the literature, case studies of a whole-garden view of education programmes (e.g. Seshan 2001, Sizykh 2001, Spector 2001, Jones 1992, Bramwell 1992, Ingram 1992) generally provide a brief history of the garden and then describe the range of education programmes offered by the garden. The reports often provide a rationale or mission statement for the garden and then proceed to link education programmes to this rationale. Ingram's discussion of the role of the Royal Botanic Garden Edinburgh in public education for scientific literacy (Ingram 1992) involves a discussion of the need for public understanding of science and then a description of a number of education programmes that will support this objective. These programmes include provision of information, public lectures, exhibitions of art and sculpture, school education programmes and a professional development programme for secondary science teachers.

Case studies of some new and developing botanic gardens report a rationale closely associated with the conservation of plants (e.g. Ruellan 2001) or associated with sustainability (e.g. Stirton 1998). The rationales for both gardens are tied closely to global aspirations that have been applied to the local situation. In the case of the French garden, it shares with eight other gardens the task of "recording French flora, preserving in situ and ex situ threatened wild species and educating the public on conservation issues" (p137 Ruellan). Similarly Stirton states "the ethos of the garden arises from concerns of the Rio de Janeiro Earth Summit, Agenda 21 and the aspirations of an emerging confident outward looking Wales taking its place in the modern world" (p39 Stirton 1998). The education programmes developed in both gardens focus on the local action modeled by the gardens to address issues of conservation and sustainability. It appears that these programmes involve the more traditional approaches of providing information, exhibitions and guided tours.

These case studies of whole-garden approaches to education are descriptive and provide some insight into the range of strategies adopted by individual gardens to address their

educational role. There appears to be limited scope for discussion of issues such as those raised by Ashwell's statements of good practice in education and adoption of strategies associated with education for sustainability. In terms of Ashwell's statements few articles refer to any research of the needs and interests of their visitors nor of the local community. Few programmes report any method or consideration of evaluation and it appears that presentation of the programme and attendance by appropriate numbers of participants are viewed as appropriate indicators of the success of the endeavour (Beckmann 2002).

The case studies provide limited insight into the pedagogy of the programmes associated with these gardens. It appears that the education strategies adopted by many gardens are the traditional asymmetrical approach associated with providing information, lectures, guided tours, exhibitions and plant displays. There are glimpses of community participation and other social action roles that these gardens may be adopting.

Programmes for school groups

The literature reveals a wide range of approaches to catering for visiting school groups. Many botanic gardens have staff dedicated to serving the needs of school groups while other botanic gardens have few, if any, specialist educators working with school groups. The majority of case studies relating to schools involve the development of programmes for schools that form part of the geographical community within which the botanic garden is located. Many projects involve development and delivery of specific programmes for school groups visiting a botanic garden.

The case studies also present a wide range of approaches to working with visiting school groups. Programmes can range from highly structured, content-based excursions (e.g. Valsala et al 2001) to student involvement in open-ended, flexible activities (e.g. Baughan 2001, Graham & Bird 2001a). Students can take part in role plays and games (e.g. Price & Willison 1993) or conduct investigations in the garden environment (e.g. Foster 1996). Other education programmes for school groups involve creating activities for groups that may not otherwise visit a botanic garden such as foreign language

students, hearing-impaired students and early childhood students (e.g. Meredith 2001, Ondertoller et al 2001, Race 2001).

While many programmes appear to be created and delivered by botanic gardens educators other programmes are the product of collaborative action research-type projects between botanic garden educators and teachers from local schools (e.g. Graham & Bird 2001b, Batty & Baughan 2001). The African experience with its emphasis on capacity-building reports a dynamic situation where teachers are involved in action research-type projects. Here, groups of teachers are assisted to identify environmental problems in their own school and then to work as change agents in their school as they involve staff and students in processes that address their identified environmental issue (Symons 2001).

Educators in botanic gardens adopt many roles in the process of design and delivery of education programmes for schools. These roles include facilitator, content specialist, teacher and guide. As a facilitator the botanic garden educator may host networks of teachers and other educators (e.g. Mkefe & Ashwell 2001, Shenk & Ceska 2001). They may also encourage partnerships with other organizations to host programmes for schools at the botanic garden (e.g. Graham 1995).

Botanic garden educators can also be seen as content specialists in science and environment-related areas or in science and environmental education. In this role the botanic garden educator may conduct training sessions (e.g. Fifield Murray 2001, McGlew 2001, Linares 1992) or professional development courses in science or environmental education (e.g. Wagner & Olien 2001, DeBuhr 2000, Sanders 1995). Botanic garden educators may also write and produce publications such as books, pamphlets and information sheets.

As a teacher the botanic garden educator demonstrates awareness of school curriculum documents and can design materials and activities that meet the expectations of teachers and students. The lesson programs designed and delivered by botanic garden educators

are located in this part of the literature (e.g. Graham & Bird 2001b, Race 2001, Sanders 2001). Many botanic gardens choose to design self-guided materials for school teachers (e.g. Foong et al 2001, Adjie & Meredith 2000, Buntin Myhill 1997). These materials often provide self-guided trails and worksheets for classroom teachers to use at the particular botanic garden.

This part of the review has demonstrated that there is a diverse range of education programmes for schools and botanic garden educators adopt a range of roles in the design and delivery of these programmes.

2.2.4 Summary

Study of the educational role of botanic gardens indicates that this role has changed over the centuries, often reflecting trends in the wider community. One of the oldest educational roles of botanic gardens is that of supporting academic study of the scientific and medicinal use of plants. This role broadened in the nineteenth century with the adoption of a conspicuous trend towards public education – especially popular education in the botanical and natural sciences. Thus the educational role of a botanic garden became associated with scientific study of plants – particularly plant diversity and taxonomy.

With the dawn of the 21st century concern grows for conservation of the world's biodiversity and correspondingly botanic gardens are demonstrating movement towards a focus on education for plant conservation. The literature of case studies of education in botanic gardens provides examples of practice that link scientific literacy with environmental citizenship.

Discussions of theoretical aspects of education in the modern botanic garden have resulted in some movement towards elucidation of 'good practice' and 'emphases' in practice. These factors can be summarised as follows.

- Education programmes in botanic garden focus on the development of scientific literacy and environmental citizenship.
- Education programmes are relevant to the community of which the botanic garden is part. These programmes may be informed by global policy but ongoing research of the needs of the local community and of specific groups within that community frames the scope and specific focus of education programmes in the botanic garden.
- Education programmes in botanic gardens encourage community involvement in real, action oriented projects.

2.3 Research of school education programmes in botanic gardens

Research of school excursions or field trips to botanic gardens is represented by a very small body of work however it stands as representative of the wider tends in the body of literature relating to primary and secondary school field trips to museums, science centres, zoos and field study centres. This section of the literature review focusses on that body of literature perceived to be most similar to the excursion experiences of school students on a day trip visiting a botanic garden. Two distinct groups of studies can be detected within this body of research. Firstly, that body of field trip research relating to 'cognitive and affective gain' represented by Farmer & Watt (1995), Valsala et al (2001) and South (2001a, 2001b). In this research paradigm, a primary concern of researchers is to establish the cognitive understandings or attitudinal changes developed in students as a result of their field trip.

The second trend in research of field trips is that of researching the lived experiences of participants. In this research paradigm researchers are concerned with the meanings made by students and teachers of their excursion experiences. The studies reflect a concern with defining learning in a broader sense than achievement of set cognitive or affective outcomes. The work of Sanders (2001), Tunnicliffe (2000a, 2000b) and her colleagues (Tunnicliffe & Johnson 2000, Reiss & Tunnicliffe 1999) and Askham (1976) are examples of this paradigm in botanic gardens. These two areas in research of field

trips are discussed in the following section of this literature review with research from botanic gardens highlighting the purpose, methodologies and findings of each.

2.3.1 Research of cognitive and affective gain

It appears that most researchers in this field would concur that excursions in themselves do not guarantee any cognitive gain (e.g. MacKenzie & White 1982). However it appears that one of the most widely researched area of field trips is that of research of cognitive gain made on the excursion and of the conditions that foster such cognitive gain (e.g. Millan 1995, McLaughlin 1994, Wright 1980). For many researchers the primary purpose of a school excursion should be a demonstrated increase in students' factual understandings. Research reported by Valsala, Ravi, & Pushpangadan (2001) is illustrative of this view. The researchers involved in this project with high school students in India were seeking "to find out how botanic gardens can be made into an institutional establishment that makes school children identify and understand the different types of plants which are commonly grown in our villages and/or countryside" (p99 ibid).

The work of Farmer & Watt (1995) highlights a further aspect of this paradigm and that is to research the conditions that maximise cognitive gain by students on excursion. Farmer & Watt established that "(school education) programmes that have been most successful are those that incorporate three critical elements as defined by researchers of museum education: previsit planning, previsit preparation, and object-oriented activities" (p33 ibid). The researchers are concerned with the "effectiveness of follow-up activities as a part of field trips" (p33 ibid).

Other researchers in the field have established that specific learning outcomes can be achieved on excursions when classwork is linked to the excursion experience. For example in their study of senior science students, Orion and her colleagues concluded that "field trips can be successful as an instructional strategy and can create a positive learning environment provided that students are prepared adequately and have a clear knowledge and understanding regarding the objectives and activities of the field trip."

(p169 Orion et al 1997). This preparation involves students being familiar with three areas identified by Orion & Hofstein (1991) as the assignment for the excursion (cognitive preparation) the actual venue for the excursion (geographical preparation) and the kind of experiences students will have on the day (psychological preparation).

Many researchers propose models to assist teachers to plan excursions as part of their classwork with students (e.g. Grieef 1999). Some of the more comprehensive models include Orion's Multi-Stage Model (Orion 1993) for developing science excursions that are relevant to secondary curriculum. This model targets teachers and requires detailed understanding of the excursion venue and curriculum areas that lend themselves to fieldwork. However in spite of stating the desirability of hands-on experiences there is no component of the model to guide the development of these activities. It appears that the model is driven by the requirements of teachers and relates most to senior science curriculum where student learning is directed by external syllabus requirements. Griffin (1999) proposes the use of a framework to "provide teachers with alternative ways of organising, planning and running school visits in order to maximise the learning potential of informal science education settings" (p5 ibid). This framework is based on three guiding principles: integration of school and museum learning; provision of conditions for self-directed learning and facilitation of learning strategies appropriate to the setting.

The work of South (2001a, 2001b) is concerned with the effect of an excursion to a botanic garden on primary children's environmental awareness. She defines environmental awareness as both a superficial and an in-depth consciousness of immediate surroundings and introduces a body of research relating to children's perceptions of vegetation. This research suggests that, for children, plants are invisible "Children could visit a forest but see nothing .... plants there were not perceived as a living community of value in its own right" (p89 South 2001b). Citing this research and a common belief that children are not interested in plants, South takes the position that there is little or indeed no scope for an excursion to a botanic garden with its short time frame to make any impact on children.

South's methodology was based on the notion that students' drawings of leaves could be compared before and after their excursion to the botanic garden. She found that "there was an increase in the percentage of atypical leaves in the second set of drawings for all classes" (p90 ibid) and concludes that the visit to the botanic garden has an impact on the environmental awareness of students. Furthermore children between the ages of 7-9 years and students from inner city rather than rural areas respond best to this situation.

South's research has revealed a wider range of issues concerned with the short excursion to a botanic garden. She found that childrens' responses to questions from a botanic garden educator "were directly attributable to work done with the (classroom) teacher, and these were adhered to, even when work done during the visit has highlighted previous concepts as erroneous i.e. there were flaws in the teachers' conceptual understanding which were accepted by their pupils" (p81 South 2001a). This aspect of the short visit may indicate that, for primary students, the experience may not result in scientifically 'correct' factual understandings. For South this aspect of her research indicates that botanic garden educators "will also teach the teachers" (p81 ibid). Furthermore school programmes offered at a botanic garden "need to be varied and cover as many subjects as possible, to have an appeal to a broad band of teachers" (p81 ibid).

This research has had an impact on the practice of education at South's botanic garden. Her research has revealed that excursions to a botanic garden can have an impact on children and this reassuring finding results in an emphasis on activities with a "high degree of plant interaction", an "extensive repertoire of games and activities" and a continuation of a "policy of no worksheets" (p94 South 2001b).

The methodology employed by many researchers in this paradigm is demonstrated by these three groups of botanic garden researchers and is based on a quantitative approach employing strategies such as pre- and post-testing of student understandings. It appears that this methodological approach is at its most powerful when the field study relates to

achievement of specific learning outcomes, with large groups of students in a tightly focussed field trip experience. Valsala et al are able use their test results that clearly demonstrate an increase in students' ability to identify specific plants to conclude that "the botanic garden itself is an effective tool in the formal ... environmental education process" (p105 Valsala et al 2001). Similarly Farmer & Watt are able to use their test results to support their case that "the use of follow-up activities by educators and museum staff ... (does) reinforce and solidify the concepts discussed on field trips" (p34 Farmer & Watt 1995). South can point to concrete evidence for the effectiveness of school excursions to botanic gardens in increasing students' environmental awareness.

At its best this paradigm has produced models that provide useful frameworks for conceptualising the excursion as a means of extending learning beyond the classroom and into areas of rich resources. The work has served to secure the notion that student involvement in activities and programmes in learning venues beyond the classroom is a highly successful strategy to promote learning in a wide variety of curriculum-based subject areas.

At its worst this paradigm of field study research appears to have created an edifice of 'desirable' characteristics of school excursions. These characteristics include the assumptions that desired outcomes for excursion are cognitive, teachers are to be familiar with the target venue and with the teaching strategies that are unique to the venue. It can be seen that the concept of a 'successful' excursion is bound up with 'solidification' of students' cognitive outcomes. Furthermore the tone of some research work seems to present a view that classroom teachers may be cast as less than professional if researchers perceive that excursions are not part of current classwork and students are unprepared for the event. It appears that this view of excursions may be unnecessarily restrictive and may not provide a methodology with which to explore the nature and possibilities of the excursion experience for school students. The next section of this review discusses research that broadens the focus of excursions to include study of teachers and student perceptions of their excursion experiences.

2.3.2 Research of the excursion experience

This area of field study research is concerned with study of the experiences of the participants involved in school excursions. Although there is a perceived lack of qualitative studies of teachers and students' excursion experiences (Gerber 1996b, Lui 1999a) such research can provide rich insights into the nature of excursion experiences. Indeed it seems critical that excursion venues need to be aware of the excursion experiences of their school visitors to enable a fuller realisation of their learning potential.

This body of research can often be associated with broad conceptions of learning (e.g. Falk & Dierking 2000) that widen the traditional view of achievement of cognitive outcomes to include acknowledgement of the roles of individual meaning making and social, cultural and environmental contributions to the learning process. The methodologies of such research tend to be more qualitative with concentration on strategies that allow exploration of personal meaning-making such as interview, open-ended questions and participant observation.

Study of this body of research reveals that there are two main areas of study. Firstly there is a body of this literature that investigates the excursion event itself. This body of work includes accounts of teachers and student experiences while on excursion (e.g. Lai 1999a, 1999b), research of student conversations during the excursion (e.g. Tunnicliffe 1995), research of outcomes teachers hold for their excursions (e.g. Mitchie 1998). The second main avenue of research is that of long term recollections of visits to excursion venues.

a. Research of experiences of the excursion event itself

The experiences of teachers and students on excursion can also be studied as a holistic event tracing participants as they prepare, embark upon and reflect on their excursion. The work of Lai (1999a) concentrated wholly on the excursion experiences of 15 and 16-year-old geography students and their teachers associated with a field trip to a local

natural area. Lai found that teachers held mostly subject-specific purposes for the excursion while their students looked forward to being outside the "constraints of the classroom" (p252). On interviewing teachers and students after the excursion Lai found that the students had achieved a richer range of learning outcomes than had been expected by their teachers.

These learning outcomes included:

- a deeper understanding of subject matter
- an increased sense of time and place
- acquirement of inquiry skills
- increase skills in learning to observe
- an increase in social and life skills through group work and interviewing people.

Furthermore in the outdoor learning environment, students were found to be "more proactive" with some students taking "greater responsibility for their learning" (p252). Students retained clear visual images of their field trip. They also demonstrated different preferences for either more teacher-guided experiences or for more student-centred inquiry processes.

Lai found that the field trip itself was treated as a discrete event that was not linked to previous field trip experiences nor to current classwork. "Upon return to school, there was a quick return to the status quo of the classroom and the syllabus-driven climate of the school" (p253). Teachers recognised this shortcoming "with their perceived heavy commitments and lack of information (about field trips) the teachers had a feeling of helplessness in initiating changes to the annual fieldwork routine" (p253). Lai concludes that the learning potential of field trips may be undervalued and hence underutilised in the secondary geography classroom.

The case-study methodology used by Lai provided a rich source of descriptive data that provided insights into the experiences of both teachers and students involved in excursions. In reading his research, one can empathise with a scenario of harried

teachers and excited but less than enthusiastic teenage students embarking on a geography field trip. This methodology allows the exploration of the research situation and a similar approach has been adopted in this thesis to explore the excursion experiences of teachers and students visiting the RBGS.

Tunnicliffe has created a body of research of children's conversations while they are visiting botanic gardens on school excursions. Tunnicliffe (2001b) states that "it is important for botanical garden educators and teachers to know what their students are likely to notice and comment about when they visit plant exhibits .... educators can use what catches students' attention to stimulate teaching and learning during a visit ... as well as in the classroom" (p28 ibid).

Her analysis of primary children's conversations at plant displays reveals that children talk about the plants they are seeing with 87% of 412 conversations classed as plant focussed. In 67% of the conversations students name the plant, 56% of conversations are about the anatomical feature of the plant with the size of the feature being the largest category in these conversations. The research of Tunnicliffe & Johnson (2000) reveals further insights into the nature of these conversations at a different botanic garden. The researchers confirmed that children's conversations focus on plants (79% of conversations) with 54% naming plants and 51% focussing on an anatomical feature of the plant. Again the research demonstrated that the size of the plants was the main feature mentioned in children's conversations. Notably children rarely mention scientific topics about plants and then these topics are part of the conversation of adults accompanying the group. In this study the topics 'biodiversity' and 'sustainability' are not found in children's conversations – even though the topics may be a feature of the plant exhibit where the children are gathered.

Pressick-Kilborn (1999) as a classroom teacher used action-research methodology to "focus upon the use of a field trip to broaden students' experience of learning" (p1 ibid). The study surveys 7-9 year old students about their perception of the role of their field trip. 76% of the 42 students involved in the study explain that it is interesting to see

waterbugs in real life outside the school and further 67% of students commented that they were going to learn about water bugs. A quarter of these young students said that they were going to have fun. Pressick-Kilborn, after discussions with her co-teachers about the role of the excursion found that their purposes coincided with those of the students. This research of the field trip experiences of teachers and students reveals that students – even young students can be aware of the purpose for their field work and that teacher and student can share a common view of this purpose.

A number of studies have focussed on secondary science and geography teachers and their views of excursions (e.g. Sorrentino & Bell 1970, Hearder 1994, Mitchie 1998). These studies revealed that teachers' reasons for excursions and their views of positive benefits are closely tied and can be listed as follows:

- to provide first-hand experiences which students could not have in a classroom
- to give meaning to learning
- to stimulate student interest and motivation in the subject
- to improve students' observation and perception skills
- to use cooperative learning strategies
- to improve subsequent classroom behaviour by improving socialisation between students and rapport between teachers and students.

This list indicates that these teachers articulated a wide range of outcomes that involve social, attitudinal, metacognitive as well as cognitive aspects of their excursions. This group of reasons for excursions will be contrasted with that generated by research of teachers involved in organising excursions to the RBGS.

b. Research of recollections of school excursions

The work of Sanders is currently researching botanic gardens as learning environments. An initial study (Sanders 2000) as part of this work investigated students' responses to two questions:

- Which plants did the children remember from their visit to a botanic garden?
- What was their favourite plant?

Students recalled a wide range of plants ranging from very specific plants (e.g. cacti, bluebells) to general terms (e.g. trees, weeds). Students used descriptive terms such as 'spiky plant' or 'the big smelly tree' as well as common names (e.g. Elephant's ear). Sanders suggests a number of factors that appear to influence student recollections of plants:

- Seasonality. Recollections of plants blooming in Spring compared with recollections of plants in other seasons.
- The programme of study at the botanic garden. The locations and activities selected by the botanic garden educator can influence recollections.
- Previous work with specific plants before the excursion.

The plant that was most common in both remembered and favourite was the rose. There may be some difference between the responses of boys and girls and between groups that have had previous experience with plants they encounter at the botanic garden. Sanders is unable to provide clear reasons for these results and is pursuing these questions with further research.

A fruitful area of research is that of study of long-term recollections of excursion experiences. This research strategy has provided a range of insights, the most fundamental of which is that "field trips are thoroughly enjoyed by students and teachers and these trips produce long-lasting, positive memories of such informal learning venues as museums, zoos and nature areas" (p141 Falk 1983). Further research of the long term memories people have of their school field trips (Falk & Dierking 1997) found that "museum field trips – regardless of type, subject matter, or nature of the lessons presented – result in highly salient and indelible memories" and furthermore "three quarters of all recollections related to the visited museum's content/subject matter ....

content-related experiences were not only experienced but encoded in memory as well and recallable after very long periods of time" (p216 ibid).

Falk & Dierking summarise the findings of research of long-term recollections into eight domains:

1. "Social memories, such as who accompanied the subject on the trip and in what arrangement, such as a family or school group.
2. Specific recollections of exhibits or objects viewed.
3. The physical characteristics of the museum, such as architecture, size or floor plan.
4. Temporal memories of the visit, such as the time in the subject's life, the time of year, or the time of day he or she attended.
5. Affective dimensions of the visit, such as how it made the subject feel.
6. Whether the memories tended to be concrete or abstract.
7. Whether the memories included specific details, such as what the subject wore, what he or she ate that day.
8. Whether the museum memories were bound with other memories, such as memories bound to a hobby, interest or other concrete life experience." (p10 Falk & Dierking 1995)

This thesis will compare these eight domains with the long-term recollections of students visiting the RBGS on excursion. This comparison may also provide insights into the application of museum-based research to research in botanic gardens.

Findings of the memorable nature of excursions need to be taken one step further by considering the issue of how these memories can be linked to learning. "Memories alone, particularly all the various kinds of memories that seem to be constructed during a museum experience, do not seem sufficient evidence of learning.... Learning must involve use of these memories to solve real-world problems or to connect important ideas; learning must involve some kind of process" (p212 Falk & Dierking 1997). This thesis considers the situation where the long-term recollections of students are linked to the learning outcomes set by the classroom teacher. Learning can be said to occur when the recollections of students can be associated with the teacher's expected learning

outcomes. The research of Pressick-Kilborn (1999) reported in the previous section demonstrates a situation of correspondence between the expectations of students and teachers for their excursion.

Research studies of students' recollections of excursion experiences has revealed a number of interesting findings that have the potential to profoundly influence the programmes and activities available at excursion venues. One of the most influential set of findings demonstrates that while on excursions both primary and secondary students do not recall situation of teacher-talk they tend to recall practical-based activities (e.g. Orion et al 1997, Knapp & Poff 2001). In their widely quoted study of secondary geography field trips MacKenzie & White (1982) concluded that students directly involved in concrete interactions with the environment had achieved more and had a longer term memory of the experience. Indeed the achievement of these students was superior to both those students on the same field trip with a content-oriented approach and students who learned similar information in the classroom. Similarly Knapp & Poff (2001) conclude "an experience that is tactile and exploratory will be more memorable than a didactic/passive programme" (p63 ibid).

In their ethnographic study of the memories of 7-9 year old students of their excursions to museums Wolins and her colleagues (1992) were able to make some conclusions about the factors that explain which field trips students remembered. These are reported as:

- "High personal involvement (positive or negative) for an individual child as opposed to the whole class.
- Links with the curriculum (when the teacher embellished the unit with many varied classroom activities).
- Multiple or repeat visits to the same institution." (p25 ibid)

These studies highlight a link between students' long-term recollections of their field trip and the potential for learning. Findings indicate the persistence of such memories

and conditions that enhance their formation. This thesis will investigate students' recollections of their excursions to the RBGS to determine the nature of these recollections and their potential to be linked to learning.

2.3.3 Summary

From study of the literature in this field it is evident that there are a wide range of excursion types – ranging from a short trip out of the classroom to visit the school garden to extended overnight stays in camps. Clearly teachers conducting these excursions would hold differing expectations and the relationship of the excursion to current classwork would differ along the excursion spectrum. Obviously students involved in excursions to different venues over differing periods of time would have widely differing experiences. Furthermore it would seem clear that infants students visiting the same venue as senior science students would have widely differing experiences and teacher expectations. Curiously these basic observations are often overlooked in research that tends to view excursions as homogenous, narrowly focussed experiences.

The results from both Tunnicliffe and Sanders appear to contradict findings of the research reported by South that contends that children do not tend to be interested in plants and that for children plants are part of an unnoticed community. It appears that plants do occupy students' attention in a botanic garden and that educators may be able to utilise these opportunities for learning activities such as those that focus observations and make comparisons between different types of plants. The results of this thesis may shed further light on students' recollections of a visit to a botanic garden and the prevalence of memories of plants. The sum total of these research efforts may provide an indication of students' understanding of plants, the nature of the learning experience in a botanic garden and design of plant displays to maximise learning.

This section of the literature review has explored the body of research of school excursions to botanic gardens and to other museums. This research can be considered as being concerned with two separate domains each with their distinct focus and

methodological approach. Firstly there is a body of research associated with cognitive and affective gain from excursions. The limited research from this domain in botanic gardens education has established that botanic gardens can be successful in increasing secondary students' understanding of plants and plant identification skills. For primary students, an excursion to a botanic garden increases their awareness of plants. The methodology associated with this domain are often quantitative in their approach using pre- and post-test situations to measure cognitive or affective gain. There is an obvious need for further research that illuminates the scope for this type of learning in a botanic garden

The second domain of research of school excursions focuses on consideration of the excursion experiences of teachers and students. The open-ended qualitative methodologies often adopted in this area of research explore the nature of the excursion experience and its impact on participants. Findings of this limited research assist to identify activities, objects and other factors that promote memorable experiences. Close study of the relationship between teacher intentions and students' perceptions of the purpose for their excursion may determine the clarity and nature of memories of the event as learning experiences.

2.4 Theoretical aspects of education in botanic gardens and other museums

This part of the literature review considers work in botanic gardens, other museums and in the wider education arena that is linked to the theoretical aspects of education in a botanic garden. This thesis approaches discussion of theory with the caution expressed by Thomas (1997) as "the word has a multiplicity of meanings popularly constructed for it" (p75 ibid). He goes on to describe four broad categories of uses for theory in education as follows:

1. "Theory as the opposite of practice. Theory is thinking and reflecting (as opposed to doing).
2. Theory as hypothesis. Theory is an ideal that may be followed up, embracing looser or tighter hypothesising, modelling, heuristics and thought experiments.

3. Theory as developing explanation. This category embraces the broadening bodies of knowledge developing in particular fields.
4. Scientific theory.... theory here exists as ideas formally expressed in a series of statements." (p82 ibid)

It appears that the use of theory in this thesis relates predominantly to the first two of Thomas' categories and reflects more a situation of what theory is *not* in this research. It would be beyond the scope and context of this work to attempt to create a 'grand theory' for education in botanic gardens. However it is the intention of this thesis to reflect on the practice of botanic garden educators and the experiences of teachers and students visiting a botanic garden. The work of educators in related fields will also be considered along with the reported theoretical perspectives that underpin such work. The emerging synthesis of this process could be seen as a heuristic where the theoretical conclusions of this thesis are viewed as provisional and part of a process of educational inquiry.

This section of this review will consider the theoretical perspectives that underpin the work of educators in botanic gardens and other museums. The first part of this review considers the nature of experiential learning and other frameworks linking learning and experience. As has been shown in this review learning in botanic gardens has been typified as experiential learning and it seems important to examine the nature of this term. Although widely used the term experiential learning is difficult to define and thus interrogate as holding meaning in descriptions of the nature of learning in a botanic garden. Furthermore there is little guidance in established museum education literature to direct such an investigation. The work of John Dewey is explored to shed further light on theoretical underpinnings of Dewey's conception of learning and also the relationship between learning and experience. More recent applications of learning and experience are also presented in this section.

The second part of this section considers the theoretical elements that are required to shape an educational stance for a botanic garden. This part of the review considers Hein's model for education theories as a conceptual framework for identifying the

theoretical elements that should form part of an educational stance. Various theoretical perspectives that may be relevant to education in a botanic garden are considered in this section.

The final part of this section will consider writings about theoretical models that describe learning in both botanic gardens and the wider museum context. This work highlights progress made by practitioners and researchers in conceptualising the nature of learning in these institutions.

2.4.1 Experience, learning and botanic gardens

Recent literature suggests that the nature of learning that happens in a botanic garden may be typified as 'experiential' learning. A government policy document *Learning for Sustainability* (NSW Government 2002) used the term 'experiential learning providers' to include "visitor centres, museum exhibitions, walkways, parks and gardens and environmental education centres." (p37 ibid). This document required such providers to move from a "predominantly information-based" approach in environmental education to "participatory and experiential learning" perspective (p15 ibid).

It appears from this quote that 'parks and gardens' are required to provide opportunities for experiential learning. The nature and appropriateness of this formal connection will be explored both in this literature review and in the light of the findings of this thesis. The next section of this chapter will explore the nature and characteristics of experiential learning and consider its application to learning in botanic gardens.

a. Experiential Learning

This is a broad and loosely allied field which is reported to have grown as a subject for educational research since the early 1930s (Melamed 1985). A number of researchers, notably Lewis & Williams (1994), consider that the growth of the field is due to a number of factors including:

- changes in our understanding of the nature of learning which have moved from a behaviourist model where teachers transmit information perceived to be relevant to the learner to a constructivist model where learners build their own understandings. This situation is coupled with a disaffection with the perceived vicarious position of the learner in traditional methods of education (Melamed 1985, Boud 1989, Henry 1989, Lewis & Williams 1994)

- growth in the concept of life-long learning coupled with the numbers and influence of adult learners (Paul 1994, Lewis & Williams 1994, Miettinen 2000)

- a perception that rapid change characterises the modern world and consequently learners will need to identify those experiences that will be of benefit to a new environment (Melamed 1985, Richards 1992, Lewis & Williams 1994).

Experiential learning became associated with the concept of life long learning proposed in the UNESCO publication *Learning to Be* (Faure et al. 1972).

> "A central principle of life long learning is to incorporate the student's own experience and aspirations and to recognise the cultural aspects of learning. As individuals mature, the richness of their experiences provides not only a basis for their own learning but also for assisting others. The challenge for educators is to help the learner to integrate personal experience into current learning activities." (p2184 Paul 1994)

Experiential learning is identified as an essential component of adult learning and can be identified in programmes across primary and secondary schools, in higher education, in adult education and in management training. In the late 1980s a number of international conferences on experiential learning were initiated and held, resulting in a formal professional organisation for experiential educators.

Henry (1989) in an attempt to investigate the meanings shared by people who see themselves as 'doing' experiential education found that "even advocates of this mode of

learning are often hard put to define what they mean by experiential learning or use the term to refer to very different kinds of learning goals, experiences and outcomes" (p25 ibid). She explains that this group can be characterised by "their determination not to neglect the human side of learning and to acknowledge the role of affect and conation alongside cognition" (p27 ibid).

In acknowledging the diversity of the field, Weil & McGill (1989) use a model of 'villages' to identify four main groups of experiential educators. Perspectives characteristic of each village range from educators involved in training and vocational education, educators involved with community action and social change, educators involved with self awareness and group effectiveness to educators involved with learner-centred and learner-controlled education strategies. It is into the last group that Weil & McGill place field trips. "Within this village there are those who stress the importance of experiential learning techniques or methods (such as structured exercises, role plays, simulations, field trips and visits, project work and laboratory or field research)." (p8 Weil & McGill 1989)

This link between excursions and experiential learning has thus identified 'field trips and visits' as a teaching strategy where teachers select and use strategies that involve the learner in activities often conducted beyond the classroom. Further investigation of the links between experiential learning and 'field trips' does not reveal evidence of guidelines nor procedures for developing 'field trips and visits' as opportunities for experiential learning. Lai (1999b) in his extensive study of literature relating to experiential education concluded "that there have been sporadic attempts to mention fieldwork as providing opportunities for experiential learning. However, reference to literature on theories and practice of experiential learning are rare and sketchy" (p103 ibid). Hence it appears that while a link between excursions and experiential learning has been established there is little evidence of research of its application. Further exploration of the area of experiential learning may reveal its characteristics and provide some insights into possible links between experiential learning and 'field trips and visits'.

Henry (1989) in her survey found that the work of David Kolb forms the basis of any theory of experiential learning. According to Henry's survey Kolb's description of a four stage model of learning is the central and often the only theoretical perspective put forward by the wide range of educators involved with experiential learning. Kolb's four stages form a cycle and described as concrete experience, observation and reflection, abstract conceptualisation and generalisation, and active testing of these new concepts. The model is the basis of Kolb's theoretical perspective of experiential learning with each stage of the model requiring a different learning ability (Kolb 1984).

Kolb's theoretical approach has been criticised for its eclectic use of a range of theoretical perspectives. Reijo Miettinen, a strong critic of Kolb's approach provides the following perspective:

> "Kolb unites terms and concepts, extracting them from their idea-historical contexts and purposes and puts them to serve the motives of his own presentation. As a result theoreticians with quite different backgrounds, motives and incompatible conceptions can be used as founders and supports of experiential learning. This happens when Kolb lumps together Carl Jung, Kurt Lewin and John Dewey with humanistic psychologists, as founders and developers of experiential learning." (p56 Miettinen 2000)

This eclectic use of theoretical perspectives to provide the historical context and theoretical basis for experiential learning has resulted in criticism of the field for its epistemologically unsound approach to theory building (Garner 2000, Miettinen 2000). Various authors have made calls for further work in providing a theoretical framework for experiential learning (Bank 1985, Boud 1989, Miettinen 2000). Hence it appears that consideration of the use of the term 'experiential learning' to typify learning at a botanic garden involves an association with a field where theory is perceived to be problemmatic.

It appears that a sound theoretical basis for learning in a botanic garden may not be provided by that of 'experiential learning'. However Henry (1989) concluded her survey

of experiential educators by commenting that the strong unifying commitment to learning through experience and the typical difficulties of implementing this approach within traditional institutions can serve to unite the field. The central role of experience in learning remains the concern of a numbers of researchers who cite the relevance of the work of John Dewey to learning beyond the classroom (Falk 2000, Lai 1999a, Ansbacher 1998b, Griffin 1998). The next section of this chapter explores some aspects of the theoretical writings of John Dewey to gain a sense of the relevance of his work to learning in a botanic garden.

b. Learning and experience – John Dewey's theory of experience

One of the greatest proponents of the central role of experience in learning was John Dewey (1859-1952). While it is well beyond the scope of this thesis to present and critique the work of Dewey, this section of the literature review considers his view of the relationship between learning and experience. This somewhat limited chance to explore Dewey's writing has revealed a descriptive, practical and deeply considered view of education that are surprisingly relevant to the current educational milieu.

Dewey criticised what he termed as traditional schooling in terms that ring true one hundred years on.

> "The traditional scheme is, in essence, one of imposition from above and from outside. It imposes adult standards, subject-matter and methods upon those who are only growing slowly towards maturity. The gap is so great that that the required subject-matter, the methods of learning and of behaving are foreign to the existing capacities of the young." (p18 Dewey 1967/1938)

He proposed the establishment of progressive schools and worked with these schools to investigate the potential of democratic and humanely-based educational practices. He compared the approaches between traditional and progressive schooling.

> "To imposition from above is opposed expression and cultivation of individuality; to external discipline is opposed free activity; to learning from texts and teachers, learning through experience; to acquisition of isolated skills and techniques by drill, is opposed acquisition of them as means of attaining ends which make direct vital appeal; to preparation for a more or less remote future is opposed making the most of opportunities of present life; to static aims and materials is opposed acquaintance with a changing world." (p19 Dewey 1967/1938)

Experience as the "cornerstone of Dewey's philosophy of education" (p459 Hytten 2000) and the central theme of progressive schooling was articulated by Dewey as:

> "The more definitely and sincerely it is held that education is a development within, by, and for experience, the more important it is that there shall be clear conceptions of what experience is. Unless experience is so conceived that the result is a plan for deciding upon subject-matter, upon methods of instruction and discipline, and upon material equipment and social organisation of the school, it is wholly in the air." (p28 Dewey 1967/1938)

Tanner (1997) in her research of Dewey's laboratory school describes his learning theory as it would have been articulated to those teachers who were the staff of his experimental school (from 1896 until 1904) in Chicago USA.

> "Learning does not take place in fits and starts but when a purpose arises from the learner's own experience.... When the children are engaged in an activity that is of interest to them that presents difficulties, they look for a method of coping with the difficulties and thus acquire new skills. Additional opportunities are provided for the child to use her newly acquired skills and complete the learning circuit." (p44 Tanner 1997)

Dewey's approach was informed by his pragmatic view of the inadequacies of philosophical aspects of education in which he abandons what he described as the dualisms of western epistemology. "The history of educational theory is marked by opposition between the idea that education is developed from within and that it is formation from without." (p17 Dewey 1967/1938) A number of researchers

(Vanderstraeten 2002, Lehmann-Rommel 2000, Fenstermacher & Sanger 1998, Garrison 1997) describe and confirm Dewey's criticism of western epistemology.

> "Such discussions and analyses were simply too abstract, too removed from everyday life and the potential for realising human growth, to merit the attention being lavished on them by the more mainstream philosophical community." (p472 Fenstermacher & Sanger 1998)

Fenstermacher & Sanger (1998) describe Dewey's conception of knowledge as "grounded in action, where each person is not simply a passive consumer of knowledge but a participant in it – a creator and user of knowledge." (p468 ibid). For Dewey even the term 'knowledge' was a 'vague word' as it conveyed the notion of something detached, static and impractical. Fenstermacher & Sanger continue:

> "knowledge is not some monolithic embodiment of truth. It is not permanent and immutable; it may not even be very stable. It is not some sort of description or photograph of an external reality, independent of who and what one is as a person. It is, instead, an organic property of being human, of acting in thoughtful and discerning ways." (p471 ibid)

A survey of the writings on Dewey's philosophical works on education reveals a current, rich and controversial body of literature. Recent authors (for example Hytten 2000 and Lehmann-Rommel 2000) cite a wide range of researchers involved in what they term as the 'resurgence' (Hytten 2000) and 'renewal' (Lehmann-Rommel 2000) of Dewey in the 1990s. Dewey's philosophical writings have contributed to "environmental studies, feminist studies, multicultural studies and even cognitive science (and) are the subject of ongoing investigation by a new generation of philosophers" (p188 Lehmann-Rommel 2000 citing Hickman 1998).

Contributors to museum education have not ignored this resurgence of interest in Dewey. Ansbacher (1998b) calls for closer study of Dewey's work and the application of his educational philosophy to the theory and practice of museum education.

> "Based on the principle that all genuine education comes about through experience, Dewey's ideas are still current and particularly relevant to the theory and practice of museum education.... Still, while his name may be familiar in the museum world, his actual work and the foundation that it lays for a theory of informal education is not." (p37 ibid)

Ansbacher applies Dewey's skepticism of 'either/or' thinking to the museum situation and shares his quest for "defining the nature of experience and the criteria that distinguish it from non-educative or mis-educative experiences." (p38 ibid)

It seems to me that the pragmatic philosophy proposed by John Dewey provides a theoretical framework for education in botanic gardens. The application of this theory to inform practical situations would provide a rich heuristic in a Deweyan tradition of research of action on reflection. The next section of this review considers the application of a theory of experience to the learning situation.

A pedagogy of learning from experience

It is at this practical level of applying the ideal of learning through experience that the links between the experiential learning movement and Dewey's work are apparent. Most works on the nature of experiential learning hold that "without doubt, the two concepts that characterise the approach most clearly are experience and reflection." (p54 Miettinen 2000) Most authors stress that experience itself does not necessarily involve learning (e.g. Pearson & Smith 1985, Boud, Cohen & Walker 1993). "Reflection consists of those processes in which learners engage to recapture, notice and re-evaluate their experience, to work with their experience to turn it into learning." (p9 Boud, Cohen & Walker 1993)

Dewey recognised that students have a wide range of experiences however it is the quality of these experiences that enabled them to be 'genuinely educative'. The quality of experience has two aspects: "there is an immediate aspect of agreeableness or disagreeableness and there is its influence upon later experiences." (p28 Dewey 1967/1938) Hence there is a requirement that students enjoy the experience. However

Dewey cautions the educator about organising experiences that a merely enjoyed by the learner. "Attentive care must be devoted to the conditions which give each present experience a worthwhile meaning. Instead of inferring that it doesn't make much difference what the present experience is as long as it is enjoyed, the conclusion is the exact opposite." (p49 ibid)

The second quality infers a purposeful selection of experiences by an educator rather than a random approach where students may be presented with experiences 'to try on' (as can be the case in 'discovery learning'). Ansbacher (1998b) takes these two qualities of experience and creates a process of designing and evaluating museum exhibits that involve both enjoyment and an educative experience. Research of students' experiences may provide some insight into the enjoyable nature of the experience at a botanic garden and its place in later learning.

Dewey provides two principles for discriminating between different experiences: continuity and interaction. "The principle of continuity of experience means that every experience both takes up something from those which have gone before and modifies in some way the quality of those which come after." (p35 ibid) The new experience must relate to the experiences and capabilities of the learner and be relevant to her future experiences.

Dewey's second principle is that of the learner's interaction within the experience.

> "An experience is what it is because of a transaction taking place between an individual and what, at the time, constitutes his environment, whether the latter consists of persons with whom he is talking about some topic or event, the subject talked about being also a part of the situation; or the toys with which he is playing; the book he is reading; or the materials of an experiment he is performing. The environment, in other words, is whatever conditions interact with personal needs, desires, purposes, and capacities to create the experience which is had. (p44 ibid)

These two principles demonstrate a number of aspects of Dewey's articulation of experience. Firstly the active participation of the learner in the situation. It is the joint elements of the learner's active participation in a meaningful learning situation that can be seen as a forerunner of modern constructivist-based learning theories which site learning within the context of the experience of the learner (Vanderstraeten 2002, Garrison 1997, Pickering 1992). This active participation also includes the idea that the learner should be able to physically move to attend to specific aspects of the experience rather than be restricted to sitting in rows in a classroom. Secondly Dewey conceptualises the environment of the learner in its widest sense including social as well as physical elements. Relevant here is the idea that the educator has selected particular aspects of the social, cultural and physical environment to provide specific experiences for the learner.

This thesis takes the view that students have many experiences on their excursion to a botanic garden. For an experience to be termed a learning experience:

- the experience must be relevant to a student's previous and future learning
- students must be actively involved in their learning
- students enjoy and are motivated by the learning experience.

The next two sections of this review explore the role of the educator and the place of subject-matter consistent with a theory of experience.

The role of the educator

Dewey was emphatic about the essential role of the educator in planning, selecting and organising the experiences for the learners in their care. There is no doubt that Dewey perceived the role of the educator to be the 'leader of group activities' not a 'boss or dictator'. According to Dewey, the educator selects experiences that are appropriate for particular students based upon his understanding of their previous experiences, interests and environmental background. The experiences will lead ultimately by a continuing process of reconstruction of experience, to the particular subject-matter that is presented

to the mature person. These experiences involve the learner interacting with 'objective conditions' selected by the educator – which includes the learner's social, cultural and material environment.

Planning learning experiences involved the educator in touch with the long-term growth of his students as demonstrated in the following quote from Dewey.

> "It becomes the office of the educator to select those things within the range of existing experience that have the promise and potentiality of presenting new problems which by stimulating new ways of observation and judgment will expand that area of further experience. He must constantly regard what is already won not as a fixed possession but as an agency and instrumentality for opening new fields which make new demands upon existing powers of observation and of intelligent use of memory." (p75 Dewey 1967/1938)

Malcolm Skilbeck (1970) in his introduction to the work of John Dewey describes four general tasks set by Dewey for school teachers "in relation to children's growth conceived as the systematic reconstruction of experience" (p20 ibid). Firstly the teacher is to look for ways to enrich, balance and clarify experiences that direct students towards creating a reservoir of situations and realisations from which to build a 'superstructure' of understandings in the formal disciplines. Secondly the teacher's task is to guide and refine students' discoveries and inquiries with a view to their contribution to students' 'growth' in seeking new meanings and understandings. The third task for teachers is to simplify experiences so that understandings that are the realm of the adult become interpreted and hence meaningful for children. Dewey's expectations of the experiences provided for children involve more than guiding cognitive understandings. Dewey is also concerned with building a humanitarian citizenry that he envisioned as consistent with the goals of a democratic society. Hence Dewey's fourth task for teachers was to embed students' experiences in the practices of local culture and heritage.

A case could be made that, in view of the fleeting interaction botanic gardens educators have with visiting students, Dewey's four tasks may not be as relevant to this group of teachers. In this situation it becomes a purpose of the research to consider the

expectations of both visiting teachers and botanic gardens educators themselves to clarify the latter's role in the learning experience students have at a botanic garden.

Experience and its relationship to subject-matter

It is my opinion that Dewey's stance on the importance of subject-matter is one of the most satisfying elements of his work. Dewey does not ignore or treat as problemmatic the place of subject-matter in his theory of experience.

> "Experience in order to be educative must lead out into an expanding world of subject-matter of facts or information and of ideas. This condition is satisfied only as the educator views teaching and learning as a continuous process of reconstruction of experience. This condition in turn can be satisfied only as the educator has a long look ahead and views every present experience as a moving force in influencing what future experiences will be." (p87 Dewey 1967/1938)

At the school level subject matter is organised as a component of curriculum. For Dewey the curriculum was not 'given' to teachers but a product of the teacher's consideration of the following elements (Skilbeck 1970):

- the interests and capacities of the child
- the continuum of the child's life experiences
- a global teaching/learning strategy of reflective inquiry
- different types of subject matter
- the cultural context
- democratic and humanistic values.

Dewey's Laboratory School approached curriculum through students' project-type experience of the 'socio-industrial arts of mankind'. His emphasis on a socially-based curriculum that is relevant to the individual learner and that requires cycles of active, purposeful engagement and reflection on action provides a useful model for an approach to pedagogy for botanic gardens and other museums.

The work of Dewey appears to be the only theory-based contribution to an approach to content that both embraces the subject matter itself as well as a pedagogy for critical encounters with content. The next section of this review considers the teaching strategies that have been developed within the paradigm of learning and experience.

Learning and experience as a teaching strategy

There is a wide body of literature that presents applications of experience to learning. Many of these works present applications of cycles of action and reflection for example Jarvis, Holford & Griffin 1998, Joplin 1995, Henry 1989. The work of Henry (1989) revealed that some experiential educators conceptualised learning as a sequence of stages. Dewey, in acknowledged partnership with the teachers at his Laboratory School (Tanner 1997), conceptualised and developed teaching strategies that applied the principles of learning through experience. There is evidence of both a stage-type and a cyclic approach to learning.

Dewey developed the notion of different levels of experience which could be interpreted as the beginnings of a taxonomy of experience. In his works *Schools of Tomorrow* (1915) *Essays in Experimental Logic* (1916) and *Experience and Nature* (1925) Dewey proposes primary and secondary experiences. Primary experience involves 'feeling qualities' which is a direct encounter with things and situations without intellectualisation nor judgement. For Dewey, things are "objects to be treated, used, acted upon and with, enjoyed and endured, even more than things to be known. They are things had before things cognised." (p28, Dewey 1988/1925)

These primary experiences can form the basis of a critical, inquiry-based reflective process referred to by Dewey as secondary experience. Skilbeck, in his discussion of Dewey's works states that for Dewey "science provides the most complete form of secondary experience, in the problem-induction-hypothesis-deduction-testing cycle of scientific method." (p13 Skilbeck 1970) Scientific method however has not been without

its critics. One of the most notable criticisms is of the impression put forward by scientists of being able to make unbiased observations of the world.

Dewey pre-empts this criticism by considering that one of the purposes of reflection is to identify the cultural aspects of observations. For Dewey the senses are culturally affected filters through which "we adjust ourselves to our environment" (p11 Dewey 1915) rather than unbiased pathways through which travel impressions of the world. In this respect observations are not value free – the learner's cultural background and environment as well as her previous experiences influence sensory observations. Hence Dewey identifies impact of social and cultural influences on the learner even at the first stages of interacting with 'objective conditions' his socially situated aspects of learning echoing the position of critical social theorists such as Vygotsky (Glassman 2001, Prawat 2001, O'Brien 2001).

Miettinen (2000) in his analysis of Dewey's work states that "Dewey asserts that hypotheses are drawn from observations, from the hypothesis and conceptions that directed the observations and, if necessary, from the totally new cultural resources and conceptions that are mobilised to interpret the observational data." (p64 ibid) Knowledge derived from this method of reflective inquiry is provisional and can be conceptualised as ideas which are "not 'copies of reality' but schemes built on the residue of previous experience, individual and communal" (p15 Skilbeck 1970). Hence Dewey's work demonstrates clear links with modern learning theory which will be elaborated upon in the next section of this chapter relating to other relevant theoretical perspectives.

c. Taxonomies of experience

Dewey's notion of primary and secondary levels of experience suggests an organisation of experience into a taxonomy somewhat similar to the cognitive taxonomy of Bloom, the affective taxonomy of Krathwohl and the psychomotor taxonomy of Harrow. The following sections describe two taxonomies of experience. The first taxonomy (Steinaker & Bell 1979) provides a detailed account of five levels of a learning

experience that would be relevant to the development of a unit of classwork. The second taxonomy (Lai 1999b) presents learning experiences in geography fieldwork.

A taxonomic sequence of a learning experience

Developed and tested in Californian schools in 1975 a taxonomy of experience was published by Norman Steinaker & Robert Bell. The taxonomy was created "to provide a framework for understanding, planning and evaluating the meaning of a total experience" (p2 Steinaker & Bell 1979). Table 2.1 demonstrates the learning principles and learning behaviours in this 'experiential taxonomy.'

Steinaker & Bell also proposed teaching strategies and learning principles for each category and sub-category of the taxonomy. Much of their work is couched in the behaviouristic language characteristic of the 1970s. Teachers plan a range of 'stimuli' or activities to create 'the appropriate response'. However close inspection of their descriptions of learning principles and teaching strategies reveals discussion of concepts such as the following.

- Cycles of learning that include activity and reflection: "The learner, as exploration and meaning occur, comes to grips with the possibilities for success ... this is time to reflect and to project." (p65 ibid)
- Social aspects of learning: "changed behaviour has little efficacy until it is demonstrated in the social milieu" (p72 ibid) and "interaction of the individual learner with group members (results) in a pooling of individual resources and thus a greater understanding of total experiences." (p67 ibid)
- Linking of new experiences with prior understandings: "meaning ... is generally achieved by ... connecting presented material to the familiar ... and ... determining the level of understanding in the learner's association with familiar material." (p65 ibid)
- Learners enjoyment of their experiences: "Its (motivation's) characteristics are ... a feeling of enjoyment, reward or purpose." (p61 ibid)

Taxonomic levels	Taxonomic sequence of learning principles	Learner behaviours
1.0 Exposure 1.1 Sensory 1.2 Response 1.3 Readiness	Extrinsic motivation Focusing Anxiety level	Seeing, hearing, smelling, tasting, touching, noticing, reacting, recognising
2.0 Participation 2.1 Representation 2.2 Modification	Initial guidance Meaning exploration Chance for success	Observing, discussing, exploring, assessing, visualising, directed reading, estimating, manipulating, ordering, collecting, modeling, defining, listening
3.0 Identification 3.1 Reinforcement 3.2 Emotional 3.3 Personal 3.4 Sharing	Personal interaction Knowledge of results Reinforcement	Associating, classifying, explaining, experimenting, mapping, evaluating, hypothesising, interpreting, investigating, writing, drawing, applying, charting, reading or observing for information
4.0 Internalisation 4.1 Expansion 4.2 Intrinsic	Overlearning Intrinsic transfer Differentiated input	Analysing (deducting, inferring), summarising, generalising, comparing or contrasting, inquiring, in-depth probing, transferring
5.0 Dissemination 5.1 Informational 5.2 Homiletic	Extrinsic transfer Reward Intrinsic motivation	Communicating, debating, influencing, demonstrating, presenting, motivating

Table 2.1 **Taxonomic sequence of a learning experience (Steinaker & Bell 1979)**

The work of Steinaker & Bell echos Dewey's concern with the adaptability of the classroom teacher and the range of roles they play within learning. Table 2.2 examines their view of the roles of the teacher, learner and evaluator at each level of the taxonomy.

Clearly the work of Steinaker & Bell incorporates a perspective where learners are actively involved in learning and their teachers are able to respond and direct this activity to create meaningful learning experiences. The authors intended this taxonomy to be a guideline for curriculum development in schools and hence its scope extends well beyond the experiences that students have in a day's excursion to the RBGS.

Taxonomic level	Learner	Teacher	Evaluator
exposure	attender	motivator	observer
participation	explorer	catalyst	questioner
identification	experimenter	moderator	assessor
internalisation	extender	sustainer	measurer
dissemination	influencer	critiquor	determiner

Table 2.2 **Roles of learner, teacher and evaluator in a learning experience (from Steinaker & Bell 1979)**

However the taxonomy may yield insights into the types of experiences that students report as having at a botanic garden. The taxonomy may also prove useful in designing learning units of classwork that incorporate an excursion to a botanic garden.

A taxonomy for learning experiences in the field

Lai in his work on field trips in geography proposed a taxonomy of learning experiences in the field. His scheme is based on interviews with secondary geography students and their "descriptions of (fieldwork) experiences that they perceived to be meaningful and significant" (p382 Lai 1999b). Lai proposes six levels of engagement: reception, focusing, engagement of senses, seeing things in holistic perspective, acquisition of new perspectives and developing people-environment values. The first three levels involve students attending to the immediate experiences presented in the field. The second group of three levels involves students 'transcending' the immediate experience and developing new understandings of phenomena.

Lai provides example of the sorts of learning experiences students would have at each level and the place of reflection at each level as demonstrated in the following table.

Level of engagement	Types of learning experiences	Acts of reflecting during the experience
Reception	Identification of features Taking down answers on worksheets	Awareness
Focussing	Comparison with visual images previously obtained from photographs, diagrams and specimens Verification of teacher-imparted/textbook knowledge and mental images	Association
Engagement of the senses	Sensing the environment through sight, touch, smell, sound and movement Encounter with novel and spectacular features Collection of specimens Measurement	Appreciation
Seeing things in a holistic perspective	Building a sense of place Building a sense of time/appreciation of changes over time Building a sense of beauty	Evaluation Integration
Acquisition of new perspectives	Developing a new sense of purpose in tasks Developing new ways of seeing things Developing new ways of learning Developing new perspectives of geography	Integration
Developing people-environment values	Developing a sense of wonder about nature Developing environmental concern	Appropriation

Table 2.3 **A taxonomy of learning experiences in fieldwork with learning experiences and acts of reflection (p383 Lai 1999b)**

Lai views secondary school geography excursions as examples of experiential learning and uses his model to develop cycles of action and reflection within geography fieldwork. His taxonomy will be compared with emerging aspects of this thesis to identify similarities and differences and hence the relevance of this framework to learning experiences in a botanic garden.

As seen from considerations of the models presented in this section of the review there are a number of possible applications to the learning situation that may exist in a botanic

garden. Classroom teachers visiting the RBGS with their students may be incorporating the excursion into a cycle of action-on-reflection. Other teachers may view the excursion as part of a group of stages within which their students learn about or experience a certain aspect of subject-matter. Botanic gardens educators may see their teaching strategies with visiting students as a cycle of action-on-reflection or as a series of stages. It is the purpose of this thesis to reveal the approaches to teaching and learning adopted by teachers and other educators involved in the school excursion to a botanic garden.

2.4.2 Shaping a theoretical framework for education in botanic gardens

The previous section has considered the elements of learning and experience that appear to contain theoretical and practical elements that could inform a theoretical framework to underpin education at a botanic garden. This section of the review considers research and writing that defines the elements of such a framework

a. Towards an education theory for a botanic garden

George Hein in his book *Learning in Museums* (1998) provides an organising framework for museum educators to consider the position of their museum (or botanic garden) on education theory. He adopts the position that

> "we can make the effort to think through the underlying principles on which we base educational activities and shape the general educational stance of the museum according to these principles, or we can follow an unexamined collection of policies and practices that, taken together, present to visitors an educational position which may or may not conform to our ideas" (p15 Hein 1998).

Hein considers that the educational stance of the museum requires a theory of knowledge, a theory of learning and a theory of teaching. A theory of knowledge (an epistemology) considers questions about the nature of knowledge and a theory of learning proposes how people learn. Together these two areas of theory provide "the theoretical underpinning of what a museum does as an educational institution" (p16 Hein 1998). Hein presents these two areas of theory in a model illustrated in Figure 2.1.

The vertical axis represents a continuum with the realist position (knowledge exists outside the learner) placed on one side and the idealist position (termed by Hein as 'knowledge is constructed by the learner') is placed on the other. In suggesting that museums consider their position along a continuum, it appears that Hein may be offering a different way of conceptualising the issue raised by Dewey of the 'either/or' dualism of western philosophy.

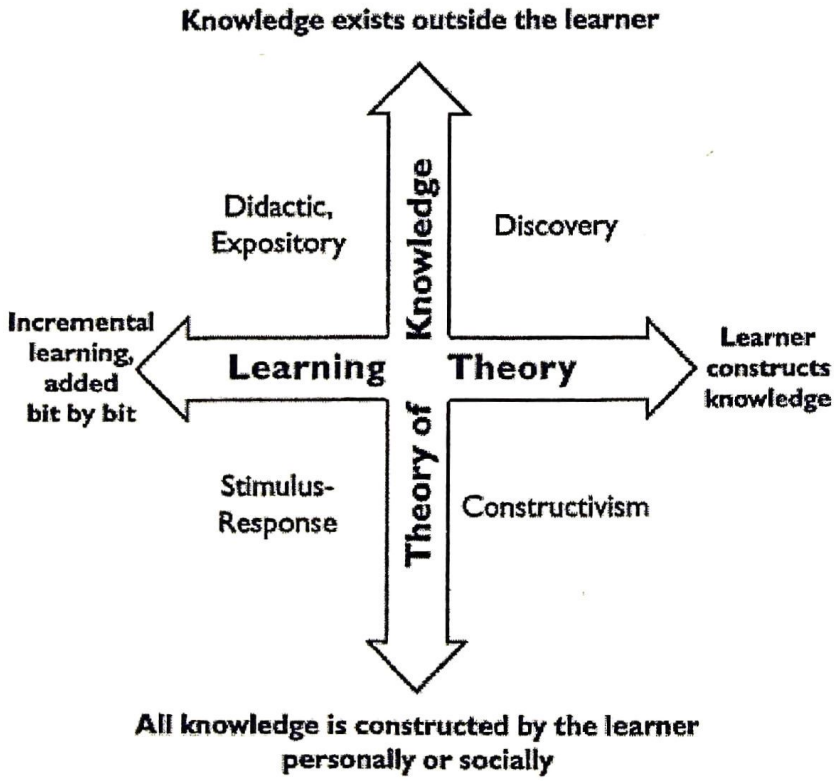


Figure 2.1 **Hein's model for education theories (p25 Hein 1998)**

Hein contends that the position along this continuum that is adopted by a museum will be evident in their displays and programmes. The museum adopting a realist position will be concerned with displaying the truth of the objector subject independent of the perceptions held by its visitors. The museum adopting a realist position would consider a

range of perspectives and interpretations about objects and displays that could be held by its own staff and by its visitors.

Hein's conceptualisation of theories of knowledge as adopting different positions along this continuum does offer practitioners a means of considering their approach to the content found in their museums. However there appears to be an absence of guidelines that indicate the meanings associated with a particular position taken along such a continuum. In my opinion it is difficult to consider that Dewey's epistemological position can be located along this continuum – Dewey's position rejected this way of conceptualising knowledge. Furthermore it is difficult to locate theoretical position taken by constructivists such as von Glasersfeld who reject the realist position and take the view that "the world is knowable only through the interaction of knower and experienced phenomena" (p142 Windschitl 2002). Hein himself considers that more work is required to clarify the epistemological position of the constructivists (Hein 1998) and places their position to the right of the continuum.

The horizontal axis of Hein's figure represents a continuum of learning theories. He places theory that views learning as being incremental at one end and theory that views learning as an active process at the other. The four quadrants that occur when the two axes are super-imposed represent theories of education. Here again, Hein has created a useful framework for conceptualising four main areas of education theory.

Hein endorses constructivism and considers that it is an 'inevitable' educational position. A detailed critique of constructivism is beyond the scope of this thesis, however, in the context of this research the power of constructivism lies in its application to learning theory as demonstrated in the following quote.

> "Since the 1960s constructivism's research base has grown to include a substantial body of work on learner's alternative conceptions, thinking and problem solving in the various disciplinary domains, the use of representations in learning and teaching and metacognition. Additionally, the recent contributions of interpretive research paradigms have provided important insights into the social and cultural influence on knowledge construction...

> Theorists have proposed new ways of framing the act of teaching, for example, as co-constructing knowledge with students, acting as conceptual change agent, mentoring approaches through the zone of proximal development, and supporting a community of learners." (p135 Windschitl 2002)

Modern constructivist theory with its active, learner-centred approach has extended the work of Dewey and is also linked to that of Piaget.

> "Piaget can certainly be labelled a constructivist, but one whose concern was to build an epistemology that was neither empiricist nor rationalist; that was realist without denying the active nature of intelligence. Indeed Piaget provides ... a means for the world to enter the mind. It is through action on the world. So for Piaget, the person exists as a real biological entity in a real physical world, and constructs mental structures to deal with that world through internalising actions on and of the world as schemes." (p126 Ogborn 1997)

Critics of constructivism question what it means to construct knowledge – it appears that learners must invent all knowledge for themselves. Considering the nature and tradition of human scientific endeavour, it would be unreasonable to expect students (or the wider community) to discover or come to their own understandings of the explanations, theories and procedures of the scientific community. As Tobin (1998) points out

> "It is improbable that students will construct scientific knowledge in the laboratory unless they possess an appropriate interpretative framework and receive guidance from someone who already knows the science." (p204 ibid)

Furthermore it appears that validation of constructed knowledge lies within the learner and raises questions about the status (ontology) of knowledge. In consideration of the application of constructivism to science education Matthew's contends "if Western science is truly just one of many equally warranted ways of making sense of experience, and it truly does not tell us anything about the world in which we live, then traditional arguments for compulsory school science and 'Science for All' need to be re-thought" (p14 Matthews 1997). It is my opinion that interpretations of constructivism where the

learner's constructed understandings and their own sense of the world are as valid as any other do not provide an approach that is compatible with the content focus of scientific institutions such as botanic gardens, natural history museums or science centres. There clearly needs to be some status given to the traditions, methods and structures of science and science-based educational institutions.

The theoretical stance preferred in this thesis echos that of Dewey and locates knowledge in the interaction between the learner and the people, things and environments of this world. Clearly this statement avoids the philosophical dilemma involved in making statements about the physical location of knowledge and turns an epistemological issue into a statement more closely related to pedagogy – into action. The preferred learning theory of this thesis is that which holds that learners actively create systems or schemes of understandings about the people, things and environments of this world.

b. Towards a theory of teaching in a botanic garden

The third component of Hein's educational stance for a museum is a theory of teaching "which determines how the theories are put into practice" (p16 Hein 1998). Hein's consideration of the education stance of a museum does not appear to provide a set of guidelines or a framework to assist museum educators to conceptualise the nature or ontology of the content contained within the objects, domains of knowledge and multiple meanings represented by a particular museum. Indeed there appears to be little indication in museum literature of such consideration of the nature of knowledge represented by museum collections. Furthermore Hein considers that the 'inevitable' constructivist perspective adopted by a museum does not provide a theory of teaching with which the museum educator can apply a constructivist perspective.

For educators, the source of guidance that would inform a theory of teaching is located within curriculum documents. It is the work of curriculum theorists to provide statements linking content and pedagogy and this thesis turns to such work for such

guidance. The work of Pearson & Smith (1985) and Grundy (1987) applies Habermas' ways of knowing to viewing content and pedaogocial approaches to content.

According to Habermas (1978) there are three ways in which people come to understand about the world. Firstly people can demonstrate technical knowledge about how the world works, for example, the sun rises in the east, the sum of two and three is five, eucalypts have flowers. Understandings such as the knowledge of different languages also forms part of technical understandings. This knowledge is not problemmatic, it is conventional and accepted. Pedagogical approaches to this form of knowledge can involve practice of skills, memorisation and other techniques of integrating this knowledge into participants' experience. In this sense the teacher may adopt the role of expert with an associated perception of authority and power.

A second way people know is by communicating with others and arriving at common understandings and interpretations. Such content in botanic gardens could involve negotiating and communicating the meaning of different cultural connections with plants and with the environment. In this way of understanding pedagogical approaches would involve facilitating understanding of differing view points and handling situations that confront deeply held personal and cultural beliefs. The teacher adopts a role of facilitator, helping students to conceptualise and communicate points of view that may differ from their own.

The third way of knowing is 'critical' knowing and involves an understanding of the self, challenging personal beliefs and awareness of the possibility of changing personal actions. Botanic gardens seek to interact with its visitors at this level when they seek to move visitor behaviour towards more sustainable systems of living. Pearson & Smith suggest that the role of the teacher in this context would be "to challenge participants as to whether their personal theories are internally consistent, represent valid claims, reflect the actual world, or are only partial conceptualisations of the 'real' world" (p77 ibid).

Clearly this application of Habermas' work provides a powerful way of viewing content and its associated pedagogy. Grundy (1987) has extended this application of Habermas into the development of school curricula and it appears that data from this thesis may be able to apply the three ways of knowing to the content of botanic gardens.

Recent research of the implementation of a constructivist perspective into classroom teaching reveals the following features that characterise teacher and student activity in a constructivist classroom.

- "Teachers elicit students' ideas and experiences in relation to key topics, then fashion learning situations that help students elaborate on or restructure their current knowledge.
- Students are given frequent opportunities to engage in complex, meaningful, problem-based activities.
- Teachers provide students with a variety of information resources as well as the tools (technological and conceptual) necessary to mediate learning.
- Students work collaboratively and are given support to engage in task-oriented dialogue with one another.
- Teachers make their own thinking processes explicit to learners and encourage students to do the same through dialogue, writing, drawings, or other representations.
- Students are routinely asked to apply knowledge in diverse and authentic contexts, to explain ideas, interpret texts, predict phenomena, and construct arguments based on evidence, rather than to focus exclusively on the acquisition of predetermined 'right answers'.
- Teachers encourage students' reflective and autonomous thinking in conjunction with the conditions listed above.
- Teachers employ a variety of assessment strategies to understand how students' ideas are evolving and to give feedback on the processes as well as the products of their thinking." (p137 Windschitl 2002)

This list of characteristics may be applied to teaching practice in a botanic garden. It is the role of the guiding principles derived from this thesis to address the relevance and application of these features to the pedagogy of school education programmes in a botanic garden.

2.4.3 Defining learning in botanic gardens and other museums

a. Chicago Model – learning botanic gardens

In 1990 a report of the development of a learning model for education programmes at the Chicago Botanic Garden appeared in its Annual Report. The purpose of this exercise was to develop a "sound theoretical framework upon which to base the formulation of goals and development of programs" (p8 Chicago Botanic Garden 1990).

Group discussion and consensus developed the model by comparing learning models developed by educational theorists with the personal experiences of the educators involved in the process. Three components for learning in a botanic garden were identified and the model itself is illustrated in Figure 2.2.

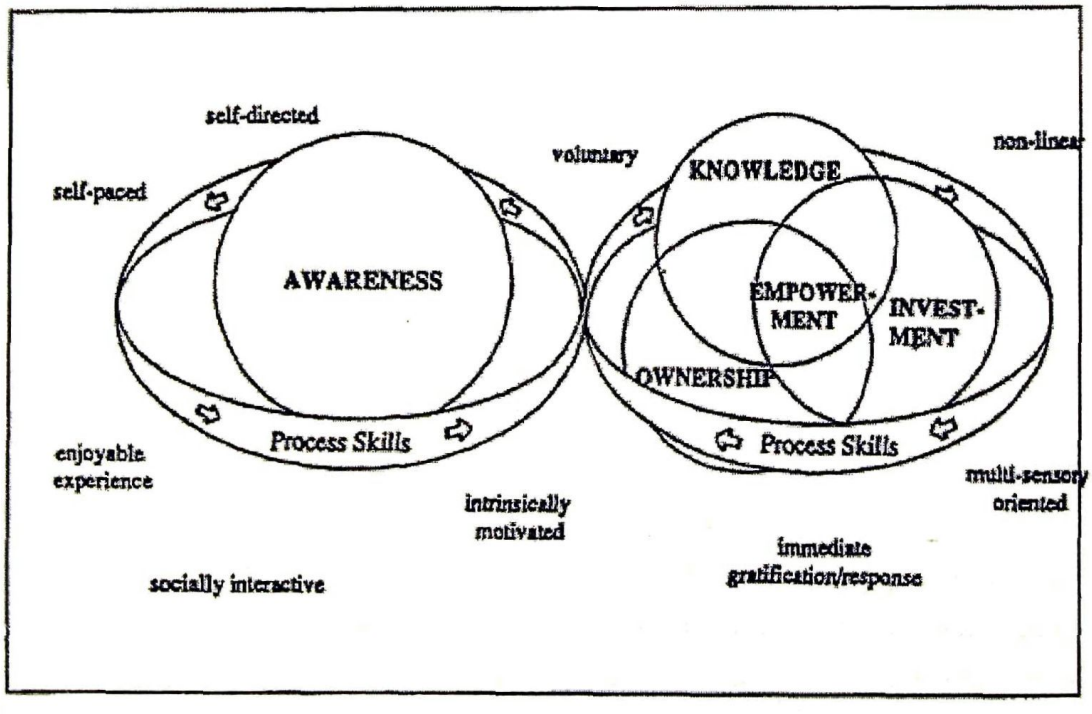


Figure 2.2 **Chicago Model for Learning in a Botanic Garden**

Firstly in a botanic garden "the process of learning begins with sensory awareness and moves through the use of process skills to knowledge"(ibid). Secondly learning a botanic garden involves attitudinal and behavioural change which "involves an investment on the part of the learner in what has been learned; an ownership of the information acquired and the opportunity to transfer, use, apply the knowledge to some action" (ibid). The third component of the model listed the conditions required for museum learning: self-paced, non-linear, immediate response, intrinsically motivated, socially interactive, voluntary, multi-sensory, enjoyable experience and self-directed.

For the Chicago educators learning can be viewed as having three components: the process of learning, learning outcomes and characteristics of learning in the context of a botanic garden. The power of this all too brief article lies both in its attempt to define a learning model for botanic gardens and as an example of a process of staff development for educators in botanic gardens. Contact with the garden and the manager of this process has produced little evidence of any subsequent work on this model yet it remains as an internal documentation of the deliberations of botanic garden educators about theoretical aspects of their practice and their relationship to the wider education arena. Study of this limited record provides some insights into the nature of learning in a botanic garden as perceived by botanic garden educators and may be useful as a starting point for action-research type professional development of botanic garden educators.

b. Falk & Dierkings' contextual model of learning in museums

Falk & Dierking (2000) state that people learn in museums and this learning can be termed 'free-choice' learning. This concept of learning "tends to be nonlinear, is personally motivated, and involves considerable choice on the part of the learner as to what to learn, as well as where and when to participate in learning" (p13 ibid). The arrival at this conception of learning is the culmination of numerous studies conducted in a wide range of museums over the past two decades. Although this work is relevant to the general visitor to a museum – rather than to school students on an excursion, it presents the need to consider broad definitions for learning beyond the classroom.

In preference to providing a definition for learning Falk & Dierking propose the 'Contextual Model of Learning' which "suggests that learning is influenced by three overlapping contexts: the personal, the sociocultural, and the physical. Learning can be conceptualised as the integration and interaction of these three contexts." (p13 ibid) The model is illustrated in Figure 2.3.

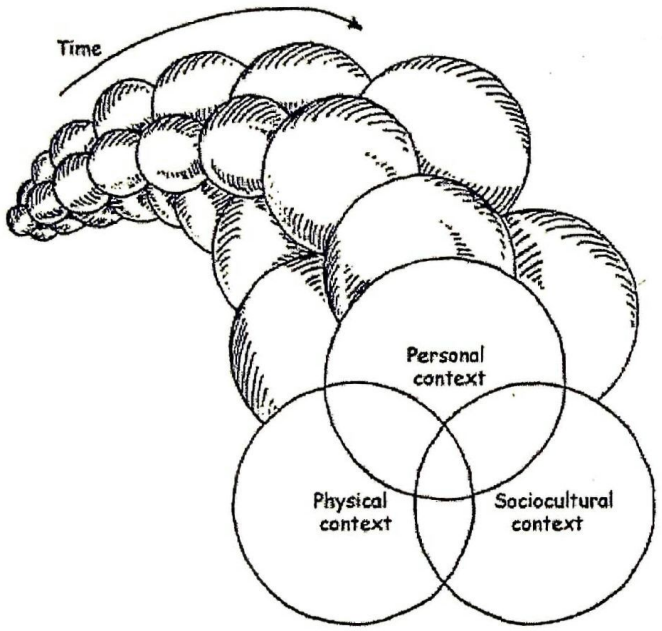


Figure 2.3 **The Contextual Model of Learning (p12 Falk & Dierking 2000)**

Falk & Dierking comment that "the model really should be depicted in three dimensions and animated, so that both the temporal and the interactive nature of learning could be captured" (p11 ibid). The authors propose that this model, while it does not purport to explain what visitors learn in museums, it does provide a framework for research of the factors that affect learning in museums.

Eight factors have been included in this framework as follows:

Personal Context

1. Motivation and expectations
2. Prior knowledge, interests and beliefs
3. Choice and control

Sociocultural Context

4. Within-group sociocultural mediation
5. Facilitated mediation by others

Physical Context

6. Advance organisers and orientation
7. Design
8. Reinforcing events and experiences outside the museum. (p137 ibid)

The authors propose this model as a more appropriate research tool for the investigation of learning in museums. They are critical of methodologies that focus on narrow conceptions of learning associated with retention of specific concepts or factual information. Both Falk and Dierking have either lead or participated in research of learning in museums for the better part of the past two decades and their observations of the nature of what is learned in museums can be stated as:

- large-scale, very generalised level of knowledge
- very small scale sampling of bits and pieces of very specific knowledge
- recontextualisation of present personal understandings.

The findings of this research of the excursion experiences of students visiting a botanic garden can be compared with the Contextual Model of Learning to investigate its relevance to a botanic garden. The application of the model itself to the experiences of

visitors to the RBGS could be the subject of further research into the nature of learning at a botanic garden.

2.4.4 Summary

This section of the Literature Review has identified education theory that has been proposed to inform and explain the nature and practice of education in botanic gardens and other museums. The need to consider the 'educational stance' of a botanic garden is expressed by Hein who identifies three elements of such a framework: a theory of knowledge, theory of learning and a theory of teaching. Theoretical perspectives from idealism, realism, constructivism, behaviourism, discovery learning and experiential learning have all been explored to some extent in this chapter. It seems to me that all three components of an educational stance should complement and enhance each other – it would be a fruitless exercise to incorporate theoretical elements because of their historical use rather than their capacity to explain and predict education practice.

Dewey illuminates both a sound theoretical basis for education and insights into practical applications of his theory of experience. His work illuminates an epistemological approach to learning that restores the place of theory to that of informing, explaining and guiding practice in educational endeavours. The centrality of the interaction of learners and experience to any theory-building in education places the learner, activity, and purpose in the foreground of such considerations.

Modern interpretations of Dewey's work as can be seen in the field of experiential education seem to fall short of the broad scope of his ideals. In experiential learning, the status of individual experience can result in its isolation from a connection with wider cultural and social fields of learning (Miettinen 2000). However the Deweyan notion of experience places the learner at the centre of inquiry "*without loss of the historic value* of civilisation" (p21 Dewey 1972/1899).

It seems clear that experiential learning is an established area of educational research and like many other 'communities of practice' – such as museum education for example

– it can be viewed as a vibrant area of educational practice in need of a sound theoretical basis. It may be appropriate to refer to learning in botanic gardens as experiential learning however we will rely on the data obtained from teachers and students visiting the venue to further illuminate this possibility.

The need to consider appropriate definitions for learning that are relevant to learning environments beyond the classroom is expressed by Falk & Dierking. They define learning as "the process of applying prior knowledge and experience to new experiences; this effort is normally played out within a physical context and is mediated in the actions of other individuals. In addition, learning always involves some element of emotion and feeling" (p216 Falk & Dierking 1997). This view considers learning as a process taking place in a physical and social context. The definition also presents the view that learning contributes to an individual's prior understandings. It appears to me that this definition of learning has relevance to education in botanic gardens however it does not provide the means with which to address the issue of the place of content in the learning process.

This Literature Review has placed the research in the context of wider readings and research in botanic gardens and other museums. Discussion of the educational role of a botanic garden has revealed its links with the changing historical, scientific and cultural factors that define the modern botanic garden. Exploration of education programmes in botanic gardens from around the world reveals a literature of case studies reporting a diversity of approaches, audiences, resources, strategies and messages. Study of this literature also reveals an emerging interest in research and evaluation of these programmes.

This review serves one of the purposes of this thesis, which is to locate and link education in botanic gardens with wider fields of education theory and practice. Potential theoretical frameworks for an education theory and models and definitions of learning in contexts beyond the classroom have been identified and explored. The theoretical and practical perspectives identified in this review will be re-considered in

the light of data from this research and re-presented in the concluding chapter as the educational stance of a botanic garden.



Plate 1 **We heard cockatoos screeching in the tree. (School E 1996)**

Chapter Three METHODOLOGY

3.1 Introduction

The literature review has established that there is little research on the nature of the excursion experiences students and their teachers have at a botanic garden. While intuitive notions about this experience may be formed there needs to be a research base that provides an insight into the experiences of school groups on excursion to a botanic garden. This set of data needs to be descriptive, allowing for the widest possible recounts of personal experiences. This descriptive data will then be used as a basis to build a conceptual understanding of the nature of the excursion experience to a botanic garden. This part of the thesis requires a research perspective that can allow for the formation of generalisations from data rather than viewing data as evidence for a particular perspective.

In essence the following list (adapted from Taylor & Bogdan 1998) provides the research perspective of this thesis.

1. The research is concerned with the real life experiences had by teachers and their students at a botanic garden.
2. Botanic garden educators, classroom teachers and students all have perspectives that are relevant to this research.
3. The data collected from these groups rather than pre-conceived notions, models and theories forms the basis of description and theory-building.
4. Every aspect of a school excursion to the RBGS provides something to be learned about the experience.
5. A particular research technique is selected on the basis of its suitability for the task at hand.
6. This research is meaningful and valid for those involved in school excursions to a botanic garden and specifically the Royal Botanic Gardens Sydney.

As an introductory study of the nature of school excursions to a botanic garden, this research needs to be broad in scope and exploratory in nature. It is expected that this research will result in both an understanding of the "essential general attributes" (p15 Gerber 1996a) of excursions to a botanic garden and the illumination of a range of areas for further study.

3.2 Choosing a qualitative approach

The phenomenon of the school field trip is highly complex and understandings of it so incomplete that it is impossible to identify and consider the range of factors and their affect on the research situation. It appears that in an area of which very little is known, methods of inquiry that can illuminate and explore need to be employed. A qualitative research approach will allow such 'discerning of meaning' and 'discovery of regularities' (Tesch 1990 cited in Gerber1996b) and will inform the research perspective of this thesis. More specifically this thesis as a form of qualitative inquiry is informed by a phenomenological rather than a positivist perspective.

According to Taylor & Bogdan (1998) "the phenomenologist or interpretivist is committed to understanding social phenomena from the actor's own perspective and examining how the world is experienced" (p3 ibid). The work of Habermas encountered in Chapter Two provides a means of locating this research in a quest to understand human experiences in a specific context. After consideration of his three 'ways of knowing' it appears that this thesis contributes to the social/hermeneutic area of knowledge. The research is not concerned with manipulating variables to form technical understandings of the excursion experience nor is it concerned with critical understandings involved in personal or social emancipation. The research is concerned with making sense of a specific context and communicating this sense to other practitioners. Scott & Usher (1999) term this an 'interpretivist approach' to research where "research takes everyday experience and ordinary life as its subject-matter and asks how meaning is constructed and social interaction negotiated in social practices" (p25 ibid).

Furthermore, from the constructivist paradigm that is linked to this approach (Lincoln & Guba 2000), the research is concerned with the meanings people make of situations and "are oriented to the production of reconstructed understandings of the social world" (p158 Denzin & Lincoln 2000). However there is a positivist tone to this research when part of the concern is to look for commonalties in these experiences in a way that findings can be generalised to create insights that will guide the practice of botanic garden educators. There are situations in this thesis where quantitative data is used as a means of comparing responses and seeking commonalties. As stressed by Lincoln & Guba (2000) "there are many opportunities for the naturalistic investigator to utilise quantitative data – probably more than appreciated" (p174 ibid).

An interpretive approach allows for the role of researcher as a participant in the research situation. This is a critical aspect of this thesis as the research is directly concerned with the researcher's work as a botanic garden educator at the RBGS. Tobin (1993) comments that "the role of the researcher is to make personal sense of experience and, in a socially mediated way, to build knowledge in a given field. To undertake research in a given area then becomes a process of personal learning" (p15 ibid). This raises issues of the validity of the research relating to some assurance that it is faithful to the situation it proports to describe and further that this research is meaningful to classroom teachers and to botanic garden educators.

For Lincoln & Guba (2000) "no one would argue that a single method – or collection of methods – is the royal road to ultimate knowledge" (p178 ibid). The authors propose a set of five "authenticity criteria – so called because we believed them to be hallmarks of authentic, trustworthy, rigorous, or 'valid' constructivist or phenomenological inquiry – were fairness, ontological authenticity, educative authenticity, catalytic authenticity and tactical authenticity" (p180 ibid). Fairness relates to a balance of perspectives from all participants involved in the research. Ontological and educative authenticity relate to a raised level of awareness evident in both the researcher and those involved with the researcher. Catalytic and tactical authenticities relate to the ability of an inquiry to

generate action firstly in the participants and then by requiring some involvement of the researcher in training participants in aspects associated with the research.

Aside from the 'fairness' criteria involving inclusion of students, their teachers and botanic garden educators in this research, it appears that the validity of this thesis rests in its relevance and applicability to both personal practice and to the practice of botanic garden educators and to classroom teachers. This issue will be taken up in the next sections of this chapter.

3.3 Selection of a strategy of inquiry

"Strategies of inquiry connect researchers to specific approaches and methods for collecting and analysing empirical materials" (p371 Denzin & Lincoln 2000). Case study was selected as the strategy of inquiry for this thesis bearing in mind Stake's comment that "case study is not a methodological choice but a choice of what is to be studied. By whatever methods we choose to study the case" (p435 Stake 2000). Issues involved in case study research are summarised by Stake as follows:

1. "Bounding the case, conceptualising the object of study;
2. selecting the ... research questions to emphasise;
3. seeking patterns of data to develop the issues;
4. triangulating key observations and bases for interpretation;
5. selecting alternative interpretations to pursue;
6. developing assertions or generalisations about the case." (p448 ibid)

The next section considers these issues as three main areas of concern in adopting case study as a strategy of research in this thesis: bounding the case study, formulating research questions and triangulation of the data as a means of comparing data blocks. Discussion of data analysis and developing generalisations occur later in this chapter.

3.3.1 Bounding the case study

This research is located in the context of school excursions to the RBGS. In terms of the boundedness of the research this context can be seen as a case study in itself. The interest of the research lies with the participants involved with school groups visiting the RBGS in a discrete period of time. These participants can be identified as classroom teachers and their students and the botanic garden educators involved with the school group.

This overarching case study can be seen to comprise a number of individual cases which would comprise the particular school group visiting the RBGS for their excursion on a particular day. This group could comprise a single class with their classroom teacher or a Year group comprising several classes and their classroom teachers. Miles & Huberman (1994) see the aim of studying multiple cases "to see processes and outcomes across many cases, to understand how they are qualified by local conditions, and thus to develop more sophisticated descriptions and more powerful explanations" (p172 ibid).

Under the umbrella of the wider case study two further areas of inquiry were pursued firstly that of interviewing botanic garden educators working in botanic gardens on the east coast of Australia and secondly surveying classroom teachers organising excursions to the RBGS. For these three areas of inquiry the overarching theme was an exploration of the excursion experiences of classroom teachers, their students and botanic garden educators.

Schools visit the RBGS as units of classes with each class group consisting of up to 30 students with their classroom teacher. Classes range from Kindergarten (5 year old students) to Year 12 (18 year olds). Schools can be from the public or private sector. Classes can be single sex or coeducational. The majority of schools visiting the RBGS are from the Sydney metropolitan area. Selection of schools to be involved in the case study was intended to be across this range. Table 3.1 outlines the range of the seven groups involved in the case studies with all case study schools from the Sydney

metropolitan area, the table also indicates how long after the excursion the research was conducted.

Case Study	After RBG visit	Year			School		Sex		
		Infants	Primary	Sec	Public	Private	Co-ed	Male	Female
E	6 months	Yr1			✓		✓		
C	7 months		Yr4			✓	✓		
B (Pilot Study)	6 months		Yr5/6		✓		✓		
A	3 weeks		Yr6		✓		✓		
J	3 weeks			Yr8		✓	✓		
H	on day			Yr8	✓			✓	
G	Various			Yr10,11	✓				✓

Table 3.1 **Range of case study schools**

All schools with the exception of Schools H and G were approached after their visit to the RBGS that had involved lessons with a botanic garden educator. Schools H and G were approached after they had made a booking with School H being surveyed at the RBGS and School G being before and after the excursion to the RBGS.

3.3.2 Triangulation

Stake (2000) defines triangulation as "a process of using multiple perceptions to clarify meaning, verifying the repeatability of an observation or interpretation ... triangulation serves also to clarify meaning by identifying different ways the phenomenon is being seen" (p443 ibid). The issue validity and meaningfulness of this research has been considered in the utilisation of a range of strategies including:

1. incorporation of a range of perspectives of the excursion experience
2. employing a range of methods to procure these perspectives including interview, survey and document study

3. repeating the research methods a number of times in similar situations
4. repeating the research methods in differing situations
5. continuing the repetition until it appears that little new information has been added
6. discussion of research findings with classroom teachers and botanic garden educators.

3.4 Methods of inquiry

Table 3.2 illustrates the methods of inquiry used in this research.

Methods of Study	Botanic garden educators	Classroom teachers	School students
Survey	✓	✓	✓
Personal interview	✓	✓	
Group interview	✓		✓
Document study		✓	✓

Table 3.2 **Methods of inquiry**

3.4.1 Researching the student's perspective

This thesis is primarily concerned with the excursion experiences of school students. Davies (1982) reported in Ball (1985) comments "children have been written about from many perspectives, and for a multitude of purposes. Rarely have they been asked to speak for themselves" (p47 Ball 1985). It is the opinions and recalled experiences of students that ultimately determine the impact of the excursion itself. Two methods of inquiry were selected to access students' excursion experiences that of group interview and of open-ended survey questions. Table 3.3 illustrates the methods of inquiry utilised for each group of students.

The group interview was selected to provide a situation of maximum ease for both the students and for the researcher. Groups of up to five students discussed their experiences and recollections of their excursion to the RBGS. The interviews were tape recorded and generally held in the school playground or library at some time after the excursion.

Student's perceptions were also sought using open-ended survey items given to class groups after their excursion.

Methods of Inquiry	Data Blocks
Group interview	
- one week before the excursion	School G: six Year Ten students
- one week after the excursion	School G: same group of six Yr Ten students
- three weeks after their excursion	School A: four Year Six students School J: four Year Eight students
- six months after the excursion	School E: 25 Year One students
- one year after the excursion	School G: Five Year Eleven students
Written Survey	
- on excursion day	School H: 72 Year Nine students
- on excursion day	School G: 100 Year Ten students
- three weeks after the excursion	School A: 70 Year Six students
- six months after the excursion	School B: 25 Year 5/6 students
- seven months after the excursion	School C: 17 Year Four students

Table 3.3 **Student perspectives: methods of inquiry**

The student survey consisted of a single page with a small number of questions. The surveys were personally administered and in the case of larger number of classes the classroom teacher distributed and collected the survey sheets.

3.4.2 Researching the classroom teacher's perspective

The perspectives of classroom teachers were explored using a range of methods of inquiry illustrated in Table 3.4. Teachers involved in the case studies who had organised the excursion were interviewed at school after the excursion (with the exception of School H were teachers were surveyed only). Where there were a group of teachers involved in the case study excursion these teachers completed a survey of open-ended items and where possible some were interviewed.

A further insight into teacher's reasons for excursions was sought from the body of teachers visiting the RBGS with their classes for lessons from a botanic garden educator.

Method of Inquiry	Data Block
Personal interview	
- one week before the excursion	School G: three secondary science teachers – KL, JJ & HR
- three weeks after the excursion	School A: Year Six teacher VC School J: Science coordinator TN
- six months after the excursion	School B: Year 5/6 teacher WC
- six months after the excursion	School E: Year One teacher TQ
- seven months after the excursion	School C: Year Four teacher AN
Written Survey	
- on excursion day	School H: three secondary science teachers School G: five secondary science teachers
- three weeks after the excursion	School A: two teachers Year 5 & Year 6

Table 3.4 **Classroom teachers' perspectives: methods of inquiry**

Those teachers visiting the RBGS over a school term were surveyed with a simple set of open-ended questions. This larger group of teachers provided a sense of the range of teachers' comments and an indication of the commonality of responses.

3.4.3 Researching the botanic garden educator's perspective

The number of full time botanic garden educators across Australia is very small and there is little time or opportunity for communication between these isolated professionals. Yet it seemed imperative to gain an insight into their views about school excursions. These insights were aired as interviews conducted at botanic gardens in New South Wales (one educator), Queensland (two educators) and Victoria (three educators).

Botanic gardens educators from Australia and from around the world provided feedback on the findings of this thesis and particularly on the set of guiding principles derived from this research. Their comments on the guiding principles were provided as emailed survey responses.

3.5 Data analysis

In this research data analysis commenced with the first foray into data collection and continued hand in hand until it was clear that further collection of data was not necessary and the analysis could continue until conclusions could be drawn and verified. The process of data analysis can be visualised as three stages (Scott 1998, Sowden & Keeves 1990):

- Data reduction where the processes of grouping and sorting data help to focus the large amount of information.
- Data display where the emerging groups of data can be organised into tables, diagrams and concept maps.
- Drawing conclusions and verifying emerging generalisations.

The research design enabled responsiveness to trends in the data as they emerged from working with school students involved in excursions to the RBGS. Taylor & Bogdan (1998) make the observation that "in qualitative research, data collection and analysis go hand in hand" (p141 ibid). The following section provides some insight into the on-going interrelationship between data collection and analysis.

From the literature review it is observed that people have long term recollections of their experiences in museums. Furthermore learning theory was explored that proposed that people build understandings or schemes about the world based on their personal experiences these schemes are highly personal and resilient to change. Hence, it would appear that if students do not recall their experiences at the RBGS then the excursion has little impact. Indeed the excursion experience could be said to have not been a learning experience. This situation would require closer investigation of the role of the excursion and if the experience is meeting the needs of schools.

If students do have recollections of their excursion then the research should explore the nature of these recollections. The recollections may be related to the social nature of the event – being with friends, having a picnic, a day away from school etc. Student

recollections may be associated with the plant-related context of the day. The research should explore how these recollections relate to the outcomes their classroom teachers have for the day. If it can be established that students do achieve learning outcomes required by their teacher then the research can result in a description of the nature of learning that can occur in a botanic garden.

At some point, recognisable to the researcher, the process of data collection does not produce any more 'surprises' and it appears that little is to be gained from a certain line of inquiry. The process of data analysis continues and trends emerge from the data. At this point findings are turned into conference papers and workshops to gain feedback and assist with crystallisation of ideas into confident generalisations.

3.6 Pilot studies

A number of pilot studies were conducted to trial the case study approach and also interview and survey techniques. The school identified as School B was the pilot case study and provided the following experience and subsequent modifications to technique.

1. Consideration of the limited time available for both teachers and students to spend diverted from their classroom routine. This reduced the study to a simple set of basic questions to be explored.

2. Trialling interview technique with teachers and with young students. Subsequent interviews were tape recorded as note-taking and immediate write-up of the interview did not seem adequate to capture the complexity of the interview event. Interviews with students were held on a one-to-one basis in the classroom while the other students were answering the written survey. Future interviews were held with small groups of students in another public area of the school.

3. Trialling of a student survey sheet. A range of student survey sheets were prepared for different age groups. All surveys asked students about their recollections of the excursion however younger students were asked fewer questions than older students and high school students from Schools H and G were surveyed on the day of the excursion.

4. Trialling the teacher survey at the RBGS. The pilot RBGS survey involved the expectation that teachers would complete a one-page survey at the RBGS during their excursion. This approach resulted in limited numbers of completed surveys being returned. A second approach were the survey was posted to the teacher organising the excursion provide more successful. The schools were phoned to remind them to send the sheet back to the RBGS. A return rate of 56% was achieved using this routine.

3.7 Summary

This study of school excursions to the RBGS initiated research into the nature of experiences had by students and their teachers during excursions to a botanic garden. Study of the literature of research of fieldwork experiences revealed that this area is under-researched and there are few guidelines or established frameworks to inform research in this area. The choice of a qualitative case study methodology was made to allow generalisations to be made about the nature of excursions to a botanic garden.

The qualitative nature of the research provided scope for selection of an appropriate strategy of inquiry that was suited to the realities of working with children and adults in formal situations. The multiple case studies within a case study allowed comparison across a number of related yet individual excursions to the RBGS. Furthermore the use of a number of different research methods created a means to compare bodies of data and their emerging generalisations which have been presented in Chapter Seven as a set of guiding principles. The methodological approach facilitated exploration of the longer term impact of the excursion and has resulted in a rich source of findings about the nature of the learning experience in a botanic garden.

The presentation of the findings of this research provides the reader with opportunities to create their own generalisations and personal opinions of the interpretations made as part of this research. This research process has resulted in an enlivened workplace where every new group of students with their teacher presents a situation for the researcher to review, reinforce and occasionally re-invent the findings of this study.

Chapter Four

INFANTS AND PRIMARY SCHOOL CASE STUDY RESULTS AND DISCUSSION

Case Study School E: Year One Excursion to the RBGS

School E is a public primary school in Sydney's inner west. In early May 1996 the young students (six year olds) from Year One visited the RBGS and the Art Gallery for the day.[1] Classes were involved in formal sessions with the education staff at both venues. The classroom teachers and a number of parents accompanied the children and the school hired a bus to transport the group to the city.

The Year One class involved in this case study spent the first part of the day at the Art Gallery then walked a short distance to the RBGS for a formal session with a bg educator. The formal session at the RBGS was based on a range of outdoor activities where the students used their senses to explore the outdoor environment.

The researcher visited the school in early November, six months after the excursion to the RBGS. The classroom teacher (TQ) was asked not to discuss this visit to the school nor the excursion itself with her students.

This case study is informed by:

- transcript of a tape-recorded interview with the classroom teacher (TI School E 1996)
- transcript of a tape-recorded interview with the Year One class (SI School E 1996)
- a class booklet compiled after the excursion
- 1996 RBGS Lesson Program (Royal Botanic Gardens 1996)
- K-6 Science and Technology Syllabus Document (Board of Studies1989).

4E.1 Students' experiences of the excursion

The young students were kept in their class group and the researcher, assisted by the class teacher, questioned the class about their recollections of the part of the day spent at the RBGS. The purpose of the class interview was to determine whether or not students had remembered being at the RBGS and if they had remembered being at the RBGS, what was the nature of these recollections.

The interview was held in the students' classroom at the start of the day. TQ started by asking the students to put their hands up if they could remember any of the places that the class had been to in the year. The responses indicated that the RBGS was one of a wide range of venues visited by the class during the course of the year. These venues included local venues such as the library, fire station and local park and venues in the city including the Art Gallery and Maritime Museum as well as the 'botanic gardens'.

4E.1.1 Students' recollections of the excursion

The students were asked what they did at the RBGS. The following quote is the transcript of the first part of the class interview.

KS: "Can you remember what you did at the botanic gardens?
S1: We go the little sticky bit and found all the colours.
S2: We collected things.
S3: We saw a cockatoo.
S4: We went for a walk through the gardens.
TQ: Do you remember what sort of things we were doing?
S5: Is it called a lemon leaf?
TQ: What did you do with it?
S5: We smelt it, we crunched it up and smelled it.
pause
S6. I liked playing there.
TQ: Why did you like playing there?

[1] A map of the RBGS illustrating its proximity to other cultural institutions is found in Appendix 1.

S6: Because it was a little bit big.

S7: I found a spider.

pause

S8: Having lunch

S9: I liked playing in the shade."

(SI SchoolE 1996)

Students have remembered specific sensory based activities that formed part of the formal aspects of their time at the RBGS. Looking for the colours of the rainbow then sticking little pieces of colour on a card, smelling leaves, being on a walk, collecting things off the ground. Students recalled seeing specific animals. Informal aspects of the day were also recalled early in this interview: having lunch playing in a large, shady area. These young students responded using 'we' rather than 'I', which may indicate a strong sense of being part of a group. Enjoyment of the experience and a sense of the physicality can also be detected in this response.

Students' attention to the recollections was re-focussed by TQ and they go on to recall plants they have seen as well as some of the organisational and social aspects of the day.

TQ: "Just close your eyes people and have a think. Remember yourself back at the Gardens. Close your eyes. Think about the day we went to the botanic gardens. So?

S10: We saw cockatoos.

S11: The dead tree with all the different coloured plants on it.

TQ: Good memory.

S12: We heard the cockatoo.

S13: It was boiling hot.

S14: We saw the cactuses.

S15: Cacti.

pause

S16: I just wanted to say that there was another class – a Kindergarten that went through the botanic gardens.

pause

S17: Getting into different groups with the adults and walking around."

(SI SchoolE 1996)

These young students have clear memories of the day. They recall plants as a general group as well as specific plants (cactus plants). Specific animals are also an aspect of these recollections as are the social arrangements of the day. The hot weather was another aspect of these recollections.

4E.1.2 Students' view of learning at the RBGS

Although the focus of the class interview was students' recollections about the day, students were also questioned about their learning at the RBGS. The following quote demonstrates a number of aspects about the students' responses to a question about what they consider to be learning at the RBGS.

> KS: "What do you think you came to the Gardens to learn about?
> S18: Plants.
> TQ What were we studying in class?
> S19: The Senses."
> (SI SchoolE 1996)

It appears that plants are the obvious focus for learning for this young student however this was not the focus of the class topic. It could be said that the plant focus of the RBGS is obvious even to young 6-year-old visitors. A consequence of this powerful association between the Gardens and plants is that it may override the intentions of the class teacher if his/her intentions differ from a plant-related focus.

The attention of the class was drawn to a booklet that TQ had made with the students after the excursion. The booklet used photographs taken by TQ at the RBGS and the students had created captions for the photos. The captions focussed on the sensory experiences of the students.

> "We saw different colours
> We looked for things to collect.
> We used our hands to feel
> We used our ears to hear

We used our nose to smell
We smelled gum leaves...."
(School E 1996)

Using the story as a focus for specific recollections, the students in the photographs were asked about what they were doing when the photo was taken.

KS: "Jack, what do you remember about the feel of those cactus?
J: They were soft.
KS: Yes, that's quite strange. Did you expect them to be soft?
J: No.
KS: What did you expect?
J: I thought they would be tall and have spikes all around them."
(SI SchoolE 1996)

This sequence provides an insight into Jack's experiences with cactus plants. It appears that Jack had expectations about cactus plants and he has been placed in a situation where these expectations have been challenged by his own sensory experience. It could be said that Jack has increased his understandings of 'cactus plants' as a result of this personal interaction with the variety of real plants from dry areas growing at the RBGS.

KS: "Who's that precious person right there?
S: Laughlin.
KS: Looks like I'm sticking it up your nostril!
L: It's the lemon leaf I can smell.
KS: Did you get a good smell of it?
L: Yes actually."
(SI SchoolE 1996)

Laughlin has identified the leaf using his recollection of its physical property of smell. Both of these situations provide an insight into the use of sensory experiences in learning. The senses can reveal surprising information about parts of the world and these experiences can be used to serve a range of educational purposes. Sensory exploration has provided these students with a means to engage and interact with plants. In these two

cases the experience is memorable. Jack appears to have broadened his understandings of plants, while Laughlin appears to be able to identify a specific plant because of his recollection that its leaves smell like lemons.

This brief interaction with these young students demonstrated that TQ's follow-up activity of making the class book with its photos of individual students and their captions for each page provides a rich resource for classroom activities. The photos focus student recollections and prompt even the quietest students to discuss their experiences. There are clear links between the excursion experience and class work.

4E.2 Teacher's experiences of the excursion

TQ is an experienced primary teacher. She had visited the RBGS at her previous school – bringing her Year 6 class to the RBGS for a session about rainforests.

4E.2.1 Reasons for the visit

TQ was asked about her reasons for visiting the RBGS. Her reasons included the relevance of the lessons at the RBGS to her school work and access to the scientific expertise of the RBGS staff. Her responses are described in the following section.

a. The resources of the RBGS

TQ values the school programs at the RBGS for a range of reasons. Firstly the formal sessions at the RBGS are linked to school syllabus documents.

> KS: "What we are looking for too are reasons why people go to a botanical garden to achieve their aims rather than say a local park or to a museum or a field study centre.
> TQ Well it's because you've got the Education Centre there and the reason I'd suggested it – I'm new to this school this year and I'd suggested it to the other teacher because I'd been there last year.... Also the program – because the way that's been written. It linked in with the Science and Technology Syllabus and with the other KLAs."
> (TI SchoolE 1996)

This formal session at the RBGS on the senses is linked to a recommended topic in the K-6 Science and Technology Syllabus called 'Sense of Direction' (Board of Studies 1989). This quote also demonstrates that teachers bring other teachers to the RBGS. TQ also valued processes by which classwork could be linked to the session at the RBGS.

> TQ: "Whenever I have been there I really noticed that the lesson has been tied in with what I've been studying. And I think it's because you send out your pre-visit sheet and ask what we've done in class. I've always felt that's been put in."
> (TI SchoolE 1996)

The links between classwork and the RBGS are evident to TQ in the formal session delivered by RBGS staff. TQ has made professional judgements about the worth of an excursion to the RBGS. As a critical user of the resources of the RBGS she values the clear connection between the programs of the RBGS and her classwork. TQ also comments that she would only take her class to a particular venue if the visit relates specifically to classwork.

> KS: "In a primary school experience would you have the kids go there (RBGS) just once?
> TQ: I think it depends on what you are actually studying and because things are so expensive we try to keep excursions to what we are studying in class. I think for the parents' sake because they do get so many demands on them."
> (TI SchoolE 1996)

A third feature of the resources of the RBGS is student access to staff expertise. Education staff at the RBGS are able to concentrate their content knowledge on the plants and environments of the RBGS. Staff are in a unique position of being able to respond to students' questions with an immediacy that may not be matched by classroom teachers.

> TQ: "The other thing too that I really appreciate from the Gardens is just the expert knowledge of the staff with particular plants that I don't have. And especially last year when I had the Year Six. They were asking me really quite difficult questions and I really didn't have the knowledge ... it was great to have someone to answer all the children's questions."
> (TI SchoolE 1996)

These quotes demonstrate a range of features of TQ's use of the resources of the RBGS. It appears that the promise and delivery of formal sessions that are relevant to school syllabus documents are important components of the school programs offered by the RBGS. This primary teacher accepts that her students are able to go beyond the classsroom for immediate responses to their questions. This opportunity would otherwise not be available to her students. TQ is at ease with her admission that for this area of the syllabus, she is not an expert and so she seeks help from the RBGS in order to foster student learning in the most appropriate learning context.

b. Relevance to classwork and students' experiences

The previous section revealed that TQ has bought her students to the RBGS because of the work she is doing in class.

> TQ: "We had gone there for a visit on the senses so we had the lesson to tie in with that. But the other aspect of it for these children is especially that they can see the spaces and have the grass because we just don't have any of that in our playground."
>
> ..
>
> TQ: "The gardens are planned as sort of a natural environment because when we go for walks around the school then it's mainly built environments that they're seeing and touching."
> (TI SchoolE 1995)

Students from this inner city school visit the RBGS to experience the space and natural aspects of this environment. TQ indicates that her students will be using their senses to interact with the natural environment at the RBGS. Students will broaden their experiences by interacting with an environment that is different from the students' local area.

4E.2.2 Teacher's pedagogy for the excursion

Teachers' responses relating to their professional judgements about the excursion and about how they will use the excursion experience with their students are reflections of their view of teaching. This category explores TQ's view of the excursion experience.

a. Features of a successful excursion

TQ was asked to provide an insight into her criteria for a successful excursion.

> KS: "For you – what are the features of a successful excursion?
> TQ: I think as an experience for the children. That the children get something out of it. And it shows in subsequent work. That the excursion leads to whatever we have gone to see. Plus an enjoyable day.
> KS: What sort of things do you see in the kids?
> TQ: Just their writing and the pictures that they draw. Just when they've had an experience like the excursion they have a lot more input. And class discussions they've got a lot more to say."
> (TI SchoolE 1996)

TQ, like other classroom teachers involved in this research are aware of the effect of the excursion on their students. They look for evidence that the excursion has an impact on their students. Evidence of success is found in students' performance in class work after the excursion. TQ indicates that the excursion increases the pool of experiences from which they and their students can refer in further class work. TQ also comments that the event is enjoyable.

b. Classwork after the excursion

This case study is able to confirm that the excursion has formed part of classwork. The class booklet is clear evidence of the impact of the excursion on class work. TQ uses photographs to create a record for her young students.

> TQ: "Whenever we go on excursion I like to take photographs. Sometimes we put them up on the wall. Often we collect them into a book.
> pause
> We sequenced the pictures and categorized the pictures that went with the different senses.
> pause

I try to take photographs because it does give them a talking point back in class. Even give really quiet children a photograph and ask them to talk about it – 'what was happening?' It does record it for them."
(TI SchoolE 1996)

The photographs are used for a range of classroom activities with these activities culminating in a class booklet[2] as an account of the excursion. The students often refer to this booklet and use it for their reading activities. The booklet was also taken home to parents.

As well as these language and literacy activities the students also used the contents of their collecting bags to create collages. Hence a range of cross-curriculum activities have been generated by the excursion to the RBGS. The excursion is embedded in classwork.

4E.2.3 Teacher's view of learning at the RBGS

TQ is able to state her objective for the excursion as follows:

TQ: "It was to increase their awareness of their senses and how they use their senses."
(TI SchoolE 1996)

This objective relates to the current classwork and it is interesting to note that TQ holds no long-term expectations that her students will recall the excursion as is demonstrated in the following quote.

TQ: "I'm not sure how much they remember now but they often like to look at old books they've made."
(TI SchoolE 1996)

TQ links the excursion experience at the RBGS with the formal lesson held at the RBGS She perceives that the session at the RBGS reached her expectations for the following reasons.

---

[2] This booklet is a prized addition to the RBGS Education Library courtesy of students from School E.

TQ: "I thought it was particularly well structured. The children got a lot out of it because it covered the whole five senses for them and it was really an activity based thing."
(TI SchoolE 1996)

It appears that the session achieves TQ's requirements because it:

- is relevant to her needs as a classroom teacher
- is critically perceived by a practising teacher as being well crafted
- involved students in practical activities.

TQ goes on to present her view of the activities that involved her students.

Rainbow hunt

TQ: "They had a little piece of cardboard with double sided sticky and they had to go round and collect something of all different colours. I was just amazed and I think the children were too at how many different colours there were on the ground."

Leaf walk

TQ: "It was sort of a narrow area in that they were only looking at leaves but within that range they got a whole lot of different smells and a whole lot of different colours and a lot of different touches as well because they touched rough leaves, smooth leaves. I think a lot of them thought that leaves were just leaves."

Collecting bag

TQ: "I think they learn best by just doing things – collecting – because they all had a bag – and that was just great because they loved the bag. When we had lunch they were still collecting things to put in their bag. I think things like that are memorable for them. When we came back we were able to look at the different colours and discuss those."
(TI SchoolE 1996)

TQ suggests that not all activities at the RBGS are suitable for all students.

TQ: "With Year Six in the rainforest the worksheets we had were really terrific but I don't think they would have been useful for Year One."
(TI SchoolE 1996)

4E.3 Discussion

This case study demonstrates the memorable nature of the excursion to the RBGS. Six months after a busy, full year these young students have recalled sensory-based activities that formed part of planned activities for their excursion to the RBGS. These recollections are associated with the learning outcomes held by the classroom teacher. This correspondence between student recollections and intended learning outcomes indicates that this excursion was a learning experience for these young students.

Considering that activities were part of these young students' first recollections of the day, it appears that they have remained part of students' long term recollections of the event. The activities for these infants students:

- use everyday items that are familiar to the students e.g. leaves, things on the ground
- involve physical interaction with real natural things
- involve an element of surprise
- have a simple focus
- are open ended e.g. students are collecting what suits them
- suitable for the age group
- can be used for further activities back at school
- are memorable.

These young students associate the RBGS with learning about plants – even when the focus for learning was about the senses. Plants also formed a memorable part of the excursion experience for these students. There is evidence that the students have increased their understanding of plants as part of their sensory exploration of the Gardens. Students recall sensory experiences such as hot weather, smells and textures. Social aspects of the day such as people accompanying the group and organisation of the day are memorable. Students also report that the excursion is enjoyable.

Evidence from this case study suggests that TQ as the classroom teacher is training her young students to understand that learning can also happen beyond the classroom. Students are involved in an active programme of excursions that relate closely to classwork. Furthermore TQ takes care to point out to this relationship to her students.

This case study provides an insight into the nature of the connections between class work and the students' experiences at the RBGS. It is clear that there is a range of opportunities for these links to occur. Firstly an initial link has been made when the classroom teacher identifies a specific syllabus-related topic in the promotional material from the RBGS. The session with this orientation has been designed by the RBGS to specifically address syllabus topics hence there is a recognisable link between the RBGS session and the class topic taken from the syllabus. Secondly the booking material sent to the school by the RBGS after the school has made a booking requests the teachers involved in the excursion to send information about what they are doing in class. The botanic garden educator uses this information to plan the session. Thirdly on the day during the lesson, interaction between the botanic garden educator and the visiting student and teacher maintains a focus on the requirements of the class. Hence the links between classwork and the RBGS are obvious to the classroom teacher. Fourthly, on return to class TQ uses concrete materials from the excursion (plant material, photographs) and her students' recollections for further class work.

There is evidence of the roles adopted by both the classroom teacher and the bg educator. First and foremost TQ can be perceived as managing the excursion experience for her students. She co-opts the professional services of the bg educator whose communication skills, teaching skills, subject expertise, curriculum expertise and knowledge of the RBGS are required. TQ participates as a co-learner with her students and keeps a record of the event. There is evidence of the administrative component of the excursion where TQ organises parents, payment for the lesson, transport to and from the venue, letters to parents informing them of the event and communication about the events of the day itself. TQ has formed clear professional opinions about the worthwhile

nature of an excursion to a botanic garden and is influential in bringing other teachers (and parents) to the RBGS.



Plate 2 **We heard the wind blowing through the trees. (School E 1996)**

Case Study School C: Year Four Excursion to the RBGS

School C is a primary Catholic school in Sydney's southern suburbs. The Year 4 class involved in this case study visited the RBGS for a lesson on 'Rainforests' late in March 1996. The school group travelled by bus to the RBGS for the day. On their arrival at the RBGS the students had a lesson then had lunch and went for a walk to Mrs Macquarie's Chair[3a] and back to the RBGS Education Centre.

The lesson at the RBGS was attended by the class with their teacher and accompanying parents. The one and a half hour session started at the RBGS Education Centre where the bg educator and students discussed what they would be doing during the lesson. The group then moved through areas of the RBGS that were relevant to the class' requirements. Areas visited by the group include the Tropical Centre[3b], the Palm Grove[3c] and a rainforest garden. The activities in these locations encourage student interaction with plants and environments. They had a two-page worksheet to complete as a record of their lesson.

The class and their teacher (AN) were visited at the end of October that same year approximately seven months after the excursion to the RBGS. On this visit the class teacher was interviewed and her students were provided with a survey to complete in class. The teacher also provided a number of photocopies of the written work students had completed during class on their return to school.

This case study is informed by:

- transcript of a tape-recorded interview with the classroom teacher (TI SchoolC 1996)
- written surveys completed by the class of Year Four students attending the excursion to the RBGS (SS School C 1996)

[3a] These areas are marked on the map of the RBGS in Appendix 1.

[3b]

[3c]

- samples of students' work completed as part of schoolwork after the excursion
- 1996 RBGS Lesson Program (Royal Botanic Gardens 1996).

4C.1 Students' experiences of the excursion

The class of 17 Year Four students was asked to complete a one-page survey sheet (see Appendix 2.1) about their excursion to the RBGS. Students were in their normal classroom and could discuss the survey with students near them. The students had not seen the survey prior to it being handed to them in class. Furthermore AN had been specifically asked not to discuss the excursion with the students prior to the day of the visit to the school. The survey questioned students about the following:

1. recollections of their visit to the RBGS
2. what they enjoyed about the day
3. if there was anything they did not enjoy
4. what they remember learning about at the RBGS
5. their favourite part of the RBGS

4C.1.1 Students' recollections of the excursion

The first survey item asked students to 'Write down what you remember about your visit to the RBGS.' The researcher had anticipated that the young students would recall a wide range of incidents from the day spent out of school. The most overwhelming aspect of students' responses was that seven months after their excursion to the RBGS, 16 of the 17 students recalled aspects of the formal part of their day i.e. the lesson with the botanic garden educator. Table 4.1 provides the results for this question item and the coded responses[4] from each student are presented in Appendix 4.1.

Table 4.1 demonstrates that the majority of students recall something of the lesson they had at the RBGS. The single response that does not include the formal aspects of the day recalls visiting the succulent garden – when the school group went for the walk after lunch.

Response	Number of responses n = 17	%
Formal and informal aspects	10	59
Formal aspects only	6	35
Informal aspects only	1	6
Places at the RBGS*	17	100
Lesson activities*	16	94
Sensory experiences*	13	76
Plants at the RBGS*	11	65
Social aspects of the day*	9	53
Incidents throughout the day*	5	29
Animals at the RBGS*	4	24

*Denotes multiple responses: students' responses are included in more than one category

Table 4.1 **School C: Student responses to survey item 'Write down what you remember about your visit to the Royal Botanic Gardens Sydney.'**

a. Places at the RBGS

Seven months after their excursion every student from this Year Four class has recalled specific locations at the RBGS. It appears that the Tropical Centre and the Succulent Garden listed in Table 4.2 form part of the longer-term memories of these students. Approximately nine in ten students remember the Tropical Centre at the RBGS. The students have not used the specific name of the glasshouse complex. They have referred to the place as the glasshouse (11/17) or the pyramid (5/17). Approximately half of the students (8/17) recalled specific details about the Tropical Centre: it was hot (7/15); it had mist (2/17) it had plants (2/17); it was tall (1/17).

Response*	Number of responses n = 17	%
Tropical Centre	15	88
Succulent Garden	9	53

*Denotes multiple responses

Table 4.2 **School C: Recollection of places at the RBGS**

[4] A legend for the codes used in written surveys is presented in Appendix 3.

Students visiting the Tropical Centre encounter two science concepts associated with students' understandings of 'air'. Firstly the concept of humidity. We cannot see water in the air but we can feel it. Students' physical perception of being hot and sticky in the Tropical Centre can be linked to the idea of water being in the air. Secondly, the concept that warm air rises. Students recognise that it is hotter at the top of the glasshouses. Hence this physical experience can be used to draw students' attention to the phenomenon. It is obvious that students have not come to the RBGS to study 'air'. However this situation is one of many potential learning situations that could contribute to the 'richness' of students' experiences on excursion to the RBGS.

Five in ten students recall the Succulent Garden. This location is referred to by these students as 'the desert'. Four students recalled specific information about the Succulent Garden: three students recalled the incident where one of them was spiked by a cactus; two students recalled the cactus plants; one students recalled the spiders in the Succulent Garden.

b. Recollections of lesson activities

In this free response question asked of students seven months after their excursion to the RBGS, almost every student remembered something associated with the lesson they had experienced. Student recollections of the lesson activities involve the physical experience of moving around the RBGS - especially into the Tropical Centre. 11/16 students recall specific information about the lesson. Study of these responses reveals that these students recall seeing plants, noticing temperature changes, recollection of the feel and scent of leaves. This level of detail is surprising considering the length of time after the excursion and also the absence of any time for reflection or discussion of the experience within the time for the administration of the survey.

c. Recollections of sensory experiences

Table 4.1 indicates that three quarters of these Year Four students recall sensory experiences at the RBGS. The nature of these sensory experiences is demonstrated in Table 4.3.

Response*	Number of responses n = 17	%
Temperature – hot/cold	8	47
Seeing / looking at	5	29
Tactile/touch	1	6
Smell	1	6

*Denotes multiple responses

Table 4.3 **School C: Student recollections of sensory experiences**

Sensory experiences are memorable experiences for these young students being recalled seven months after the excursion.

> "I remember the glasshouse and all of the plants. I liked how the temperature got hotter when you went higher it got hotter. When we went to the desert and saw" ...
> "I remember going into the glass house, seeing the wedding, desert and the smell of the eucelipyes (sic) tree."
> (SS School C 1996)

This is an unexpected response from these young students. It appears that the nature of these responses demonstrates that the excursion to the RBGS has a strong impact on these students.

d. Recollections of plants

Approximately two thirds of these Year Four students remember plants as part of their recollections of the excursion to the RBGS. Students can recall plants in general (6/17) or specific plants (6/17). The following quotes demonstrate recollections about plants.

> "I remember when we went into the RBG and we went into the pyramid where all the beautiful plants were and in one part of the pyramid was hot and the other side was misty and cool."
> "I remember going into the glasshouse and seeing all the plants. I remember in the pyramid when I got in there it was very tall. I also remembered seeing the little tadpoles."
> "I remember the walk seeing all the different types of plants and the glasshouse and it temperature."
> (SS SchoolC 1996)

The first two quotes are two of four responses that link seeing plants with being in the Tropical Centre. Further research is required to determine the nature of the students' recollections about plants. Study of the plant-related responses reveals that some students have memories of the diversity of plants in the Tropical Centre.

The following quotes represent responses about specific plants.

> "I remember going into the glasshouse, seeing the wedding, desert and the smell of the eucalyptus tree."
> "Going to the desert and seeing cacti."
> (SS School C 1996)

Cactus plants form part of the long term recollections of four students and it appears that this group of plants have a strong impact on this group of young students.

e. Recollection of incidents through the day

There are many incidents that form part of the excursion event and the expectation of the classroom teachers was that these incidents would be recalled by her students. It is clear from the data that incidents have been recalled by the students but they have not formed the major group of recollections of the day. The data suggests that the classroom teacher has underestimated the impact of the experiences associated with the formal aspects of the excursion. The two incidents that are recalled by students their friend being spiked by a cactus (three students) and seeing a wedding in progress at the RBGS (two students).

f. Recollections about animals

Table 4.1 indicates four responses about animals. Closer inspection of student responses reveals two responses about spiders and two about tadpoles. The data suggests that plants rather than animals have been the feature of the day. This feature of students' responses indicates that a botanic garden may be a unique environment for focussing student attention on plants. Consideration of students' responses from both case study

schools discussed so far indicates that students associate study of plants with their visit to the RBGS.

g. Personalising the experience

These recollections can be re-investigated to look for ways these students have personalised their experiences at the RBGS. This selection of responses is a process of looking for evidence of students linking the experience to their own personal view of the world. The groups are based on personalisation of information or experiences as follows:

- naming
- associated with sensory perception
- showing descrimination.
- associated with friends or social group.

Table 4.4 presents the frequency of these responses.

Response*	**Number of responses n = 17**	**%**
Naming	14	82
Associated with a sensory experience	8	47
Descriptive/showing discrimination	6	35
Association with friends or group	3	18

*Denotes multiple responses

Table 4.4 **School C: How students personalise information**

i. Naming

Some students are able to provide names for their aspects of their recollections as we see in the following quotes.

> "I remember the glass *pyramid* and the *desert* and the play after. I also remember the furry leaves and the tropical plants."
> "I remember the glasshouse and the *botanical desert* and the spiders and spiders webs."
> (SS SchoolC 1996)

These students have named the Succulent Garden a desert and the first student describes the Tropical Centre as a pyramid. These names are idiosyncratic yet accurate and factual.

ii. Associated with a sensory experience

The responses in this group demonstrate that students can associate particular sensory experiences with specific locations and specific plants at the RBGS. The following quote is an example from this category.

> "The huge glasshouse and how we went inside and the temperature got hotter and then the water came down and felt nice."
> (SS SchoolC 1996)

This student, like many involved in this research, recalls the sensory aspects of her experience in the Tropical Centre at the RBGS. Responses such as this indicate that the sensory nature of the excursion is a memorable feature of the event.

iii. Describing or showing descrimination

Students have personalised their experiences at the RBGS by use of descriptive adjectives or phrases as demonstrated in the following quote.

> "I remember when we went into the RBG and we went into the *pyramid where all the beautiful plants were* and in one part of the pyramid was hot and the *other side was misty and cool*."
> (SS SchoolC 1996)

This student embellishes his/her recollections with descriptive (yet accurate) phrases about the Tropical Centre. The following quote shows student use of adjectives to describe specific plants he/she has seen at the RBGS.

> "I remember the glass pyramid and the desert and the play after. I also remember the furry leaves and the tropical plants."
> (SS School C)

iv. Association with a friend or social group

Students have personalised situations associated with the friends as demonstrated in the following quote.

> "When we went into the dessert (sic) and *my friend Rixon got cactus spikes in her hand.*"
> (SS SchoolC 1996)

This child's friend has been hurt by a cactus. The response demonstrates that this child has a personal association with a specific group of plants in a specific place at the RBGS. We gain a further insight into the learning that this situation provided for this student in her response to the question 'what do you remember learning about at the Gardens'.

> "Don't touch a cactus with spikes"
> (SS SchoolC 1996)

Further study of these personalised responses provide an insight into the types of associations students make with specific plants or places or activities at the RBGS. These associations may prove useful to prompt student recall of specific memories of learning experiences at the RBGS.

4C.1.2 Students' view of learning at the RBGS

In all but two of the responses to the question item 'What do you remember learning about at the Gardens?' students associate the learning with the formal part of the excursion. Table 4.5 indicates the range of responses to this question and coded students' responses are found in Appendix 4.2. Seven months after the excursion the majority of student responses demonstrate close correspondence between AN's learning focus for the excursion and their perception of the nature of their learning. Students' responses also locate their learning in the formal part of the day i.e. in the lesson with the botanic garden educator.

Response	Number of responses n = 17	%
Learning related to formal part of day	15	88
Learning related to informal part of day	1	6
Nil/nothing	1	6
Concepts	8	47
Facts	8	47
Learning about plants*	8	47
Sensory experience*	8	47
Learning about rainforests*	4	24

*Denotes multiple responses

Table 4.5 **School C: Student responses to survey item 'What do you remember learning at the RBGS?'**

Study of students' responses reveals that plants and sensory experiences are the focus of learning for these students. This group of quotes presents a range of views about sensory experiences as learning experiences: temperature and humidity are factors in learning; some leaves smelled like lemons; the glasshouses were hot; don't touch cactus plants. These factual accounts arise from students' individual experiences and these experiences can be seen to relate to individual students building their understanding about plants or environments.

One student reports to know what a rainforest 'feels like'. This sensory experience moves beyond the more concrete sensory experiences of other quotes. Personalisation of a sensory experience contributes to the student gaining a deeper understanding of a rainforest environment. It is also clear that this type of learning could not happen in a classroom – indeed it would best happen in a real rainforest.

The responses can be grouped as student learning of general concepts or of specific facts. In the former situation, students say that they learned about 'plants' (five students) or about 'rainforests' (three students). The following quotes demonstrate some of the responses in this category.

"what a rainforest is like"

"I remember learning about the different trees and plants."

"All the different plants and temperatures."

(SS School C 1996)

These quotes indicate that students can accurately recount that they have learned about broad concepts. In some cases such as the first of the above quotes, students recount a 'big picture' idea. These quotes can be contrasted with those of students who recall factual information. Of these responses two are incorrect. This aspect of the data indicates that students may not demonstrate accurate recall of factual information gained on their excursion.

The nature of students' responses reveals a need to question students further about their view of what they learned at the RBGS. This research is limited by the lack of time available to explore students' perspectives and consideration should be given to utilisation of research strategies that devote time to discussing students' ideas. The data indicates that further, richer insights into the nature of learning in a botanic garden can be gained from exploration of students' responses.

4C.1.3 Enjoy about the day

Students were asked what they enjoyed doing the most at the RBGS. Table 4.6 demonstrates that there is almost a balance between those students that enjoyed the formal aspects of the day (eight students) and those that enjoyed the informal aspects of the day (seven students). Students coded responses are presented in Appendix 4.3.

All the eight responses for the formal aspects of the day relate to the Tropical Centre and provide reasons for making this choice. These reasons can be arranged into three groups: sensory (seven students); the plants in the Tropical Centre (three students); it was exciting (one student).

Response*	Number of responses n = 17	%
Formal aspects of the day	8	47
Informal aspects of the day	7	41
General aspects of the day	2	12

*Denotes multiple responses

Table 4.6 **School C: Student responses to survey item 'What did you enjoy doing the most at the Gardens? Why?'**

The informal responses can be arranged into three groups: going to the 'desert' (four students); going for a walk (three students). Students enjoyed going to the 'desert' because of the cactus plants (three students) and the experience of seeing these plants (two students).

These results indicate that students have enjoyed specific places at the RBGS and for many of these students, the plants have been the feature that they enjoyed. There is also a sense that students have enjoyed the physical nature of the day.

4C.1.4 Not enjoyed about the day

Students were asked 'Was there was anything about the day that you did not enjoy?' Table 4.7 provides the results of this item and students' coded responses are presented in Appendix 4.4. Three quarters of the students indicate that they enjoyed all aspects of the day. Of the three students that did not enjoy some aspect of the day, one did not like filling in the worksheets, the other had a headache and the third student did not enjoy the walk.

Response	Number of responses n = 17	%
No; liked everything	13	76
Not enjoyed some aspect of the day	3	18
Nil response	1	6

Table 4.7 **School C: Student responses to survey item 'Was there anything about the day you did not enjoy?'**

Hence the following observations can be made about what these students have enjoyed or not enjoyed at the RBGS.

- A majority of students (76%) enjoy all aspects of the day.
- Students enjoy specific locations at the RBGS (twelve students). These locations are enjoyed because of the experiences that students have there (nine students) or because of the plants that are in that location (six students).
- Students enjoy the formal aspects of the day.

4C.2 Teacher's experience of the excursion

The class teacher (AN) was interviewed in a small room near the front office of the school. The interview was tape-recorded and lasted for approximately 20 minutes.

4C.2.1 Teacher's recollections of the day

The first question asked in the interview was about AN's recollections of the day.

> K: "When you think of your excursion what is your immediate recollection of the day?
> AN: Look I thought it was a great day because it really tied in with what we did at school.
> K: Yes?
> AN: We were doing the unit 'What is life like in a rainforest?'
> pause
> AN: It was relevant because it was hands on and they actually saw things that I spoke about. They could see and experience in the Pyramid. That actual physical how we went up and it was warmer. They could actually feel a little bit of the humidity – and you can't get anything better than that I thought."
> (TI SchoolC 1996)

AN's quote provides an insight into the impact on her and her students of their close physical contact with rainforest plants and environments at the RBGS. The experience engages the senses and the focus of this experience is the real, living plants that students have been hearing about back at school. The excursion is relevant to their current unit of

work and AN's students could link their classwork with what they could "see and experience" at the RBGS.

The practical nature of the day extends to the physical experience of the humidity associated with tropical rainforests. AN goes on to state that this experience of humidity was a highlight of the day for her. The Year Four students are immersed in a rainforest-like environment and it is clear from the results of the student survey that this experience in the Tropical Centre has been a memorable one for students as well.

4C.2.2 Teacher's pedagogy for the excursion

AN perceives that excursions are important for her students as a break in the routine that is preferably part of a unit of classwork. One of her main teaching aims is to create real experiences for her students either outside or inside her classroom. AN sees excursions as one of the ways that she can make learning real for her students. She is willing to take her students to new venues and to incorporate these new experiences into her teaching programs. AN has incorporated the excursion experience into her teaching sequence for the unit of work on rainforests and uses a range of aspects from the excursion in across-curriculum activities.

a. The excursion as part of a teaching program

The excursion was timed to occur early in the unit of work on rainforests.

> AN: "I think going at the right time is important too. We went very early in the unit which was good. We were in the middle of the input."
> (TI SchoolC 1996)

The interview provided some insights into AN's approach to her teaching and the use of the excursion as a teaching tool.

> AN: "After they got back they had to do a recount of the day."
> ..

AN: "I took some good photos which we used for visual arts. The photos were really good because they (students) remembered some of the plants. They really worked out well. All these things you think of as you go along just try and get something more out of the unit."

..

AN: "[We] try to bring as much as we can into the classroom to make it more real."
(TI SchoolC 1996)

These quotes indicate that the excursion forms part of the teaching sequence for this unit of work. The excursion has occurred early in the unit to provide the students with some concrete experience of a rainforest environment. The experiences that students have had at the RBGS are used for a range of cross-curriculum activities such as genre writing (factual recount) tasks for english and visual arts projects.

b. The excursion as a break in routine

AN also holds that students should have a trip away from school once a term.

AN: "I think you really do – once a term, need to take the children out – if you can possibly tie it in some way with what you are doing."
(TI SchoolC 1996)

It appears from this quote that there is a perception that students need a break in the routine of school. It also appears that teachers would try to tie this break into classwork however the notion of having the break seems to take precedence over its relevance to classwork. AN goes on to indicate that other factors also play a part in the decision to go on an excursion.

AN: "Sometimes we can't go anywhere. There's too much going on at school or we're asking for too much money."
(TI SchoolC 1996)

c. Previous experience at the RBGS

This was the second time that AN had taken a group to the RBGS for an excursion. The year before she had taken her class to the RBGS for a lesson about the RBGS and its significance as the site of Australia's first European farm.

> AN: "Which I found quite fascinating. I doubt the kids did. But that was a different group even though it was the same unit (What is life like in a rainforest?'). When you do a unit a second time you somehow perfect it.... This time we actually said 'Rainforests' ... concentrating on exactly what we were doing – whereas last time it wasn't quite that way."
> (TI SchoolC 1996)

It seems that the lesson about the history of the RBGS did not relate to classwork and did not suit the young students. AN had visited the RBGS with a colleague who had organised the bookings and other administrative details of the day. AN pursued the idea of returning to the RBGS even though this first experience of the formal sessions at the RBGS had not fulfilled her expectations. It is apparent that AN views her initial lack of success at the RBGS as part of a process of perfecting her unit of work. This process has lead to her more successful use of the venue and a more effective component for her Year 4 teaching program as we see in the following quote.

> AN: "I think it's good to put it into your program and make it a regular thing .... I've been on Year 4 or 5/4 and we've made that part of our program in Term 2 – a unit on the rainforest for Science and Technology."
> (TI SchoolC 1996)

d. Excursion is successful

AN demonstrates a professional awareness about the success or otherwise of the excursion.

> K: "How do you know that if you've taken them on an excursion it's been successful?
> AN: Feedback. Look one of the students said to me 'That's the best excursion I've been to.'"
> ..

AN: "Parents – the ones that went – and so many parents wanting to come saying 'I'd love to go and see that.' You know when children bring things in. I had a couple of kids who bought things in from home.... You know talking about it and bringing things in.... When you see children doing that and you haven't told them to – I think you've created an interest.

K: *Have you done things that are not successful?*

AN: Definitely.... There's not a lot of enthusiasm. You can feel it. This group will tell me 'This is boring'.... This is an interesting group.... There's a few in there that will really speak up."

(TI SchoolC 1996)

It is clear to AN that successful events or learning experiences are interesting to her students and motivate them to initiate a range of activities on their return to school. AN is also able to discern when students have run out of enthusiasm for specific topics and she is prepared to be guided by the opinions expressed by her students.

e. Excursion is a social experience

Part of the events of the day involved students with their teachers and parents going on an extended walk to Mrs Macquarie's Chair. AN was asked about the walk.

K: "When you're walking with the kids do you question them about things or talk to them?

AN: Talk to them.... You have to look at the children – they talk about other things going on in their lives. Just enjoying your company as a person. I think I liked that. Particularly this group I found that that excursion I think they saw me like a friend. Breaking down – we were still Term Two so it was fairly early in the year."

(TI SchoolC 1996)

AN regards this class as somewhat outspoken and boisterous and no doubt she would have adopted quite a strict persona in class – especially at this initial stage of the year. She has used the excursion as a chance to create a more personable relationship with her students. There is a feeling that the day is relaxed and enjoyable.

4C.2.3 Teacher's view of learning at the RBGS

AN describes the difficulty of teaching a unit on rainforests when her students have had little previous experience of a rainforest environment.

> AN: "That's quite a hard unit – when it's not really there. You've really got to be there and that way they can relate back. That's why I think it was important to go early in the unit like that. When they've had a little experience and then we can keep referring back to it."
> (TI SchoolC 1996)

AN expects that her students will be able to experience a rainforest-like environment at the RBGS. As revealed earlier in this discussion, AN found that at the RBGS her students could see the plants that they had been learning about at school. Her students would have experience with components of a living environment.

> AN: "I really do believe it's the hands on (pause) that Pryamid (pause) to me that experience (pause). When you read about it and you remember (pause) when you've read about it and heard about it and then you actually experience it. And they do remember some parts – they're not going to remember everything."
> (TI SchoolC 1996)

AN's students had a limited understanding of rainforests. They live in an urban environment with the nearest rainforest being found in isolated pockets in national parks to the south and west of Sydney. The class uses books and videos as part of 'input' to inform their understandings of a rainforest environment. It is expected that students will learn much about the physical features of a rainforest by a visit to the Tropical Centre at the RBGS.

This discussion demonstrates that learning at the RBGS has three essential components: a cognitive aspect or 'what' students are to learn, a concern for 'how' students will learn and thirdly the 'where' or the location of the learning. For these Year Four students the content or conceptual understanding is about the rainforest environment. A further aspect of this quote is that AN does not expect her students to recall factual details of this experience she simply wants them to 'experience' a rainforest environment.

The second aspect about the nature of learning for School C is concern for how the students learn. The experiences required for this group of Year Four students are practical and sensory. The students are physically immersed in a rainforest-like environment. The third component of learning at the RBGS is the access to living plants and environments that complement the unit of classwork i.e. the rainforest plants housed in the Tropical Centre. It is clear that placing students in a rainforest provides them with the third critical component of this learning experience.

4C.3 Discussion

The classroom teacher, AN, used this excursion experience to contribute to her students' understanding of a rainforest. Students recall the plants as well as the heat and humidity of the Tropical Centre. These recalled experiences are used as a resource for study of the rainforest topic at school. Furthermore students' recollections seven months after the excursion relate to the formal part of the day and demonstrate a correspondence with AN's desired learning outcomes for the excursion. For the class involved in this excursion the excursion to the RBGS can be said to be a learning experience.

This type of learning is viewed in the Deweyan concept of learning and experience and is referred to in this thesis as scheme-building learning. Students, through their own personal experience with real objects or real environments build their understandings of these objects or environments. This type of learning has a content focus with broad cognitive outcomes and it is concerned with the learning process or how students are to be engaged with this learning. Learning through experience is also concerned with where this learning takes place.

This case study reveals that discussions about learning at the RBGS involve considerations of what is to be learned, the nature of the learning process and the location for learning. It appears that classroom teachers may not expect factual recall as a learning outcome. Furthermore there are indications that students do not demonstrate accurate factual recall. Classroom teachers expect their students to interact with specific plant collections in such a way as to increase their experience with this particular group

of plants. Sensory interaction with real, living focussed collections of plants results in long term memories of environments.

Students' survey responses provide an insight into the types of memories that they hold about their excursion to the RBGS.

- Students' memories are associated with the learning outcomes set by their classroom teacher and by the botanic garden educator.
- Students have long-term memories of the sensory experiences they have on their excursion to the RBGS.
- Students recall specific places at the RBGS – especially the Tropical Centre and the Succulent Garden.
- Students recall plants as part of their memories of the excursion.
- Students recall the activities in which they are involved at the RBGS.

This data has provided an insight into methods that these students have used to personalise their experiences at the RBGS. All but a single response report more than just a string of events as their recollection of the day. Students have associated their experiences at the RBGS with their friends and with practical sensory experiences. Students also use creative descriptions of their experiences and prefer to use accurate scientific names for places and plants they have seen at the RBGS. It appears that learning experiences for middle primary students at a botanic garden could be enhanced by:

- providing sensory experiences as part of the learning experiences
- encouraging creative and descriptive responses to learning situations
- creating social situations for learning
- modelling use of accurate and scientific terms appropriate to the students and encouraging student use of these terms.

Close study of students' responses indicates that there appears to be a hierarchy for the conceptualisation of sensory experiences. Sensory experiences may be seen as concrete

sensory recognition of the physical features of objects or environments. Sensory experiences can also be used to create a more holistic understanding of a particular environment. Furthermore it appears that all these sensory experiences happen with real objects or in 'real' environments.



Plate 3 **We saw leaves of different shapes. (School E 1996)**

Case Study School B: Year Five/Six Excursion to the RBGS

School B is an inner city public school. Year 5/6 students with their classroom teachers visited the RBGS for the day mid March 1996. The students were in two class groups with one class (not involved in this study) having a lesson at the RBGS on rainforests in the morning and the second class having a lesson on rare and endangered plants in the early afternoon. The group involved in this study with their classroom teacher WC, spent the morning sketching, going on a self-guided history walk and visiting parts of the RBGS. The day was very hot.

The school was visited six months after their excursion to the RBGS. WC was interviewed during her lunch break in the staff common room. As discussed in Chapter Three this interview was not tape-recorded. The record of this interview is the researcher's written account of notes taken during the interview and written up that same afternoon. The Year 5/6 students completed the written survey in class after lunch. The students were aware of the researcher's visit and had seen copies of the survey the day before her arrival. Six students had completed the survey before the researcher's arrival.

This case study is informed by:

- records of teacher interview, (TIN School B 1996)
- written survey from the class of 25 students (SS School B 1996)
- sketches done by students at the RBGS
- K-6 Science and Technology Syllabus (Board of Studies 1989)
- *1996 RBGS Lesson Program*

4B.1 Student experiences on the excursion

The students in WC's Year 5/6 class were surveyed to gain insights into their experiences at the RBGS. The survey (see Appendix 2.2) questioned students about the following:

1. recollections of their visit to the RBGS
2. what they enjoyed or did not enjoy about the day
3. their understandings of the purpose of the excursion
4. what they remember learning
5. their perceptions about learning in a botanic garden.

4B1.1 Student recollections of the excursion

The first survey question asked students to 'Write down what you remember about your visit to the Royal Botanic Gardens Sydney'. Table 4.8 illustrates the frequency of responses and students' coded responses are presented in Appendix 4.5.

Response	Number of responses n = 25	%
Formal and informal aspects	9	36
Formal aspects only	8	32
Informal aspects only	7	28
Nil response	1	(4)
Recollections of plants*	23	92
Recollections of places*	15	60
'Personality trees'*	12	48
Recollections of activities*	9	36
Sensory recollections*	6	24

*Denotes multiple responses

Table 4.8 **School B: Student responses to survey item 'Write down what you remember about your visit to the Royal Botanic Gardens Sydney.'**

a. Recollections about the formal aspects of the day

Results from Table 4.8 indicate that 68% of students have recollection associated with the formal aspects of the day. Hence six months after their visit to the RBGS these students remember being involved in a learning situation at the RBGS. The students' responses to this question item provide further insight into the features of the formal learning situation that are memorable for primary students and these are presented in Table 4.9.

Response*	Number of responses n = 25	%
Plants	17	68
Places	9	36
Information recall	6	24

*Denotes multiple responses

Table 4.9 **School B: Memorable features of the formal learning situation at the RBGS**

Every student recalling aspects of the formal part of the day recalled something about plants. Ten of these students recall the names of specific plants or plant groups and these were:

- the Dragon's Blood Tree (six students)
- the Bottle Tree (four students)
- cactus (six students).

The Dragon's Blood Tree (*Dracaena draco*) and the Queensland Bottle Tree (*Brachychiton rupestris*) appeal to three out of ten students involved in this survey. Cactus plants also seem to be a feature of students' recollections. These plants were visited by the students during the walk and were used as examples of rare and threatened plants (Dragon's Blood Tree) or endangered environments (Queensland Bottle Tree). Just over half of the 17 students recalled a specific location visited during the formal session at the RBGS. Of these nine students, seven mention the 'cactus garden' or 'cactus display'.

A group of six responses recall quite detailed information about the formal session. All of these six responses are included below. The first three quotes are unexpectedly lengthy and detailed. Further study of these responses revealed that the first response has been made from the student's personal notes taken on the excursion. The next two responses were completed at home the night before the researcher's visit. The final three responses were completed during the general class time. It appears that given time to respond to this survey, students are able to retrieve notes taken on the excursion or

reflect on their experiences at the RBGS. It does not appear that these students have discussed their responses with each other as they are quite different in their approach to answering the question.

1. "I remember much about the Dragon's Blood Tree, and how it came from the Canireai (sic) Islands and that they want to regrow them, and there are about 15 left and it called a dragon's blood tree because if you cut it it's red like blood."
2. "I remember learning about tree(s) from different country sent here because there aren't many left in that country so we grow them and send the seeds to that country."
3. "I remember walking around the Gardens and being taught many things about the plan (sic) for example the reason a certain plant is in the Gardens. I remember looking at slides telling you about other Botanical Gardens and so on."
4. "*I remember the wall near the water that took 30 years to build.* The wedding with living statues. And the dragons blood tree."
5. "I saw some flowers and trees from other countries."
6. "*I remember the bottle tree. It had something like a you-know-what and it looked like a woman dancing*. I liked the cactus garden too."

   (SS SchoolB 1996)

These detailed responses contain specific factual information such as that from the first and fourth responses. The content of these factual recollections is quite idiosyncratic and unlike the factual responses from many students in other case studies these responses are accurate in their detail. The second and fifth quotes provide broad conceptual ideas about the content of the formal session. Again these ideas are accurate in their broad detail. The third and fourth quotes describe a string of events from the day. The last quote in this group demonstrates a descriptive observation by the student. Hence it appears that plants are the memorable features of this learning situation. With specific 'personality' trees providing the focus for students' recollections of the day.

b. Other recollections about the day

The most outstanding feature of these results is the large number of recollections about plants. Further investigation of these responses reveals that students have recalled specific 'personality trees' at the RBGS (twelve students). In addition to the two trees

mentioned in the previous section students (eight students) have added the Wishing Tree (*Araucaria cunninghamii*).

Almost half the students from School B recalled plants as a general recollection (three of these students recalled plants in general as well as specific plants). One of the implications of these findings is that plants form part of students' long term memories of the RBGS. Furthermore specific trees appeal to students and form part of their long-term memory about the day.

Approximately two-thirds of the students recalled locations at the RBGS. We have seen above that seven of these students recall the Succulent Garden with its display of cactus plants. Eight students recall the setting of the RBGS as demonstrated in the following first two quotes and three students recall the location of the Wishing Tree (third quote).

"I remember the plants I saw and *the view on the hill*."
"I remember sitting on a rock and sketching the Harbour."
"I remember there was a wishing tree in the middle of the gardens."
(SS SchoolB 1996)

Just over one third of students recall activities that they were involved in during the day. Three students recalled making a wish at the Wishing Tree. A further three students recall sketching the city sky line from the RBGS. Three students recalled going for a walk in the Gardens.

Almost one quarter of students from School B recall their sensory experiences at the RBGS. Of these students four recall seeing or looking at plants etc as demonstrated by the first of the following quotes.

"I remember sketching the city line with the tree and *looking at unusual trees. Seeing the wishing tree*. Learning about plants."
"I liked when we were walking through the garden it was *shady and quiet* and the breeze of the trees."
"*Very hot* very beautiful, have lots of flowers."
(SS SchoolB 1996)

The other two students recall the temperature of the day as recorded in the second and third of the following quotes. The second of these quotes presents a very different recollection and seems to relate to the aesthetic nature of the Gardens.

4B.1.2 Enjoyed doing the most

The second survey question asked students to write what they enjoyed doing the most at the RBGS. Table 4.10 contains the results of this question item and students' coded responses are presented in Appendix 4.6.

Response*	Number of responses n = 25	%
Formal and informal aspects of the day	12	48
Informal aspects of the day	7	28
Formal aspects of the day	6	24
Plants	18	72
Sensory aspects of the day	10	40
Walking around the RBGS	9	36
Sketching	8	32
Enjoyed learning	2	8
Responses with reasons	21	84
Feature of the object/activity	8	28
Fun / just like it	7	28
Interesting	6	24
Sensory aspect	6	24

* Denotes multiple reasons

Table 4.10 **School B: Student responses to survey item 'What did you enjoy doing the most at the Gardens? Why?'**

As demonstrated in Table 4.10 almost three-quarters of the students enjoyed formal aspects of the day. Plants have also proved to be an enjoyable feature of the day and of the 18 students who recorded plants as an enjoyable part of the day nine students mentioned specific plants (cactus: four students; Wishing Tree: three students; rainforest: one student; Bottle Tree: one student; rare and threatened plants: one student). A further six students enjoyed the trees at the RBGS and four students enjoyed plants and gardens of the RBGS.

Of the ten students who recorded enjoying sensory aspects of the day six students enjoyed the shady, cool parts of the Gardens and four students enjoyed seeing or looking at plants. The walking and sketching activities are popular with the students and two students enjoyed learning on the day.

The majority of students (84%) provided reasons for the parts of the day that they had enjoyed. Eight of these students provided reasons that related to the object of their enjoyment, some examples of this group of responses are included below.

> "The cactuses, I liked the shape and protection of these plants."
> "Walking around because it was nice to see all the different kinds of trees."
> "I enjoyed going to the rainforest type of spot. I liked because it was as if I was really there."
> (SS SchoolB 1996)

These responses present a personalisation of the excursion experience. These personalisations appear to relate to the types of learning that can be achieved at the RBGS. The first response in this group points out observable and memorable features of cactus plants i.e. their shape and the protection afforded by their spines. It would not be difficult to make the connection between these features and the idea that cactus plants have special features that help them to survive in an arid environment. The second response points out that the RBGS has a wide range of plants. This easily observable feature of the RBGS can be linked to the concept of the diversity of plants. These two responses indicate that broad concepts of plant adaptations and plant diversity appear to be associated with enjoyable memories of the excursion to the RBGS.

The third response demonstrates the sensation of being able to experience a rainforest-like environment. This experience is both an enjoyable and a memorable feature of the day. Hence another important aspect of the type of learning that can be achieved at the RBGS emerges from this third quote i.e. students are immersed in life-like environments and these environments can demonstrate a range of physical conditions that approach an experience of the real environment.

These quotes demonstrate that there are underlying features of students' recalled experiences at the RBGS that can be linked to conceptual understandings. Further investigation of the data will provide further insight into the features of the RBGS that are memorable for both younger and older students.

4B.1.3 Not enjoyed

Table 4.11 demonstrates the responses to the question that asked 'Was there anything you didn't like?' and the coded students' responses are presented in Appendix 4.7. One fifth of the students could not identify anything that they didn't like about the day. The results in Table 4.11 demonstrate that these students are sensitive to the physical conditions in their environment with 14 students not enjoying either the hot weather or the sight of litter near or in the RBGS.

Response	Number of responses n = 25	%
No liked it all	5	20
Weather was too hot	7	28
Litter	7	28
Activities	2	8
Not visiting the Tropical Centre	2	8
Joggers	1	4
Everything	1	4

Table 4.11 **School B: Student responses to survey item ' Was there anything you didn't like? Please explain.'**

Of the two students not enjoying the activities one did not like sketching – it was boring, the other did not enjoy the walk – it was too hot. A pair of students was disappointed that the group had not visited the Tropical Centre.

4B.1.4 Students' view of learning at the RBGS

The next three survey items ask students about learning at the RBGS. As well as their understanding of the learning purpose for their excursion the questions provide an insight into students' use of the term 'learning'.

a. Students' view of the learning purpose of the excursion

The fourth survey item asked students 'What do you think you went to the Gardens to learn about?' Table 4.12 illustrates the groups of responses to this item and coded student responses are presented in Appendix 4.8.

The specific learning focus of the excursion was about endangered plants and human impact on the environment. While this focus appeared to be clear to just over one quarter of the students, the majority of students could say that they were at the RBGS to learn about plants. This data reveals a powerful aspect of learning at the RBGS and that is that students associate the Gardens with learning about plants. In this case study the clarity of

Response	Number of responses n = 25	%
Plants, trees	16	64
Teacher specific: endangered plants / the environment	8	32
Nature	1	4

Table 4.12 **School B: Students responses to survey item 'What do you think you went to the Gardens to learn about?**

the association between the RBGS and plants may have obscured the teachers' specific focus on endangered plants. However six months after their excursion to the RBGS a clear majority of these young students recall that they were at the RBGS to learn about plants.

b. Students' recollections of their learning at the RBGS

This question item provides an indication that students consider that recall of factual information demonstrates what they have learned at the RBGS. Table 4.13 outlines the responses to the question item 'What do you remember learning at the Gardens?' and students' coded responses are presented in Appendix 4.9.

Response	Number of responses n = 25	%
Related to formal aspects of day	21	84
Related to general learning of day	4	16
Specific information	17	68
General ideas	8	32

Table 4.13 **School B: Student responses to the survey item 'What do you remember learning at the Gardens?'**

Data from Tables 4.12 and 4.13 demonstrates that although 32% of students could state a purpose for the excursion that coincided with their teachers' specific purpose, 84% of students recalled specific information associated with this formal aspect of the day. This data also indicates that students are likely to consider that learning is associated with recall of factual information and this information is associated with formal aspects of the excursion.

c. Students' view of learning at the RBGS compared to learning at school

The last survey item asked students 'How is learning at the Gardens different to learning at school?' Table 4.14 illustrates the results of this item and coded student responses are presented in Appendix 4.10.

Response*	Number of responses n = 25	%
Plants	11	44
Sensory	10	40
Close to what learning about	7	28
Enjoyable / fun	5	20
Subject matter	5	20
Outside	5	20
RBGS information	2	8

*Denotes multiple responses

Table 4.14 **School B: Student responses to survey item 'How is learning at the RBGS different from learning at school?'**

Students recognise the obvious – at the RBGS they will be seeing plants and it will be outside. Students' responses indicate that they use their sense of sight and touch at the Gardens. 'Seeing' is also used in the context of coming into contact with real plants and the actual plants that they are learning about. Another feature of these responses is the students' appreciation of the proximity and clarity of the focus for their learning. Students recognise that they are actually standing with and can see the focus of their learning. These responses identify that these students link the Gardens with learning about plants. Some students have also identified access to special expertise provided by the RBGS.

The motivational aspects are also a component of the experiences that these students have identified. The excursion was fun, enjoyable and a break from school. Indeed one student describes what appears to be the antithesis of being at school – the Gardens is "calm, quiet and cool".

4B.2 Teacher's experience of the excursion

4B.2.1 Reasons for the excursion

The first question of the interview asked WC for her reasons for running an excursion to the RBGS. Her initial response was to say that she had successfully run excursions to the RBGS in the past. She had taken her students the previous year for a lesson on rainforests and this year the other class teacher wanted to repeat the visit. He was doing rainforests and "wanted his students to experience a rainforest, get a feel for what it is like." (TIN SchoolB 1996) WC had looked at the RBGS lesson program and decided to do a lesson on endangered species making the comment that "lessons run by the RBGS are linked to the curriculum." (TIN SchoolB 1996)

WC and her colleague demonstrate an informed use of the RBGS. They repeat what they perceive to be worthwhile experiences with successive groups of students. It is clear that where two classroom teachers are involved in decisions about excursion venues, the topic for one class may not suit the other. In this case WC as the accompanying teacher had actively created a focus that suited her classroom needs. What becomes clear later in

the interview is that the excursion would form part of her classwork in Science and Technology.

WC went on to explain that the RBGS has live examples of plants and habitats and is a good example of a managed environment. She felt that the RBGS provided a model of positive human interaction with the environment. Hence the RBGS provides access to real, living things and to physical environments that are relevant to the needs of the school. The RBGS is held by this teacher to be a model of good environmental management where it can be demonstrated that "people can do things that help the environment." (TIN SchoolB 1996). As "the lungs of the city" and a site for "juxtaposition of city and garden." (TIN SchoolB 1996) the RBGS are an essential part of the urban environment.

Like many other experienced classroom teachers involved in this research, WC comments that the serenity of the RBGS is a compelling component of her reasons for the excursion. Student appreciation of this serenity forms part of her formal outcomes for the excursion as described in the next section.

4B.2.2 Teacher's view of learning at the RBGS

WC was asked to describe the objectives or outcomes she had for the excursion. She related these outcomes to concepts and to attitudes and values. As part of her response, TQ directed attention to the outcomes written as part of the unit of work 'Environment Matters' in the K-6 Science and Technology' syllabus (Board of Studies 1989).

WC describes specific content outcomes as: "Concepts: endangered species; what can people do to help the environment; contrast the city and natural areas." (TIN SchoolB 1996) The syllabus provides more specific insight into the focus of this outcome for the excursion: "explore the roles and functions of zoos and botanical gardens in protecting animals and plants under threat." (p133 Board of Studies 1989). These conceptual outcomes involve quite specific factual understanding i.e. the role of the RBGS in plant conservation as well as broad, open-ended understandings such as behaviour that helps the environment and the contrast between natural and made environments.

WC provides a range of outcomes for attitudes and values: "RBG is a place to visit in your leisure time. RBGS has science too. Feelings about the Gardens – write poems. Comparison between the city and the serenity of the Gardens." (TIN SchoolB 1996) These statements relate both to attitudes and values associated with the class topic as well as to students' broader appreciation of the RBGS.

WC also makes an insightful comment about learning at the RBGS. She explains that the RBGS "gives meaning to more abstract ideas." (TIN SchoolB 1996) This learning is associated with the concept that rainforests are humid environments. It appears that students' experience of humidity in the Tropical Centre is associated with the conceptual understanding about the humidity of rainforest environments.

4B.2.3 Teacher's view of the successful excursion

WC was asked to describe the features of a successful excursion. Her first comment related to the requirement for the excursion to be a structured experience. Her example of a structured experience was the lesson at the RBGS. Her second requirement was for the excursion to be linked to the curriculum and to have wide application across the curriculum. WC commented that with successful excursions the event "is part of a program – lead up to it and then use the material from the excursion in follow up activities"(TIN SchoolB 1996).

High on WC's criteria for successful excursion are managerial considerations. The venue is to be accessible. The excursion must be easy to organise and economical in terms of travelling time and costs.

The success of the excursion is demonstrated by "feedback from children from their written work in class after the excursion – the poems and by the quality of the artwork produced at the Gardens. The students are inspired by the excursion they enjoy the excursion." (TIN SchoolB 1996). WC, like other teachers involved in this research, detect superior work back at school as a result of students' experiences on excursion. Successful excursions inspire students. Interestingly WC also notes superior work

produced by her students during the excursion. In both cases she sites examples from the excursion to the RBGS. WC uses student enjoyment of the excursion as an indicator of its success. WC's final comment is "students see the real thing." (TIN SchoolB 1996)

From these comments it appears that WC considers the day at the RBGS to be a successful excursion. WC also commented on experiences that were not success. These experiences include those that are not pitched at the students' level. She goes on to comment that many situations are too childish, underestimating the maturity and sophistication of upper primary students.

4B.2.4 Teacher's view of the best way to learn at the RBGS

WC was asked to consider how students learn best in a botanic garden. Her immediate response was to emphasis practical experiences. "Hands on experience: experience in the real rainforest; experience real endangered plants. Being involved themselves; listen, look and do." (TIN SchoolB 1996) There are a number of aspects to this response. Firstly students are to be physically engaged in their learning and secondly this physical interaction occurs with real plants and in 'real' environments. Thirdly the interaction has a conceptual focus and this focus is informed by curriculum requirements. Fourthly WC's learning process of 'listen, look and do' implies that there is someone directing the activity and focussing student interaction.

WC's comment "Contact with people that know their stuff" (TIN SchoolB 1996) implies that the botanic garden educator provides content expertise and works directly with students. Hence there is a sense of the immediacy of the learning situation. Students have immediate access to a content specialist. This situation also implies that the content specialist is able to communicate their understandings and that there is interaction between RBGS staff and school students. It could also be inferred that this content specialist may be perceived by school students as modeling particular attributes hence contact with the specialist could involve students forming particular conceptions of the people involved in science-based work.

WC was able to articulate her requirements for worksheets on excursions. "Using worksheets that direct student observations but do not detract from seeing or experiencing the Gardens. Worksheets should be visually attractive and not time consuming. They are a reminder of the day. There should be more drawing than writing and labeling rather than drawing." (TIN SchoolB 1996) For WC worksheets perform a number of functions. Firstly they can direct and focus students' experiences and secondly worksheets are a student's record of the excursion.

Lastly WC turns to the professional expertise of the bg educator. "Using the classroom at the Gardens for the ed officer to get to know the students, to provide a focus and to suss out what the students know." (TIN SchoolB 1996) WC implies that bg educators incorporate a range of pedagogical understanding about the learning situation into their professional practice. Firstly students require a structured situation within which they can respond as individuals and perceive the focus of the learning activity. Secondly students are individuals and bring their own understandings to the learning situation at the RBGS these understandings can be a basis for communication between the bg educator and a new group of students. Thirdly if the excursion experience is to be meaningful to students, their prior understandings need to be linked to the experiences that they will have at the venue.

4B.3 Discussion

The long-term recollections of students about their excursion to the RBGS are associated with the formal session held at the end of a long, hot day. Plants form part of the recollections of all but two students and furthermore more than half of the students recalled specific plants. It appears that students recall specific plants for a range of reasons including an unusual name: Dragon's Blood Tree; an unusual shape: Queensland Bottle Tree; a special activity: the Wishing Tree; a sensory association: smell of scented leaves or being shady on a hot day. Students also remember cactus plants. Students also state that they enjoy the plants at the RBGS.

One quarter of the students were able to state the specific purpose of the day which was to learn about endangered plants and the role of the botanic gardens in saving plants.

However students stated that they were at the RBGS to learn about plants. Evidence from this case study suggests that for upper primary students there is a clear association between being at the RBGS and learning about plants.

The classroom teacher was able to state clear outcomes for the excursion and these included both cognitive and affective outcomes. Students did demonstrate some aesthetic awareness of the peace and serenity of the Gardens. However, student statements about the purpose of the excursion did not demonstrate that they were aware of either their role in protecting the environment or the role of the RBGS as the lungs of the city. It seems that the clearest educative role of the RBGS is directly related to direct experience of plants.

The classroom teacher was able to provide an insight into the nature of a successful excursion as follows:

- excursion is structured
- excursion is linked to the curriculum; wide relevance to a range of curriculum areas
- excursion embedded in classwork: lead up to excursion, follow up using materials and experiences from the excursion
- efficient managerial considerations: accessibility of venue, economical use of time and money; easy to organise
- evidence of superior student work after the excursion
- students are inspired by the excursion
- students enjoy the excursion
- students see the 'real thing'
- pitched at a suitable level for students.

Students and teachers from School B had expectations of the botanic garden educator even if students made no mention of her in their recollections of the day. The botanic garden educator provides a learning experience that is linked to school curriculum documents and is a source of information on the day. Experiences provided by the botanic garden educator prove to be memorable for the students. These experience

include interacting with specific 'personality trees' and visiting memorable locations including the Succulent Garden.



Plate 4 **The cactus felt sharp and spikey. (School E 1996)**

Case Study School A: Year Six Excursion to the RBGS

School A is a large public primary school in Sydney's inner northern suburbs. The school has special classes for gifted and talented students. Four classes of upper primary students visited the RBGS in early March 1999 for a lesson on rainforests. The classes were organised into two groups that visited the RBGS on two separate days. The first two were parallel classes of Year Six students and included the class of the teacher VC, who organised the excursion. The next two classes were the groups of gifted and talented Year Five and Year Six. It rained on the second day and this group of students returned to school after their lesson on rainforests.

The rainforest lesson involves students working in the Tropical Centre, the rainforest garden and the Palm Grove. Students have various activities that help them to observe and interact with rainforest plants. This session represents the formal part of the day. After the one-and-a-half hour session students had lunch near the Main Ponds then did some sketching before returning to school.

The school was visited three weeks after the excursion. At the school

- surveys were distributed to the three classes of Year Six students who completed and returned them on the morning of the visit
- four students from VC's class were interviewed
- VC was interviewed.

The interviews were held in the school library that had been richly decorated by the Year Six students to look like a rainforest. The creative display of animals and plants had been part of a major undertaking by library staff, class teachers and students and was a clear demonstration of the link between the excursion and schoolwork.

This case study is informed by:

- transcript of a tape-recorded interview with the organising teacher (TI School A 1999)
- written surveys from the two other Year Six teachers (TS School A 1999)
- transcript of a tape-recorded interview with four Year Six students (SI School A 1999)
- written surveys completed by three classes of Year Six Students (SS School A 1999)
- samples of students' creative writing tasks completed after the excursion
- samples of students' work completed at the RBGS
- sample of one student's record of the unit of work on rainforests
- RBGS booking information provided by School A.

4A.1 Students' experiences of the excursion

This section of the case study explores students' views of their excursion to the RBGS. The first section presents the results of interview data and the second section the student survey.

4A.1.1 Student Interview

Four students from VC's class were interviewed in the school library for twenty minutes before recess. These students were in the RBGS for the day. They had caught the train into Circular Quay and walked around the Harbour foreshores past the Opera House into the RBGS. The class had a lesson with RBGS staff then had lunch in the RBGS. They did some sketching before walking back to the train and returning to school.

The interview was tape-recorded, then transcribed. Where students are distinguishable on the tape they have been given numbers. Responses that are not clearly from a particular student are labelled with a letter of the alphabet.

a. Students' recollections of the excursion

The students were asked about what they remembered about the day and what they remember doing.

S1: "Going into the Arc.
S2: Touching.
SA: And then getting blindfolded.
S2: Touching and getting led around. Touching, touching the plants .. and took off the blindfold. It was really surprising because it looked three times better than it felt.
SB: It's really freaky when you're blindfolded because ..
SC: The person that was leading me kept me walking off the edge.
SD: And when it went up high it got hotter.
SE: Someone told me there was a spider on my back and I went all crazy."
(SI SchoolA 1999)

These responses indicate that students' recollections centre on the formal aspects of the day. The Tropical Centre is recalled as are the sensory experiences of touching plants and the physical environment of the place. Students remembered being blindfolded in the Arc. It appears that this activity is memorable for students and the responses provide some insight into the memorable aspects of the experience. The activity has elements of surprise and trepidation and focuses students' attention on their personal reaction to the plants in their grasp. At this early stage of the interview the students have focussed on place and sensory experiences with little mention of plants.

The last response in this group relates to an incident involving that particular student. Interestingly, it appears that, while the excursion involves a whole day's worth of experiences away from school, there are few references to such personal incidents throughout this research. Three weeks after their excursion, the recollections of these students from School A focus on the formal aspects of the excursion.

b. Students' expectations of their excursion

Students' thoughts about the day were probed further.

> K: "Is it what you expected?
> SF: I didn't think there was going to be the Arc and the Pyramid. I thought it was going to be out in the open.
> SG: I was really amazed when I took off the blindfold it was just like really green. Lots of different kinds of plants. This pointy, cone type of thing, sharp.
> SH: I couldn't believe all the leaves. These really really big leaves.
> SI: It wasn't as dark as I thought it would be. I thought it would be really dark.
> K: In the Arc.
> SI: Yes.
> SJ: I saw a Venus Fly Trap – carnivorous plant.
> (SI SchoolA 1999)

The response from SF indicates that visiting the Tropical Centre makes an impact on students. However the response from SI where the environment in the Arc has not matched this student's correct understanding that it is dark in a rainforest. Further time would have allowed investigation of whether or not the student changed his understandings of rainforests to coincide with this misleading aspect of the environment in the Arc. This is a second incident uncovered by this research where experiences in the artificial environments at the RBGS have the potential to mislead students.

The conversation presented above indicate that plants have made more of an impact on the students than they had expected. The characteristics of the plants and plant displays at the RBGS that have made them charismatic to these students include the following:

- display of many different kinds of plants
- plants with big or larger than normal features
- unusual plants such as carnivorous plants.

c. Students' view of what they had learned at the RBGS

Students were asked about what they learned on the excursion.

K: What do you think you learned on that day?
SK: How hot and moist it is in the rainforest.
SL: There were lots of different epiphytes.
SM: I got to feel what it really felt like not just like looking at pictures.
SN: What goes in a rainforest.
SO: There are different types of plants, lots of vines.
(SI SchoolA 1999)

These responses indicate that the students have come away from this excursion with an enriched understanding of rainforests. The students have expressed their learning as 'big picture' concepts that can be listed as follows:

- The physical conditions of a rainforest: it is hot and moist.
- There are lots of different types of plants in a rainforest.

The responses indicate that the personal sensory experiences of the students have contributed to their understandings. This learning relates to students building their understanding of a rainforest as a real, physical environment.

While these responses indicate that students' accounts of what they learn at the RBGS match VC's intentions for the day, the students were asked about what they thought was the intention of the excursion.

K: What do you think your teachers wanted you to learn?
SP: About rainforests.
SQ: The plants
SR: Go in and see the real thing."
(SI SchoolA 1999)

There is a clear correspondence between teacher and students' perception of the purpose for the excursion.

d. Students' view of learning at the RBGS compared to the classroom

Students were asked to compare learning at the RBGS with learning at school.

K: "Do you think that learning in the botanic gardens is different to learning here at school?
Ss: Yes
SS: Way more fun.
ST: You sit down in a classroom but you don't sit down there you walk around .. and it's more fun.
SU: Here it's boring and you do heaps more work.
SV: You've got to look at pictures and imagine – there you can .. like .. see it.
SW: You can see it and touch it.
SX: You can see all different things.
SY: At school you can't even talk.
SZ: Definitely the change in environment.
(SI SchoolA 1999)

The immediate response to this question indicates the affective nature of the experience. It is fun at the RBGS. A second feature of these responses is the physical nature of the experience – students are outside, walking around. This type of response seems to indicate a psychomotor aspect to learning at a botanic garden. The richness of the environment is commented on by SX. Student recognition of the variety of plants could be a precursor to introducing the scientific concept of plant diversity. SY's response indicates the social nature of the learning at the RBGS.

The responses from student SV and SW indicate a metacognitive aspect in their recognition that you learn in a different way at the RBGS. Instead of trying to imagine what a rainforest is like from looking at pictures in a book students can physically interact with real plants in a garden environment. While the students recognise that they may be learning about classwork at the RBGS there are differences in how they learn and in their disposition towards learning.

4A1.2 Student survey

Three weeks after their excursion to the RBGS Year 6 students were asked to complete a one-page written survey (see Appendix 2.2) about their excursion experiences.

a. Students' recollections of the excursion

The first survey item asked students to 'Write down what you remember about your visit to the Royal Botanic Gardens Sydney. As demonstrated in Table 4.15 the large majority of students (93%) recalled aspects of the formal part of the day. The coded responses of the students are presented in Appendix 4.11. The majority of student recollections centre on the formal aspects of the day and are explored in the following discussion.

i. Student recollections of places at the RBGS

Of the 48 students recalling places at the RBGS, 41 (59% of students) recall the Tropical Centre. The students have a wide range of names for the Tropical Centre and more than half of these responses refers to the pyramid-shaped glasshouse that is part of this complex. Students perceive a connection between the glasshouses and the concept of rainforests.

Response	Number of responses n = 70	%
Formal aspects	61	87
Informal aspects only	7	10
Nil response	2	3
Places at the RBGS*	48	69
Plants at the RBGS*	44	63
Sensory experiences*	35	50
Animals at the RBGS*	19	38
Trip details*	18	26
Walking around*	8	11

* Denotes multiple responses

Table 4.15 **School A: Student responses to survey item 'Write down what you remember about your visit to the Royal Botanic Gardens Sydney.'**

Study of students' responses relating to the Tropical Centre demonstrates that simply placing students in a glasshouse complex with its special plants and hot, humid environment results in a memorable experience. Further study of these responses reveals the context of students' recollections about the Tropical Centre and these can be explored to identify features that have made this place memorable for Year Six students. There is a sense of the physicality of the experience in the comments that relate to walking through or going into the Tropical Centre. Sensory experiences are also associated with the Tropical Centre with students recalling that was hot, moist and misty. Students also mention the plant displays of the Tropical Centre. Responses demonstrate that students have responded to the impact of seeing a massed planting of a wide variety of rainforest plants.

Features of the building complex itself are mentioned by students in responses such as it is misty, it has displays that light up and three different 'rooms' for rainforest plants. A small number of responses relate to 'affect' where students found the Tropical Centre fun or interesting. A single student has associated the session activity of being blindfolded with being in the Tropical Centre.

Students' responses suggest that teaching strategies in the Tropical Centre should encourage students to physically interact with the plants and the environment. Teaching strategies should allow students to 'engage' with their surroundings. It appears that the novelty of the Tropical Centre may provide enough of an impact that the simple physical experience of being inside it provides a lasting memory of the excursion.

ii. Student recollections of plants at the RBGS

As illustrated in Table 4.15 almost two thirds of students had recollections about plants. This is a clear indication of the memorable association of the excursion with plants. It seems that this excursion to the RBGS achieves a simple yet effective purpose and that is to focus students' attention on plants.

Study of students' responses in this group provides an insight into the factors that may make plants a memorable feature for these students. Many of these recollections include

the students seeing or looking at plants. There is an indication that students recall attending to plants or plants being the focus of their attention. The sensory impact of touch and smell has also been included with the visual impact of plants. The physicality of walking around or through plants is another memorable feature of the day for these students. Hence for some students there is a sensory and a physical association with plants.

Large numbers and a diverse range of plants have also proved to have impact on these students. Responses also indicate that students associate plants with the Tropical Centre. The responses provide a small number of adjectives that students have used as a personal description for plants they recall: weird, amazing, cool, lovely, and luscious. A small number of students have associated plants with animals i.e. bugs and bats. A small number of recollections associate plants with the activities of the formal session i.e. guessing and being blindfolded.

It seems that the plants themselves have an impact on the students with the implication that simply placing students in an environment dominated by a large number of diverse plants may be sufficient in itself to provide a focussed recollection of plants.

iii. Sensory experiences at the RBGS

As demonstrated in Table 4.15, 44% of these students remembered sensory experiences in their recollections of the day. Inspection of these responses indicates the large emphasis on seeing or looking at various things at the Gardens. It is difficult to distinguish whether or not these responses relate to the visual impact of the RBGS or to a student's way of using the term to 'see' or to 'look' in written expression as meaning something encountered.

The responses indicate that sensory experiences are part of students' memories of the excursion. Considering the number of sensory recollections the sensory aspect of the excursion to the RBGS is a significant component of students' experiences at the Gardens.

b. Students' view of learning at the RBGS

Three question items from the survey related to students' perceptions about learning at the RBGS. These questions were:

- What do you think you went to the Gardens to learn about?
- What do you remember learning at the Gardens?
- How is learning at the Gardens different to learning at school?

i. Students' view of the learning purpose for the excursion

The first question item investigated students' understanding of the purpose of the excursion asking the question: What do you think you went to the Gardens to learn about. Table 4.16 illustrates students' responses to this item.

Response	Number of responses n = 70	%
Rainforests	67	96
Other	3	4

Table 4.16 **School A: Student responses to survey item 'What do you think you went to the Gardens to learn about?'**

The results in Table 4.16 clearly indicate that the large majority of students (96%) are able to state that they are at the RBGS to learn about rainforests. This is also their teachers' purpose for the excursion. This result also indicates that this group of students could identify the purpose of the excursion.

ii. Students' recollections of their learning at the RBGS

The second question item in this group of responses relating to learning at the RBGS asked the students 'What do you remember learning at the Gardens?' Table 4.17 contains students' responses to this question and the list of coded student responses is presented in Appendix 4.12.

Response *	Number of responses n = 70	% of students
Rainforests	36	51
Groups of rainforest plants	15	21
Features of rainforest plants	12	17
Conservation issues	4	6
Plants	27	39
Heat & humidity	9	13
Heat & humidity of rainforest	4	6
Animals	8	11
About the RBGS	3	4
Nil response	4	6

*Denotes multiple responses

Table 4.17 **School A: Student responses to survey item 'What do you remember learning at the Gardens?'**

Table 4.17 demonstrates that the main categories of responses are about rainforests (36 responses) and about plants (27 responses). Close study of students' responses from Appendix 4.12 shows that only four responses appear in both categories. Hence a total of 59 students or 84% of students from School A consider that they have learned about plants and environments at the RBGS. Half of the students from School A state that they have learned specifically about rainforests. A small number of students recall the conservation aspects of the session.

When students talk about rainforests they include groups of rainforest plants such as epiphytes and vines (15 responses) or features of rainforest plants such as drip tips or buttress roots (12 responses). There are three responses that mention both groups of plants. Hence 24 students or 33% of students recall details about rainforest plants.

When students talk about plants they can include general comments such as learning about where they live and how they grow (15 responses). Students also make general comments about all the different kinds of plants (10 responses). A further group of students states that they learned about plants (five responses) or they learned the names of plants (four responses). Students' responses indicate that some associate learning with

recall of sensory information about heat and humidity of these nine students, four associate heat and humidity with rainforests.

iii. Students' view of learning at the RBGS compared to learning at school

The third question relating to students' ideas about learning at the RBGS asks students 'How is learning at the Gardens different to learning at school?' Close study of the responses reveals that they fall into two major clusters (with an overlap of eight responses). One cluster of responses relates to students' ideas about how you learn in a botanic garden. The other cluster of responses relates to the concrete idea that the RBGS is a different place to the school classroom. Table 4.18 illustrates the groups of students' responses to this question item and the coded responses are presented in Appendix 4.13.

Response*	**Number of responses n = 70**	**%**
Learning processes at the RBGS		
Sensory basis of the learning	29	41%
Access to the real thing	20	29%
Active learning	10	14%
Concrete differences		
Outside / walking around	22	31%
RBGS has different resources	16	23%
It's fun	7	10%
No Maths etc	6	9%

*Denotes multiple responses

Table 4.18 **School A: Student responses to the survey item 'How is learning at the Gardens different to learning at school?'**

Learning processes at the RBGS

The larger group of responses relates to how students perceive they learn at the RBGS. Figures from Table 4.18 show that three in every five students from School A are aware that they use their senses at the RBGS. This group of responses can be further studied to explore how students perceive they use their senses. Table 4.19 reveals more detail of this information.

Response*	Number of responses n = 70	%
Sensory basis of learning	29	41%
See or look at or visual learning	19	27%
Touch/feel	15	21%
See or touch the real thing	10	14%
See or touch what you are learning about	8	11%
Hear or listen or oral learning	3	4%
Learn by seeing or touching	3	4%
Smell	1	1%

*Denotes multiple responses

Table 4.19 **School A: Students' perception of learning using the senses**

Responses range from students perceiving that they are able to see and touch to seeing or touching what they are learning about to seeing or touching the real thing. The responses below indicate students' perception of the nature of this sensory-based learning.

Able to see and/or touch

"Learning at the Gardens means that you can see, hear and feel the rainforest."

See or touch the real thing

"You can see the real plants and study them closer."

See or touch what you are learning about

"Learning at the Gardens is better than learning at school because you actually get to see what you're learning about."

Learn by seeing or touching

"You get to feel the texture of the plants rather than just hearing about it."

"You can absorb the information by listening and you can visualise it as well however at school you can't visualise the information as much."

(SS School A 1999)

The second quote in the group above overlaps with students' responses relating to being able to have physical access to real plants and environments. Furthermore a small group of five responses that overlap the sensory and access to the real thing indicate that students perceive a hierarchy of experiences where experience of the real thing is superior to looking at pictures in a book or a video. Some of these responses are grouped below.

"It's hands on. You get to touch the thing you are learning about and not just read it from books."
"You can get an example of a rainforest right in front of you whilst at school you'll be watching videos."
(SS School A 1999)

Table 4.18 illustrates a further group of responses that relate to students' perception of how they learn at the RBGS. This group of ten responses share a perception of the active and personally involving nature of learning at the RBGS. A sample of three responses in this category follow.

"Learning at the Gardens is interactive."
"It's different because we have to move around and it's hands on stuff"
"Learning at the gardens is different because you can feel and experience for yourself."
(SS School A 1999)

Concrete differences between the RBGS and school

This cluster of responses can be compared with the cluster of responses that relate to concrete differences between the two venues. Table 4.18 indicates that approximately one in five students comments on the sensory-motor aspect of learning – they are not sitting at a desk at the RBGS they are walking around. A further group of students comments that they are learning outside. The following quotes are examples of responses in these categories.

"Well at the Gardens you walk around heaps and at school you sit down."
"Learning at the Gardens was much more fun than learning at school because you're out in the fresh air."
"Your outside, your walking, talking and feeling the plants."
(SS School A 1999)

A further group of responses in this cluster relate to students' observations about the different sorts of resources available at the RBGS and a smaller group of responses state

that you only learn about plants at the RBGS. The following quotes demonstrate responses placed in these groups.

Resources at the RBGS

"There are rainforest plants at the Gardens and not at school and the teachers are different."

"You learn more things at the BG because there are more plants from different places."

Learn about plants at the RBGS

"We learn about plants and not math or spelling, reading."

"You're learning outside and it's pretty and at the Gardens it's about trees and plants."

(SS School A 1999)

Learning is fun at the RBGS

This small group of responses has links to the two major clusters of students' responses to this question item. Nearly one in ten students comments that they have fun at the RBGS.

4A.2 Teachers' experience of the excursion

This section of the case study explores Year 6 teachers' view of their excursion to the RBGS.

4A.2.1 Interview with organising teacher

An experienced classroom teacher, VC organised the school excursion to the RBGS. Her supporting documentation of the booking held by the RBGS contains a photocopy from support documents from the draft K-6 Human Society and Its Environment Syllabus (Board of Studies 1998). While none of the outcomes from this document have been highlighted as outcomes to achieve on the excursion, VC has highlighted two of ten dot points from the section 'Learning Experiences':

"* Where possible, *visit a rainforest* (highlighted section) or view a video and/or visual texts that depict a rainforest.

* *Develop a classroom display representing a rainforest with emergent, canopy, understory and forest floor. Label where animals and plants would be typically located in the rainforest.*" (p83 Board of Studies 1998)

This documentation confirms that the cohort is studying 'Rainforests' which is a unit of work taken from syllabus documents. This documentation also indicates that learning experiences rather than achievement of specific syllabus outcomes appear to be the focus of the excursion.

a. Reasons for the excursion

VC's first response to the question about her reasons for the excursion was to link the excursion to classwork and to provide specific cognitive outcomes.

> VC: "Because we were studying rainforests and we wanted to learn about the adaptations of the plants – the way they looked and some source of information. I know you had the Arc and everything set up there – that's basically what it was – plants and how they grow, what they look like and all the rest of it."
>
> ..
>
> VC: "I've used it before. I did your desert study with the plants and cacti you have there. I think it's a great place for studying environments."
> (TI School A 1999)

There is a clear focus on the rainforest environment at the RBGS. VC perceives that the resources of the RBGS specifically complement her classroom topic on rainforests. She went on to add a group of reasons about the RBGS itself.

> VC: "To me it was also that the Botanic Gardens are a place of interest, history and culture – why they're there, where the plants come from, people that look after them, how you behave in a botanic garden. So there were other reasons that I expected them to get out of it apart from just rainforests."
> (TI School A 1999)

For VC the RBGS is part of Sydney's cultural heritage. It is also a scientific institution and a place where horticulturists work. It appears that VC would view the RBGS as a venue her students should visit much like they should visit other cultural and historical venues through their school years. Her students would gain an insight into possible careers and have the experience of visiting a place where science is part of its makeup and purpose. VC's reasons for the excursion also include a strong sense that her students were to be socialised into how to visit a place like the RBGS.

VC explains some of the practical aspects of her choice of the RBGS: the RBGS is close to the school, accessible by public transport and is a low cost excursion. She is also motivated by the aesthetics of the experience of simply walking around the Harbour foreshore and through the RBGS itself.

> VC: "we can have lunch at the Gardens after we finish the lesson. For these kids that have got basically an asphalt playground – it's a real treat."
> (TI School A 1999)

b. Teacher's view of learning at the RBGS – what students learn

The reasons for School A's excursion as stated by VC are closely associated with their unit of classwork. Although the documentation from School A suggests that specific cognitive outcomes are not the focus for the excursion, VC's first quote in the previous section indicates that she has specific learning outcomes for study of a rainforest environment at the RBGS. Specifically students will 'learn about' adaptations, forms and structure of rainforest plants.

For VC the excursion experience is a learning experience on a range of levels. There are specific cognitive outcomes that relate to factual understandings, and broader cognitive outcomes that relate to learning about the RBGS itself. VC has outcomes for her students that relate to appropriate behaviour for visiting the venue and also a metacognitive aspect of learning how to learn outside the classroom as demonstrated in the following quote.

VC: " A lot of kids would just treat that as just a day out and 'let's have fun'. But we do a lot of excursions – we go to a lot of places and also I expect them to behave and to learn something."
(TI School A 1999)

VC comments on the excursion as an opportunity to enculturate her students and expose them to historical and cultural venues like the RBGS. Clearly there are affective aspects to this type of learning where students may gain an appreciation of the cultural, historical, scientific and vocational aspects of the RBGS based on their understandings of their experiences at the RBGS.

c. Teacher's view of learning at the RBGS – how students learn

VC has an appreciation that her students will learn in a different way at the RBGS. She describes this as a 'total' experience.

VC: "It's a total experience; it's a practical experience. It's not just someone talking and describing epiphytes or bromeliads – it's hands on. And they can walk around which they can't do in the classroom. And they can talk to each other. They can discuss what they are looking at and touch it and feel it so that it becomes a total experience."

..

VC: "It was to see the things and to look at the way the plants are different and the features that they have – their adaptations to being in the rainforest. I hadn't really thought about that feeling and touching until you put the blindfolds on them."
(TI School A 1999)

These quotes from VC indicate that learning at the RBGS is different to the learning that happens in a classroom. Learning is based on student's physical interaction with plants and environments. Students interact with plants and environments using their senses. This awareness activity can then be focussed by attending to or observing specific aspects of the plant or environment. A third component of this learning process is a social aspect of discussing and 'sharing' sensations and observations.

The quotes indicate that the learning, while directed by a teacher, is focussed on student's direct physical interaction with plants and environments. It appears that the bg educator (and the garden display itself) is expected to provide information about rainforest plants however this role of 'expert informer' is complemented by activities focussing on student's practical interaction with plants.

d. Teacher's view of learning at the RBGS – where learning is situated

The previous two sections describe the content and processes of learning on the excursion and clearly demonstrate that the physical environment where this learning occurs is an essential aspect of the learning. Students are away from their classroom and the routine of school and although this factor does not suggest that learning will be an outcome of this change in routine, it provides students with a degree of predisposition towards learning.

> VC: "It's peaceful, it's different for the kids, it's a change for them and these kids are very receptive to different learning situations."
> (TI School A 1999)

VC's quote describes the RBGS as a peaceful place – there is a calm, aesthetic quality to the general environment. The RBGS is perceived to be a place that encourages learning – there is conspicuous information on plant labels and on signage. This range of factors provides a background to endorse and promote learning in students.

In the previous section VC describes learning as a total experience. Students are placed in specialised environments and surrounded by specific plants. They have immediate physical access to rainforest plants. Students may have encountered these plants in books or from videos however they now have direct access to real specimens.

e. Evidence of learning

VC was asked to indicate how she is able to assess the impact of the excursion to the RBGS.

K: "If they've gone to the Gardens to learn about rainforests how do you know that what they've learned in the Gardens is transferable into the classroom?
VC: By the work they've done, the quality of the work, the writing. And the knowledge and when you talk to them and when you discuss what they saw, or what they felt or what they liked about it."
(TI School A 1999)

It appears from this quote that VC, like the other primary teachers involved in this study, detects an increase in the quality of students' written work after their excursion. VC has also detected an increase in students' understanding and level of discussion. However the exact nature of these understandings remains unclear. VC goes on to infer that her students display a degree of motivation about plants.

VC: "We did do the microclimates straight away after we'd been to the Gardens. I had no problems getting them to bring in the bits and pieces for that – looking at plants and discussing which would be the taller ones."
(TI School A 1999)

It appears that the excursion may have resulted in increased student interest in and willingness to discuss and work with plants.

4A.2.2 Teacher survey

The two other Year Six classroom teachers accompanying students from School A were asked to complete a single page survey (see Appendix 2.3) about their excursion experiences.

a. Immediate recollections of the excursion

The first survey item asked teachers 'What are your immediate recollections of your excursion to the Royal Botanic Gardens Sydney?' The two responses are written below.

"How well the guides were prepared."
"Wonderful orchids, interesting bromeliads, profusion of lush plants."
(TS School A 1999)

These two responses relate to the quality of the resources of the RBGS: well prepared staff and richness of the plant collection relating to the needs of these teachers.

b. Teachers' reasons for the excursion to the RBGS

The second survey item asked teachers 'Why did you choose to bring your students to the Royal Botanic Gardens Sydney?' The responses are written below.

> "Because it was the most accessible area to study for the Rainforest unit."
> "We have been studying rainforests as part of our Jason Project."
> (TS School A 1999)

Both responses indicate the relevance of the excursion to classwork. Although these responses indicate that the classwork is current, many other factors such as other responses in this survey, VC's comments, students' responses and classroom decorations and activities confirm that the excursion was conducted at the time of the unit of classwork.

c. Pedagogy for the excursion

The two Year Six teachers responded to the question 'How did this excursion fit in with your teaching program?' as follows.

> "We were studying Rainforests and looking at similar plants that were in the Arc."
> "Integral part of unit as photos, books etc are extremely useful but the actual reality makes the learning more relevant."
> (TS School A 1999)

These teachers indicate that they and their students encounter real examples of the rainforest plants they have seen in books and other resources. This experience contributes to their teaching program by locating classwork in a real context. Students may perceive relevance in their classwork if they appreciate that they are learning about aspects of the real world.

d. Teachers' view of the learning environment at the RBGS

The teachers were asked to identify 'What can/did you achieve at the RBGS that they may not have achieved in your classroom?' The responses are written below.

> "First hand experience."
> "Having experts on hand enabled the students to ask specific questions."
> (TS School A 1999)

Both teachers in their survey responses have mentioned the presence of RBGS staff working with the school group. There appears to be recognition of the professionalism and expertise of RBGS staff. A further aspect of the second response is the sense of the immediacy of response to students' questions.

e. Teachers' view of learning at the RBGS

Teachers were asked to state the outcomes that were achieved as a result of the excursion.

> "Giving the children a visual first hand experience on what a rainforest looks like."
> "Students very familiar now with the look of rainforest plants and have written wonderful descriptions of this experience."
> (TS School A 1999)

Both responses are concerned with students' experiences. The teachers indicate that their students know more about rainforest plants because they have seen real, living specimens. It appears that the excursion has increased student understandings of rainforests by creating the opportunity for direct student experiences with a rainforest-like environment. It can be said that these statements of outcomes relate to cognitive aspects of the excursion as well as to the interactive, physical processes by which students' learn at the RBGS.

The first response indicates that students had been personally involved in their learning about rainforests. The second response comments that students have produced work of a high standard as a result of their experiences. It appears that both teachers perceive that students have personalised their experiences and can use these experiences in further classwork.

4A.3 Discussion

The majority of students from School A made statements about plants and environments when they are asked about what they learned at the RBGS. Clearly these students have made the connection between the RBGS and learning about plants and environments. The data indicates that primary school students are aware that school excursions are associated with learning. Students appear to be socialised by these experiences to expect that learning happens in a place like a botanic garden.

The following observations can be made from study of students' statements about their own learning:

- Students associate learning at the RBGS with learning about plants. Their ideas about learning are associated with the cognitive aspects of the day.
- Students tend to make general rather than specific statements about the plant-related content of their excursion.
- Students' statements about their learning relate to their recollections about the day.
- Students' statements for their learning relate to the teachers' requirements for the day and the theme of the formal session at the RBGS.

A small number of general responses from students from School A can be seen as statements of 'big ideas' associated with learning about rainforests at the RBGS. These responses are grouped below.

> "I remember learning about the different types of plants in the rainforest...."
> "The different plants and different types of rainforest around the world."
> "Many things about rainforests and rainforest plants."
> (SS School A 1999)

A second group of sub-themes associated with the general focus on rainforest plants can also be identified in the students' responses. These responses are grouped below.

> "I remember learning ... how humid it is in the rainforests."
> "The different types of plants eg epephite, driptips"
> "At the botanical gardens I remember learning that it can be dangerous clearing rainforests for farms because of the rainfall."
> (SS School A 1999)

The 'big idea' of the session relates to a very general concept of learning about rainforest plants. The groups of sub-themes expressed in students' responses relate to the physical features of a rainforest, groups of particular rainforest plants and to aspects of human impact on the rainforest environment.

The data suggests that students from School A consider that they learn in a different way at the RBGS. They learn by using their senses to interact and experience for themselves. The data also indicates that students perceive the physical nature of their learning – they are outside and they are able to move around.

Students consider that at the RBGS they can use their senses to interact with the plants and environments that they have been studying at school. These resources are immediately at hand at the RBGS and hence the focus of learning can be clearer than it is at school. The data indicates that students consider that studying the real plants at the RBGS is better than seeing pictures in a book or watching a video.

This case study provided the opportunity to observe, first hand, a situation where the excursion to the RBGS is embedded in classwork. For teachers involved in this study the site of learning has moved from the classroom to the RBGS for the day and there is evidence of a clear expectation being given to students that they will learn while they are 'on excursion'. Teachers have expressed their outcomes for the excursion in terms of student experiences rather than listing a range of specific factual requirements. Teachers involved in this case study revealed a view of a hierarchy of learning experiences

discussing their preference for learning that involves physical interaction with the 'real thing' rather than students seeing pictures or videos or listening to someone talking.

Data from teachers reveals the concept of learning at the RBGS being a 'total experience' where students are physically immersed in a learning environment. The plants and environments that are the focus of their study surround students. They can select and physically interact with plants and environments and discuss their experiences with accompanying classmates.



Plate 5 **We touched leaves. They felt prickly. (School E 1996)**

Chapter Five

SECONDARY SCHOOL CASE STUDY RESULTS AND DISCUSSION

Case Study School J: Year Eight Science Excursion to the RBGS

School J is the Year 7/8 campus of a large Catholic school in Sydney's western suburbs. This excursion was the third year that School J had bought their Year 8 students on a science excursion to the RBGS. The whole cohort of 250 students from Year 8 was bought by bus into the RBGS. This is one of the largest groups of students to use the RBGS Education Service.

The day was organised by dividing the students into three large groups, headed by a member of the science staff. Each large group was then divided into three smaller class-size groups with two teachers to each class. The six science staff (5 teachers plus one lab attendant) were divided evenly across the three groups. The balance of 13 teachers comprised teachers from other faculties including librarians. This number of teachers was achieved by having all students at the campus involved in an excursion on the one day.

The head of science (TN) organised and attended the excursion and felt pleased with this way of coping with large numbers of students. She felt that having a member of the science staff leading each of the three groups took a lot of the pressure off the single organising teacher and also helped to train the staff to take over the organisation of the day in future.

Three botanic garden educators were stationed at three locations: the Succulent Garden Tropical Centre and the water plants display. A timetable was drawn up so that each class of students with their accompanying teachers would rotate to each botanic garden educator as well as to a range of locations that had been decided upon in previous years.

The worksheet for the excursion contained questions and activities for each location. The topic for the lesson provided by the botanic garden educators was 'Plant Adaptation'. The school had requested the topic when they phoned to book the excursion.

The school had booked the day of Friday 14 November well in advance and had sent back the following information about their classwork in Science. "We are covering Environmental Interactions and Plant Growth in class. Excursion: look at plant adaptation to environment – how different plants live in different conditions." The day itself was sizzling hot – a factor which TN thought detracted from the success of the day.

This case study is informed by:

- transcript of a tape-recorded interview with the organising teacher (TI SchoolJ 1997)
- transcript of a tape-recorded interview with four Year 8 students (SI School J 1997)
- 1997 RBGS Lesson Program (Royal Botanic Gardens 1997)
- booking information for the day held at the RBGS Education Service.

4J.1 Students' experiences of the excursion

Four Year 8 students were interviewed three weeks after their excursion to the RBGS. The tape-recorded interview was held outside in the grounds of the school during the students' normal science lesson. The session was very short preventing exploration of students' responses. The four voices: three male and one female are easily distinguished on the tape.

4J.1.1 Students' recollections of the excursion

The different sorts of places at the RBGS were the memorable features of the day for this group of Year 8 students. All of the places mentioned by the students were visited as part of the formal sessions of the day.

K: "A couple of weeks back you went to the RBGS for an excursion. I want to know what you remember about the day.

T: I remember the desert section. Where it is all humid and that. And the big glass area.

K: Anything else?

T: The two different sections. The humid one with the water and the dry one.

R: The rainforest part of the first one. Where it's rainforest and it's all sticky.

E: The rainforest where it's all hot.

T: When you were in that pyramid thing and you crossed from one section to the other and there was the water sprinklers.

D: That bit for the water plants. The slippery one inside – the big one.

K: Insect eating plant?

D: Yeah

E: It was hot. Mosquitoes."

(SI School J 1997)

Students do not name the Tropical Centre however it is associated in their minds with rainforest plants. There are many sensory experiences associated with recollections of the Tropical Centre – it is humid, hot and sticky. These students recall the structural features of the Tropical Centre – a glass structure with one section having a pyramid shape, the different internal sections and its sprinklers. Students' responses give us a sense of the physicality of the experience – being hot and sticky and moving from one place to another. Insect eating plants in the waterbeds are one of the types of plants recollected by these students. The 'desert section' is also remembered because of its collection of cactus plants.

K: "You said the succulent garden – the cactus garden. How come you remember that?

T: I just remember seeing all the cactuses. And it reminds you of the desert and all that sort of stuff. And that there was no other plants except cactuses. All those spikes."

(SI School J 1997)

The students were also asked to consider what they would remember most about the RBGS.

K: "What do you think you'll remember most?

E: Just how they have all these different sections – they have different sections with all different plants.

R: All the greenery all over the place.

D: I think the really hot and steamy pyramid.

K: The one that steamed up?

D: Yeah – like a sauna.

K: What would you remember – say if you're old?

T: Probably the glass – the pyramid and probably the first section there."

(SI School J 1997)

The students have visited many parts of the RBGS on their excursion yet it is the Tropical Centre and the Succulent Garden that have made the strongest impact. Furthermore it is the sensory aspects of the physical conditions in the TC that are memorable for these students where it is the plants that are the memorable feature for the Succulent Garden. There is little evidence of any other factors being recalled as part of the day with one student only mentioning the hot day and mosquitoes.

4J.1.2 Students' view of the reason for the excursion

The clear response to the question posed about why they visited the RBGS was that they were doing a unit of work at school on plants.

K: "So you were doing a plant topic at school.

T: Yeah

T/D/R: Managing Plants

D: What plants need to survive and germinate.

Different stuff about how they survive and how they reproduce. What they need – like cactus – to survive in an environment.

K: How long does it go for – that topic?

R: I think it's supposed to be finished this week.

K: So you basically were at the start of the topic when you came to the Gardens.

R: Kind of an introduction.

D: Now we're growing bean plants and measuring the roots. We've got them growing in cups and in plastic bags. And we see how big they are, how much their roots have grown."
(SI School J 1997)

As for the primary students involved in this research, these junior secondary students are able to identify the unit of classwork associated with their visit to the RBGS.

4J.1.3 Students' view of learning at the RBGS

A picture of student learning is presented by their response to the question about what they remembered learning about plants.

K: "Is there anything in particular that you remember learning about a plant or about plants in general?
D: That silvery leaves of the cactus is to attract the sun.
Why some plants are really really green because they get a lot of water.
Some plants have points at the ends of the leaves because they need to get the sweat off.
R: Drip tips.
T: That vine the one that grows up and strangles the tree.
K: E, what do you remember?
E: Just about cactuses. They don't need water to grow because they store it."
(SI School J 1997)

Much of the specific information given by the students is incorrect. Student D gets his drip tips right – however the structure removes excess external water from the leaves rather than water transpired by the plant. Cactus plants do not have leaves and shiny leaves in the dry environments reflect rather than attract sunlight. Student T is referring to the Strangler Fig and seems to think that these vines grow from the ground up to strangle the host tree. The seeds of this fig are placed in branches of trees by birds where they grow roots down to the ground – rather than grow from the ground up. He is correct in saying that the vine strangles the host tree. Student E understands that cactus plants store water.

It appears that students certainly gain a clear overall picture of the types of plants that grow in desert and rainforest environments. However they report a number of incorrect ideas about the adaptations of these plants and how these adaptations help the plants to survive.

4J.1.4 Enjoy the most

The students were asked about what they enjoyed the most at the RBGS.

> R: "Learning stuff. See new plants.
> D: Getting to see unusual plants that we haven't seen before.
> T: Like those fly traps and all that. Like we've never seen that stuff before.
> D: It was interesting to get to see that.
> R: I hadn't really seen those cactuses before – just those really little ones you keep in pots.
> T: We got a bit of time out – after we did all the worksheets we could have lunch and all that.
> E: Yes it was really nice sitting around."
> (SI School J 1997)

Students enjoyed the formal sessions at the RBGS and seeing plants that they hadn't seen before. The informal parts of the day were also mentioned – having lunch and relaxing. When asked if there was anything they didn't enjoy about the day the single response was that the day was too hot.

4J.1.5 Previous visits to the RBGS

The students were asked if they had visited the RBGS before their excursion. Only one of the four students had been there before and he commented that he had walked around the harbour foreshore and hadn't had much of a look at the RBGS itself. For the other three students this was their first experience at the RBGS.

4J.2 Teacher's experiences of the excursion

TN is the Head of Science at this campus of the high school. She was able to provide insight into the organisation of a very large junior secondary group and her thoughts about the RBGS as an excursion venue. The interview followed her from outside to inside the staff room where she went to confer with the other members of the science faculty. The background of general school noise at times drowned out our voices and was a strong reminder of the busy, intense atmosphere in schools.

4J.2.1 RBGS as an excursion venue

TN was not convinced that the RBGS was an appropriate venue for a Year 8 science excursion the year before this excursion. Her staff had been before and managed to convince her that it was a worthwhile excursion. She continues:

> TN: "I had mixed feelings about running it last year 'cause that was the first time I'd been to the botanic gardens with a group of kids for a science excursion. They'd run it the year before but I wasn't on this campus then. It was like 'Oh we did it so let's do it again'. I though mmm. I thought 'Oh yeah wandering around having a look at a few plants'. I wasn't really looking forward to it.
>
> But I actually came away from it last year thinking 'This is a great excursion'. I actually learned a lot. I mean I'd never thought about silvery leaves and really dark green ones. I knew about it – but I'd never really thought about the why's and wherefor's of it. So last year for me, I was like a kid. I was absorbing it all. Whereas this year I went in with 'Oh yeah I know what I've got to do'.
>
> I wasn't really looking forward to it last year but I really enjoyed it. So I was quite happy to go back and do it again this year. And know that yeah the kids were going to get a lot out of the day."
>
> (TI School J 1997)

This quote highlights a range of issues associated with the choice of venues for an excursion. It appears that teachers themselves make professional judgements about the success or otherwise of an excursion. TN's decision to be guided by the previous experience of her staff demonstrates (amongst other things) the strength of professional opinion about the educational worth of the excursion. Teachers bring other teachers to the RBGS. An excursion venue may be perceived as being relevant to the syllabus but TN demonstrates that teachers also consider the interests of their students and make decisions about the suitability of the venue with their students in mind.

TN felt that she had learned something of value at the RBGS and associates a great excursion with learning alot. She may have known a great deal about the theory of plant adaptations however the impact of seeing and considering real applications of this theory has made an impression on her. Hence she made the judgement that the excursion would be of advantage to her students.

A further aspect of this quote is the specialised work of the bg educators who have pointed out and discussed these adaptations. Students (of all ages) are encouraged to stop and look for specific details that would ordinarily go unnoticed. Furthermore the design of the garden display assists these observations by grouping together plants from similar environments providing the visual impact of a wide range of specimens that demonstrate special features.

4J.2.2 Reasons for the excursion

For the science department at School J, the excursion to the RBGS compliments classwork. Year 8 students follow a particular textbook for science and it contains two plant-related topics one of which was described by the Year 8 students above. Both students and teachers perceive the links between the excursion to the RBGS and classwork. It appears also that TN perceives the information about plant diversity and adaptation gained on the excursion as complementing and enriching students' experiences rather than reinforcing classwork. TN goes on to explain the science department's approach to excursions for the Year 7/8 campus.

TN: "And so the idea was in Year 7 we do stuff on animals and we take them to the zoo and we show them the diversity of animals. In Year 8 we go to the botanical gardens and we show them plant diversity. We show them that everything isn't the same. Different plants need different requirements to live in particular regions and then about competition and survival of the fittest.
It's really to complement what we do in class."
(TI School J 1997)

The excursion to the RBGS is part of an overall range of experiences that the science department plans for their students. These excursions are linked to classwork and extend students' awareness of and experience with the diversity of plants and animals in our world.

TN went on to point out that the students wouldn't otherwise go into the city to see the RBGS – a factor that the group of Year 8 students had already explained in their interview. There is little doubt, then, about the impact on students of walking inside a large glass pyramid or through a garden of cactus plants or having lunch on the rolling lawns of the RBGS. TN sums up this experience:

TN: "Well Mum might grow some azaleas at home or you might have a pine tree or something but you don't have something as concentrated as what you've got in the Succulent Garden, what you've got in the tropical area. Occasionally you've got an indoor plant – it's pretty bland in comparison."
(TI School J 1997)

4J.2.3 Teacher's view of learning at the RBGS

TN understands that her students will gain an 'awareness' of plants and their variety and importance.

TN: "I think that there was a huge awareness that there's far more to it than meets the eye. That they (plants) do have an important role to play in the Earth and um even our survival. I mean they're not just there to look pretty. They actually have a function – they have a job. And I think that they get that from there (RBGS). It's very hard to get that message across when they're looking at these seedlings – a plastic cup in a classroom. And looking around – there's not a huge amount of greenery around here. So I think they get that message across there (RBGS)."
(TI School J 1997)

It is difficult to link TN's conception of the 'message' students get at the RBGS with her students' perceptions of what they learned at the RBGS. However TN is aware of the impact that the RBGS will have on her students. It appears that students may not grasp the factual and conceptual background that TN requires however plants are a memorable feature of this Year Eight excursion to the RBGS.

4J.2.4 Enjoy about the excursion

TN was very enthusiastic about seeing her students so interested in plants.

K: "What do you enjoy most about the day?
TN: Seeing the kids really into plants. Here when you do something in class you grow a few seedlings – woopy doo. It's not all that riveting and exciting – well I don't find it all that riveting and exciting I suppose. But in there – just see the big differences and to see the kids take notice of the differences."
(TI School J 1997)

This quote also coincides with the Year 8 interview group and the aspects that they had enjoyed about the day. It appears that the RBGS is a successful environment for learning about plants. TN was also aware that her students were in a situation where they could apply the understanding that they had gained in the classroom. She was pleased with this feedback.

TN: "And to realise that they do take in some of the stuff that we're going through. I mean when you talk about what plants need to grow, about the process of photosynthesis and you sort of think 'Oh the kids are switched off they're not taking this in'. But they actually are. It's quite reinforcing to say 'Hey we're not wasting our time completely'".
(TI School J 1997)

TN enjoyed the day as an opportunity for informal interaction with her students. Without the bell times of a normal school day, she was able to 'switch off' and chat with her students.

TN: "It's a far more relaxed atmosphere to actually do the learning."
(TI School J 1997)

TN also felt relieved of the anxiety of managing a whole group of 250 students. She had two other teachers to whom students could report as well as 16 staff members to assist with classes.

4J.3 Discussion

This case study demonstrates some differences between the excursion experiences of primary and secondary students and their teachers. Whole-year excursions with more than 120 students are a common feature of secondary excursions to the RBGS. The normal organisational aspects of the day including transport and management of large numbers of students at the venue are considerably magnified. TN has taken care to devolve some of the managerial and supervisory aspects of the day to other classroom teachers involved with the excursion. Nevertheless organising such an event for approximately 250 students is a commendable feat.

For the young adolescents involved in this case study plants are a memorable and enjoyable feature of their excursion to the RBGS. Students report that they enjoyed seeing plants they had heard about before the excursion and plants that were larger and with more variety than they had seen before. These students did not always report

accurate factual or conceptual information about the plants they encountered at the RBGS.

Similar to other students involved in these case studies, special environments at the RBGS formed part of students' recollections of the day particularly the Tropical Centre. The sensory and structural features of the Tropical Centre are the factors recalled by these students who readily associate the environment with rainforests. The Succulent Garden, with its collection of cactus plants is another memorable place at the RBGS and is associated with a desert environment.

Although these students have enjoyed having time out they have not reported being with their friends as a part of their excursion experience. Students have also recalled physical aspects of the day including the sensory aspects of heat and humidity.

These students are aware that plants are the intended focus of the day and are able describe the unit of work that is relevant to the excursion. The excursion to the RBGS is part of a whole-school excursion policy that aims to enrich and extend students' understandings of plant and animal diversity. The RBGS is seen as a venue that can provide impact and motivation to students' classwork on plants.

The organising teacher understands that the excursion to the RBGS engages student interest as well as being relevant to classwork. The excursion is an educational, manageable and safe event for a large group of young adolescents that may not otherwise have the opportunity to visit the RBGS.

Case Study School H: Year Nine Science Excursion to the RBGS

School H is a local public school for boys. Their excursion to the RBGS has been running for a number of years. In 1997 the whole Year 9 cohort of six classes visited the RBGS for the day. Each class was involved in three 1.5 hour activities: a plant diversity lesson with the botanic garden educator, self-guided sessions in both the Tropical Centre and the Succulent Garden. The boys moved around the RBGS with their classroom teacher.

This case study is informed by survey data from the teachers and students involved in the excursion. The school had been notified in advance and approval sought to distribute a questionnaire to the group at the RBGS. Once written approval had been provided, the surveys were distributed at the end of the plant diversity lesson. Students and their accompanying teacher were asked to respond to the one-page written survey about the excursion and return their completed surveys to the RBGS education unit at the end of the day. Approximately 160 students attended the RBGS with six science teachers. 72 student surveys (45%) and three teacher surveys were returned to the RBGS education unit.

5H.1 Students' experiences of the excursion

The one-page student survey (Appendix 2.4) contained six question items. The purposes of the survey were:

- to determine students' understanding about the purpose of the excursion
- to find out what the students had enjoyed and not enjoyed about the day
- to quantify students' rating of the excursion as compared to a normal school day.

5H.1.1 Students' view of the purpose of the excursion

The first item of the student survey asked 'What do you think is the purpose of your excursion to the RBGS?' As demonstrated in Table 5.1, 85% of students stated that they

were at the RBGS to learn about plants. Coded students' responses to this survey item are presented in Appendix 5.1.

Response	Number of responses n = 72	%
Learning about plants	61	85
Learning about other related aspects / to learn	6	8
Nothing/nil response/unrelated	5	7

Table 5.1 **School H: Student responses to the survey item 'What do you think is the purpose of your excursion to the RBGS?**

The six responses included in the 'related' response groups are included here to provide an indication of the type of response placed in this category. One single student states that the excursion is related to their classwork.

"To learn more about our environments, so that we can broaden our knowledge."
"To learn about the natural habitat."
"This excursion is for us to know more things than at school."
"For our unit we are doing at school."
"To learn."
"To learn stuff."
(SS School H 1997)

Table 5.2 illustrates the types of plant-related responses. Over half of the plant-related responses are a single response item similar to the following.

"To learn more about plants."
"To increase our knowledge of plant life."
(SS School H 1997)

The next category of responses links study of plants with study of environments. Also included in this group are responses that mention learning about plants from around the

world or learning about plants and their adaptations. A representative group of these responses follows.

"To learn the plants & environments."
"To know about plants and their adaptation to the particular environment."
"The purpose of this is for us to learn about different types of plants etc It was very interesting to learn about different types of plants around the world."
(SS School H 1997)

The last quote in this group also includes a response about learning about the different types of plants. The first part of this response has also been included with the third group of responses relating to learning about the variety of plants.

Response*	**Number of responses n = 72**	**%**
Learn about plants single response	34	47
Plants & environment/plant adaptations	12	17
Variety of plants/type of plants	6	8
Origins of plants	5	7
Plants/trees/forests	3	4
Plant growth & reproduction	3	4
Importance of plants	3	4

*Denotes multiple responses

Table 5.2 **School H: Students' plant-related responses**

A small group of students commented that they were at the RBGS to learn about the origins of plants. Examples of these responses are included as follows.

"The purpose was probably to help us understand more about plants and its (sic) origin."
"To learn more about plant (sic) how they became what they are now."
(SS School H 1997)

The following three quotes provide an indication of the responses included in each of the last three groups.

"To find out more about trees and forests."
"To learn more about plant and how they live."
"To learn about plants & trees and their importance."
(SS School H 1997)

This last group of quotes demonstrates that the importance of plants is not an obvious feature of either the worksheet for the excursion or of the teachers' comments about the purpose of the excursion. However it could be said that students may encountered other information sources at the RBGS e.g. session with the bg educator or through signage at the Tropical Centre.

It is clear from the discussion of students' responses to this survey item that the Year 9 boys have a clear understanding that the purpose of their excursion is to learn about plants.

5H.1.2 Enjoy about the day

The Year 9 students involved in the survey have enjoyed formal and informal aspects of the day as demonstrated in Table 5.3. Coded students' responses to the survey item 'What did you enjoy doing most at the RBGS?' are presented in Appendix 5.2.

Response	Number of students n = 72	%
Enjoy formal aspects	35	49%
Enjoy informal aspects	18	25%
Nil/nothing responses	10	14%
Enjoy both formal and informal aspects	9	12%

Table 5.3 **School H: Student responses to survey item 'What did you enjoy doing most at the RBGS?**

A good majority (61%) of the students enjoyed the formal aspects of the day. These aspects can be grouped into the following areas and are quantified in Table 5.4

- enjoyment of learning
- activity stops
- involved with plants
- practical activities
- specific places at the RBGS
- everything.

Students have enjoyed the following informal aspects of the day:

- lunch
- aesthetics of the RBGS
- free time.

The responses from a small group of ten students are difficult to interpret. Six students have responded with 'Nothing' and hence have registered their lack of enjoyment of the day. Two students record 'Yes' as their response but it is impossible to assign them to one of the other three categories. A further two students have not recorded a response to this question.

a. The formal aspects of the day

Table 5.4 provides information about the numbers of students who have responded to each of the five groups enjoying the formal aspects of the day.

i. Specific activity stops

The three activity stops involving the boys from School H are mentioned in these responses.

Plants of Tropical Rainforest

Table 5.4 demonstrates that one quarter of these students enjoyed this activity. As it is difficult to determine if students are responding to the place or the plants in this activity – both types of responses are included in this category.

"Visiting the tropical rainforest and the succulent garden."

"Tropical rainforest."

"The tropical rainforest centre."

"Pryamid."

"Looking at the tropical forest."

(SS School H 1997)

Response*	Number of students n = 72	%
Specific activity stops	27	38
- Plants of the rainforest	19	26
- Plant diversity	8	11
- Plants of arid areas	2	3
Practical activities	27	38
- learning / finding out	8	11
- looking at	7	10
- exploring / observing	7	10
- walking	6	8
Involved with plants	22	31
- rainforest plants	11	15
Places at the RBGS	10	14
- Tropical Centre	10	14
- Succulent Garden	2	3
Everything	1	1

*denotes multiple responses

Table 5.4 **School H: Aspects of formal activities enjoyed by students**

Plant Diversity

Ten percent of students enjoyed features of this stop. Four students enjoyed the plants at this stop, three students enjoyed learning about the plants and two students enjoyed the activities of either looking through the microscopes or the walk.

Plants of Arid Regions

Two students have enjoyed this stop. Study of students' responses indicates that it is both the location and the plants that these students have enjoyed.

ii. Involved with plants

While the discussion of the previous section has described the results for this category, it is important to note that approximately 30% of students have enjoyed the plants of the formal part of the day at the RBGS. Half of these students have responded to rainforest plants.

iii. Practical activities

The boys have enjoyed the practical aspects of the day. They have recorded the sensory activity of looking at specific plants or just looking in general as demonstrated by the following quotes.

"Looking at the thing through the microscope."
"Learning and looking."
"Looking at the tropical forest."
"Walking around looking at trees and plants."
(SS School H 1997)

A further group of students have also enjoyed observing and exploring as the following quotes illustrate.

"Exploring rainforests."
"Exploring."
"Observing the plants and trees, different kinds."
(SS School H 1997)

Six students have also enjoyed the physical activity of walking. Three of these responses identify that walking is part of the formal activities and the other three just enjoy walking.

iv. Specific places at the RBGS

The Tropical Centre as an architectural feature is identified as being enjoyed by ten of these students. The following quotes clarify this category.

"The tropical rainforest centre."
"The pyramid, the rainforests."
"Pyramid and lunch."
(SS School H 1997)

v. Enjoyment of learning

One in ten students recorded that they had enjoyed learning or finding out. The following are the five quotes taken from this group.

"The facts and information about plants."
"Finding out information from the plants and answering the questions."
"Learning about moses (sic)."
"Working at Education"
"Learning and looking."
(SS School H 1997)

vi. Everything

One single student enjoyed all aspects of the day as he reports:

"I enjoyed everything equally."
(SS School H 1997)

b. Informal aspects of the day

Table 5.3 demonstrates that 38% of students (27) have enjoyed informal aspects of the day. Table 5.5 quantifies the categories identified in these responses.

Response	Number of students n = 72	%
Lunch	15	21
Aesthetics of the RBGS	4	6
Free time	2	4

Table 5.5 **School H: Aspects of informal activities enjoyed by students**

i. Lunch

Over one fifth of the boys enjoyed lunch. Ten of the 15 students in this category have just written lunch as the single enjoyable feature of the day. The following quotes provide an insight into the nature of the responses in this category.

"Besides having lunch, probably the rainforest section."
"Having lunch."
"Eating lunch and leaving."
(SS School H 1997)

ii. Aesthetic environment at the RBGS

A small number of students (four) have responded to the general attractiveness of the RBGS as demonstrated by their quotes.

"The colourful flowers."
"The lovely flowers."
"The scenery."
"The Tropical Rainforest and the gardens of the Botanical Gardens."
(SS School H 1997)

iii. Free time

A very small number of students (two) have recorded having free time as an enjoyable feature of the day.

4H.1.3 Not enjoyed about the day

Immediately following students' responses to the question about what they had enjoyed about the day, students were asked 'Was there anything you did not enjoy about the day?' Table 5.6 demonstrates that 43% of students have found nothing that stopped them

Response	Number of responses n = 72	%
No	31	43
Not enjoyed some aspect of the day	30	42
Everything/nil response	11	15

Table 5.6 **School H: Student response to the survey item 'Was there anything you did not enjoy?**

enjoying the day. However 57% of the students did not enjoy some feature of the day. Coded responses from students for this survey item are presented in Appendix 5.3. Table 5.7 illustrates those aspects of the excursion that were not enjoyed by the students from School H.

Response*	Number of responses
Organisation of the day	13
Worksheets and working	11
Locations at RBGS	6
Other	2

* Denotes multiple responses

Table 5.7 **School H: Aspects of the day not enjoyed by students**

a. Organisation of the day

Most of the responses (ten) in this group relate to a negative attitude to the amount of walking involved in the excursion. Three students objected to the lack of freedom and having to walk with their teacher for the day.

b. Worksheets and working

Seven responses indicate that these students did not enjoy completing the worksheet. The remaining four students did not enjoy the idea of working on the excursion.

c. Locations at the RBGS

Two students did not enjoy the humidity in the Tropical Centre and four students found the Succulent Garden boring.

d. Other

These two responses are quite idiosyncratic – one student would have liked to encounter more animals while the other student hurt his finger.

5H.2 Teachers' experiences of the excursion

Teachers accompanying the Year 9 science excursion were asked to complete a one page survey (see Appendix 2.5) at the RBGS. The survey had the following purposes:

- to determine the teachers' view of the purpose of the excursion
- to ascertain why RBGS was chosen as the excursion venue
- to gain an insight into what these teachers value about the excursion to the RBGS
- to explore teachers' understandings of how students learn best at the RBGS.

5H.2.1 Purpose of the excursion

Teachers' responses to the question 'What is the purpose of your excursion to the RBGS?' follow.

1. "Hands on examination and observation of plants not commonly available to students."
2. "Day out; change of learning environment; accelerated learning."
3. "To extend the students' knowledge of plants introduced to them in Science lessons."

(TS School H 1997)

There is a clear expectation that students will be learning on this excursion. Two of the three responses relate to learning about plants. It is clear from these teachers' responses that the focus of this excursion is study of plants. Furthermore from study of the student survey results, the majority of students understand that the purpose of the excursion is to study plants. Clarity of intention and focus appears to be a feature of secondary excursions to the RBGS.

The three responses can be discussed by considering four aspects:

- the teaching program at School H
- teachers' pedagogy for the excursion
- students' experiences
- the resources of theRBGS.

a. The teaching program at School H

One of the three responses ties the excursion to classwork in Science. This teacher implies that students have been introduced to plants in previous science lessons. The topic of classwork is not reported nor do we have an understanding of the currency of classwork in plant-related topics.

b. Teachers' pedagogy for the excursion

The second quote indicates that the excursion is a change in routine. The quote also indicates that this teacher sees that his students will be learning much more while they are on excursion. Clearly this teacher demonstrates that the site of learning is moved from the classroom at school to the RBGS.

c. Teachers' perceptions of students' experiences

The first quote focuses on the practical nature of students' experiences at the RBGS. The teacher uses the terms 'examination' and 'observation'. Both these terms imply that students will be in close physical contact with plants. This teacher goes on to state that students will be in contact with plants that they may not have seen before. Hence the students will be extending their experience of plants.

This quote can be compared to the third quote where the teacher demonstrates a cognitive-based approach to the excursion. This teacher focusses on students extending their 'knowledge' of plants.

d. The resources of the RBGS

The first quote indicates that the RBGS has a collection of plants not commonly available in the wider community. There is a sense that this is a unique environment for his students to visit. The second quote goes further and states that the RBGS is an effective learning environment.

5H.2.2 Selection of the RBGS as the excursion venue

Teachers responses to the question 'Why did you and your colleagues choose to bring your students to the RBGS?' follow. The first quote responds to the plant resources of the RBGS while the third response concentrates on students' experiences with plants at the RBGS. The second quote relates to the ongoing nature of this excursion. The excursion to the RBGS is a feature of the science excursion calendar. It appears that it is part of the routine to break the routine!

1. "Excellence of diversity and variety of plant life."
2. "Annual event; it is very organised."
3. "For students to gain further insight into plant life and what's available."

(TS School H 1997)

In the case of School H links between classwork and the excursion to the RBGS are reported to be present by a single teacher and a single student (see Section 5H.1.1) however the focus and timing of classwork remain unclear. It may well be that the excursion has links to current classwork however the methodology has not focussed on this aspect of the excursion experience and there is no mechanism to explore the possibility of these links.

5H.2.3 Attributes of the excursion

This question item was included to provide an opportunity for teachers to shed more light on affective aspects of their excursion. The three responses to the question 'What do you value about the excursion to the RBGS?' are listed below.

1. "Change of environment, new experiences and excellent information."
2. "Diversity. Beautiful. It (RBGS) is fairly old."
3. "Excellent instructors. Extremely well organised and presented."

(TS School H 1997)

The first two quotes demonstrate that these teachers value both cognitive and affective aspects of this excursion. The first quote indicates that the change in the routine is welcomed, as is the opportunity for new experiences. This teacher also values the RBGS as a source of information. The second quote focuses on the RBGS as a venue. He values the aesthetic nature of the Gardens as well as the scientific nature of the plant collection.

The third response still demonstrates a cognitive 'dominated' view of the excursion. As we can see in his previous responses, his teacher focuses on gaining of understandings. In keeping with this view, this teacher values the input from the bg educators. His comments provide a professional opinion on the work of educators at the RBGS.

5H.2.4 Teachers' view of the best way to learn at the RBGS

Teachers were asked to consider the following question 'How do students learn best in the RBGS?' and their responses are written below.

1. "Hands on instruction."
2. "All these: worksheets, moving around, guided tour."
3. "By completing worksheets, listening and observing plant life."

(TS School H 1997)

These responses have a sense of a didactic approach to student learning. There is little sense of interaction between students and the plants at the RBGS. Apparently, students from School H learn best if they complete worksheets, listen and follow instructions.

However, there are some practical aspects to these responses from School H. The first quote provides a sense of student involvement in directed, practical activities. The second quote comments that students should be able to move around – implying that some degree of freedom can be afforded the students. The third quote states that students would learn best when they could observe plants.

5H.3 Discussion

The main purpose of this case study was to compare teachers' and students' responses to a question about the purpose of the excursion. The surveys for teachers and students from School H both open with the question 'What is the purpose of your excursion to the RBGS?' It is clear from teachers' responses that the focus of this excursion is study of plants. Furthermore students' survey results demonstrate that the majority of students understand that the purpose of the excursion is to study plants. Clearly teachers and

students from School H were in close agreement about the focus of the day. Responses to this item provide further insight into the degree of correspondence between the intentions of teachers and students' perceptions of these intentions.

Teachers anticipate that students will extend their understandings of plants by having practical experiences with living plants that students would otherwise not encounter at school. The physical nature of the learning with students moving around the venue, interacting with plants is a feature mentioned by teachers and students. Plants, places and activities have all formed parts of the formal event that students have enjoyed.

Results of this case study suggest a sense of inadequacy of survey data to provide a clear picture of the school excursion experience. The topic of classwork is not reported nor is there any indication of the relationship of the excursion to current classwork. The survey does not allow exploration of the nature of students' learning aside from reporting of a wide range of plant-related topics.



Plate 6 **The grass felt soft. (School E 1996)**

Case Study School G: Year 10 Science Excursion to the RBGS

School G is a public secondary girls' high school in the northern suburbs of Sydney about 40 minutes drive from the RBGS. The school has a long history of annual Year 10 science excursions to the RBGS for plant diversity and adaptation. This group is one of the largest groups to visit the RBGS with up to 210 girls and their teachers in the Gardens from 10.00am until 1.45pm.

The excursion involves students rotating to seven activity stops, five of which are staffed by teachers from School G and two stops are staffed by botanic garden educators. The activities are located in the Tropical Centre (rainforest adaptations), Succulent Garden (xerophytes), Palm Grove (cycads), Fernery (ferns), Cryptogam House (bryophytes), Conifer Lawn (conifers), Education Classroom (algae) and Solander Garden (bush foods).

The student handout for this excursion contains:

- the timetable for the day with the times and places for each of the seven classes
- a map of the RBGS with the teachers names on each location
- instructions about how to get to the RBGS
- the activity sheets for each of the seven stops.

Class groups of students have a map of the RBGS with the locations of each stop marked and numbered. The groups of students are unsupervised and are expected to use the map to move to each activity. Teachers located at each activity stop assist the students to make observations and to complete a worksheet. At the end of each 17 minute activity students rotate to the next stop where the numbers of students are checked and the next activity proceeds. There is a one hour stop for lunch after the fourth activity.

The school was visited by the researcher one week before and one week after the excursion to the RBGS.

The case study is informed by

- transcripts of tape-recorded interviews with Year 10 students before and after the excursion (SIPE School G 1997) and (SIAE School G 1997)
- transcript of interview with Year 11 students one year after their excursion to the RBGS (SIOY School G 1997)
- transcripts of interviews with three classroom teachers before the excursion (TI1 School G 1997) and (TI2 School G 1997)
- written surveys responses collected from 100 students completed on the day of the excursion (SS School G 1997)
- written surveys from five science teachers completed on the day of the excursion (TS School G 1997)
- student handout for the excursion.

5G.1 Students' Experiences of the Excursion

Four data blocks are considered in the following sections of this case study relating to students' experiences of the excursion to the RBGS:

1. interview with Year 10 students one week before their excursion
2. survey results conducted on the day of the excursion
3. interview with the same group of Year 10 students three weeks after their excursion
4. interview with Year 11 students one year after their excursion to the RBGS.

5G.1.1 Student interview one week before the excursion

One week before the excursion to the RBGS, six Year 10 students were interviewed outside in the grounds of their school. The girls formed a representative group from across the form and were being interviewed during their normal science lesson. The interview was tape-recorded. The following section contains quotes from this interview

with students. Where it is clear which students are speaking they have been identified with numbers. Where it is not clear, students have been identified with letters of the alphabet.

a. Students' view of the reason for their excursion to the RBGS

The girls understood that the excursion was for science to look at plants.

K: "What do you expect to do next Thursday when you come into the Gardens for your excursion?

S1 Just look at the plants and .. science.

S2 Look at all the trees, the plants and the species of them and all the different varieties of them.

...

S1: Educational ... I know it's like a typical thing to say but it is. Like you learn stuff.

K: What sort of things ... so you think you'll be learning about plants?

S1: Mainly plants.

S2: Structure.

S1: Where they come from.

S3: Variety.

S1: How they change through time.

...

S3 Our teacher said you had an area just specifically for the Aboriginal use of Australian plants.

K: Yes that's the garden just outside our classroom.

S1: Yes that's the new topic that we're learning.

SA: And that pine.

SB: That pine from the Blue Mountains.

SC: The Wollemi Pine.

SD: The species wasn't there and here it is."

(SIPE School G 1997)

It is clear that a week before the event the students have a well-defined focus on the purpose of the excursion. The girls go on to report that the day's work at the RBGS will form the bulk of work for a whole science topic.

K: "Are you doing a plant topic at school?
SE: We are doing genetics right now.
S1: Basically we are trying to get through the whole topic (plants) at the RBG. That's our entire topic.
S3: So this will be our last area (of Year 10 work)
K: So you start Year11 work.
SF: In term 4 – yes."
(SIPE School G 1997)

The excursion is almost a 'stand alone' learning experience for the science faculty. Some preliminary work on the topic will be done at school as indicated in the following comment.

K: "I know we talk a lot about the plants that are right there. That might get a bit boring sometimes if what you're hearing isn't relevant.
SG: It would be relevant because we're going to do a bit about plant biology before we go. And when we go there (RBGS) we'll have something to connect with it.. Like the types of leaves and the chlorophyll and everything."
(SIPE School G 1997)

b. The organisation of the excursion

The students have a very clear picture about the organisation of the day. This information has been provided by their classroom teacher during class discussions about the day. Further information is contained in the permission note that the girls take home for their parents' consent for their child to join the excursion. Although this excursion has been part of Year 10 work in science for many years it appears that the girls did not get their information from senior students at the school.

The girls knew that they would be travelling to the city by train. When they arrived at the RBGS they would be organised into in class groups which would move around the Gardens to different activity stops. There would be a worksheet that they would have to complete. The girls know that they were going to the Tropical Centre and that there had been a new topic about Aboriginal use of plants added to the day. The students were also excited about organising their picnic for lunch at the Gardens.

c. Looking forward to the excursion

For all the students the excursion was a welcome break in school routine.

SH: "It'll be good to get a day off school.
Others: Yeah (laugh)
...
SH: I'm looking forward to it I guess because it makes a difference from boring old science classes. I enjoy Science but..
SI: Yeah
SJ: It's like a practical.
SI: Yeah
SH: It gives variety to the regular classes."
(SIPE School G I997)

Students like the RBGS and the majority of the group had been before. The following quotes also indicate that there is a strong connection between some students and the RBGS.

SK: "We went to the botanic garden for our dance excursion. We went for a picnic near the Opera House. We stayed there. It was really fun. We were with the school – a couple of dance classes – and we went to the botanical gardens for a picnic. We got there with the teacher. It was fun. We took photographs and they looked really great – all nice and green.
..
SL: Like the big fig tree that's the one that I like. You can sit in between the roots and it's like – like you're being hugged by a tree."
(SIPE School G I997)

d. Students' view of learning at the RBGS

Students ventured their thoughts about why learning at the RBGS is different to learning in the classroom. The following student considers that she will learn more because the excursion is a break in the routine.

> SM: "And because it's variety your brain seems to switch on a little bit more and you seem to take a little bit more in .. you're not sitting down on a stool."
> (SIPE School G I997)

The following interview sequence demonstrates that the students will feel more relaxed and less constrained than they do in class. Students feel that being able to see what they are studying is a very memorable way to learn. Furthermore students perceive that what they are learning is relevant to them in their later lives and also to their work at school.

> K: "I was interested when you said you learn things there (RBGS) but it's very different to being in the classroom.
> SN: It's open and you feel more free .. more fun.
> SO: Different surroundings, environment.
> SP: Someone actually speaking to you and you actually there.
> SQ: It's practical.
> SR: In the classroom it's more theory and stuff, taking notes. When you're out there and you see it and it kind of sticks in your mind more.
> SS: Variety, just being out of the classroom.
> K: Somewhere different and seeing the stuff.
> ST: It's more relevant to what we're studying if you can actually see it.
> K: Yes well it's certainly different to being in the classroom. So you think it's more – it'll stay in your mind?
> SU: Now you learn all these formulas that you don't think you'll use in later life. Like when you're there (RBGS) you know it's definitely relevant to what you're doing."
> (SIPE School G I997)

Students are able to see at first hand what they have been studying and they feel that they will be able to learn when they can be in direct contact with what they are learning about. Students also perceive that being at the RBGS places learning in the context of the real world beyond the classroom.

One student tried to explain her thought processes when she is on excursion. It appears that she is involved in an active process of taking in information and incorporating it into her own understandings then communicating her understandings by responding either to written or verbal questions.

> SV: "You're processing like what someone's told you and putting into your own words and answering questions."
> (SIPE School G I997)

Her friends went on to comment on their satisfaction in being able to investigate things for themselves.

> SW: "Or you could investigate it for yourself. You don't have to rely on the teacher.
> SX: Well it's like you're not having everything done for you. It's like something you've got to do for yourself. You get to investigate for yourself and you get satisfaction out of that."
> (SIPE School G I997)

5G.1.2 Student survey on the day of the excursion

On the day of the excursion students from School G were asked to complete a one-page survey (see Appendix 2.6) and return it immediately to their last teacher who was to pass it directly on to the Education Centre at the RBGS. The purpose of the survey was to gain immediate feedback from the students involved in the excursion. The survey required students to record the following:

- what they had enjoyed and not enjoyed about the day
- what they remember learning
- opinions about learning in a botanic garden compared to learning at the RBGS
- various ratings about the day compared to a normal school day.

Approximately 50% of the student surveys were returned to the Education Centre. This return rate is high in comparison to other response rates, however considering the captive nature of the audience a higher return rate was expected. It appears that, at the end of the day, the overriding concern for both teachers and their students is probably the need to return to school on time rather than complete and return a survey sheet. However 100 student surveys form this set of data which provides an insight into the experiences of the Year 10 students on the day of the excursion.

a. Enjoy most about the day

The first survey item asked students to write what they had enjoyed most about the day. Table 5.8 illustrates an overall impression of the results of this survey item and the coded responses of students are presented in Appendix 5.4.

Response	Number of responses n = 100	%
Enjoy informal aspects	40	40%
Enjoy formal aspects	34	34%
Enjoy both formal and informal aspects	24	24%
Nil/nothing	2	2%

Table 5.8 **School G: Student response to survey item 'What have you enjoyed most about the day?'**

Over half of the students have enjoyed formal aspects of the day. These aspects can be grouped into the following areas:

- general enjoyment of the whole day
- enjoy learning, finding out about plants
- involvement with plants
- involvement in practical activities
- the places at the RBGS: the Tropical Centre, Succulent Garden or Education Centre.

More than two thirds of the students have enjoyed the informal aspects of the day. These aspects are grouped into the following areas:

- the aesthetics of the RBGS; beautiful surroundings; good weather
- lunch; free time; feeling relaxed
- being with their friends.

i. The formal aspects of the day

Table 5.9 illustrates those aspects of the formal part of the day that are enjoyed by students. These aspects are discussed in the order they appear in the table.

Specific activity spots

The majority of students that enjoyed aspects of the formal component of the excursion reported that they enjoyed specific activity spots. Four of the seven activity stops are specifically mentioned by students and these are listed in Table 5.9 in rank order. The other three spots: cycads, conifers and the Fernery have not appeared in this response item. The following responses are typical of those for each spot.

> "Visiting the Tropical Pyramid."
> "Eating algae stop."
> "Learning about the Aboriginal food, medicine and tools."
> "I enjoyed going to the place where the succulent plants were. They were interesting and it's the kind of thing you don't get to see anywhere else in this area (-Sydney)"
> (SS School G 1997)

Stop 5 – Tropical Centre

One quarter of students' responses are about the tropical rainforest activity spot. Table 5.9 also indicates that all of these responses specifically relate to the Tropical Centre itself.

Stop 1 – Algae

The Education Centre was the location for study of algae. The sensory experience of tasting agar (a sweet jelly made from an algae) was the focus of students' reasons for enjoying this spot.

Response*	Number of responses n = 100	%
Specific activity spots	45	NA
- Stop 5 Tropical Centre	25	25
- Stop 1 Algae	14	14
- Stop 2 Aboriginal Plant Use	7	7
- Stop 7 Succulent Plants	5	5
Plants	32	NA
- algae	9	9
- general plants	9	9
- cactus / succulent plants	5	5
- plants used by Aboriginal people	4	4
- rainforest plants	3	3
Places at the RBGS	32	NA
- Tropical Centre	25	25
- Succulent Garden	4	4
- Education Centre	3	3
Involved in activities	18	NA
- sensory activities	17	17
tasting	8	8
seeing/looking at	5	5
- general practical approach: 'hands on'	2	2
Enjoyment of learning	10	10
Enjoyment of the day	6	6

* Denotes multiple responses

Table 5.9 **School G: Aspects of formal activities enjoyed by students**

As Table 5.9 indicates eight of the 14 students mention the sensory experience of eating at this stop. Nine of the 14 responses relate to the plants themselves and three of the 14 students mention the Education Centre.

Stop 2 – Aboriginal Plant Use

Seven students have specifically enjoyed Aboriginal use of plants. The information provided at this stop is based on plants of the Sydney region that may be familiar to students. Four of these seven students mention plants.

Stop 7 – Succulent Plants

This activity is held in the Succulent Garden. Five students mention this activity stop and all five respondents associate plants with this stop while four of the five students' responses are about the location.

About plants

Plants are enjoyed by 32% of the students involved in the survey. This category can be further divided into sub-groups that describe the sorts of plants enjoyed by the students.

Algae

Algae seems to be a strange group of plants to be enjoyed by Year 10 students. Four of these nine students enjoyed eating the seaweed. It appears that tasting agar may have contributed to student enjoyment of this group of plants as demonstrated in the following quotes from this group of responses.

> "The education centre where we observed algae and got to taste foods produced from algae."
> "The demonstration of all the different types of algae."
> "Eating seaweeds in the Education Centre and taking photos with friends at lunch time."
> (SS School G 1997)

Plants

The general category of plants was mentioned by students in connection with learning about plants. Enjoyment of the garden was not included in this category – these responses have been placed with enjoyment of the informal part of the day.

> "Lunch, but it was interesting finding out about all the different plants. Admiring the plants was also very good."

"Learning about the different sorts of plants and the rainforest section."
(SS School G 1997)

Plants used by Aboriginal people

Students have also enjoyed the part of the day concerned with plants used by Aboriginal people. Care has been taken to distinguish between responses that relate to plants and responses that relate to information about Aboriginal people and their foods, medicines and tools. Responses included in this category specifically mention plants rather than the activity stop.

"Aboriginal uses of plants."
"Everything – I particularly liked the Aboriginal plant use part."
(SS School G 1997)

Rainforest plants

These responses state that they have enjoyed the rainforest or rainforest plants. It is difficult to distinguish whether the students are commenting about the rainforest plants or about the location. However only responses that have distinguished this particular group of plants have been placed in this category. All three of the responses in this category link rainforest plants with the Tropical Centre and hence have been placed in both this rainforest plants category and in the category for the Tropical Centre. The following are examples of these responses.

"The tropical rainforest."
"Lunch and the tropical and carnivorous plant arc thing."
(SS School G 1997)

Places at the RBGS

Table 5.9 demonstrates that 32% of the students involved in the survey enjoy specific places at the RBGS. The following quote provides a thoughtful reason for this choice.

"The variety and detail of each place especially enjoyable was the tropical plant greenhouse."
(SS School G 1997)

The Tropical Centre is a major feature in students' considerations about their excursion to the RBGS.

Practical activities

18% of students say they enjoyed the activities associated with the formal aspects of their excursion. Table 5.9 indicates that the majority of these experiences are sensory experiences of either tasting agar jelly or looking at plants. Two students enjoyed the overall practical nature of the excursion as seen in the following responses.

"Picnic lunch and good scenery. Hands on approach to learning."
"Succulent plants. Picnic and hands on aspects eg taste testing."
(SS School G 1997)

Enjoyment of learning

One in ten students stated that they enjoyed learning about particular aspects of the day's activities. One student commented that she had enjoyed learning away from the classroom. The majority of these responses stated that the student enjoyed learning about plants and learning something new. The following quotes are examples of the responses in this category.

"Learning about different plants and their characteristics, the ducklings!"
"Seeing plants that I haven't really seen before. Finding out facts I didn't know."
"The fact that I'm learning something new and worth while out of school."
(SS School G 1997)

Enjoyment of the whole day

A small number of students (six) commented that they had enjoyed the whole day. Two examples of the responses in this category are included below. The first response places enjoyment of the day in the context of the aesthetic environment of the RBGS and

personal motivation. The second response links enjoyment more closely to the formal content of the day.

> "The free time to sit in the sun and look around. The park was beautiful and great to admire. It was a great day, interesting, fun, peaceful and enjoyable."
> "Everything – I particularly liked the Aboriginal plant use part."
> (SS School G 1997)

ii. The informal aspects of the day

Table 5.8 shows that 40 of students have enjoyed only the informal aspects of the day. A further 24 students have written that they enjoyed both formal and informal aspects of the day. Hence 64% of students have enjoyed the informal aspects of their school excursion. These aspects have been grouped as follows:

- lunch
- relaxing and having free time
- aesthetics of the RBGS
- animals.

Table 5.10 illustrates the frequency of responses in these four categories.

Response*	**Number of responses n = 100**	**%**
Lunch	35	35
Relaxing and having free time	28	28
Aesthetics of the RBGS	18	18
Animals	9	9

* Denotes multiple responses

Table 5.10 **School G: Aspects of informal activities enjoyed by students**

Lunch

A highlight of the day! Over one third of the students put lunch on the list of enjoyable aspects of the day. Lunch is associated with time to relax and be with friends in the

scenic surroundings of the RBGS. The following quotes provide an insight into this feature of the day.

"Lunch – it was good to sit down and relax in the beautiful surroundings."
"In Stop 1 (Education Centre) because you get to eat, 2. lunch time we get the talk to our friends and taking photos."
"Lunch time and going home."
(SS School G 1997)

The last quote is one of a group of six responses that indicate an 'off task' attitude to the day.

Relaxing and having free time

Approximately one quarter of the students enjoy the relaxing side of the excursion. They have free time to move around the RBGS or to sit and enjoy the company of their friends. They are out of the school environment and can relax outside and enjoy the sunny weather.

Aesthetic environment of the RBGS

Approximately one fifth of the students enjoy the aesthetic environment at the RBGS. Students respond to the beauty of the surroundings as indicated by the following quotes.

"Walking through the beautiful gardens because of the natural/fresh environment."
"The beautiful gardens and sunny weather"
(SS School G 1997)

Animals

A handful of students enjoyed seeing a family of ducks and ducklings walking on the grass near one of their activity spots. Five of the eight students mentioned this as their single enjoyable aspect of the day.

b. Not enjoyed about the day

The second survey question asked students if there was anything that they had not enjoyed. Table 5.11 illustrates that one quarter of the student stated that there wasn't anything that they had not enjoyed. A further eleven students left this question blank. Hence it could be said that approximately one third of the students found that nothing had stopped them enjoying the day. However there are two thirds of the students that have not enjoyed some aspect(s) of the day. Students' coded responses to this survey item are presented in Appendix 5.5.

Response	Number of responses n = 100	%
Not enjoyed some aspect of the day	63	63
No	26	26
No response	11	11

Table 5.11 **School G: Student response to survey item 'Is there anything you haven't enjoyed? Explain.'**

These aspects are illustrated in Table 5.12 and can be grouped as follows

- organisation of the day
- specific activity stops
- RBGS and facilities at RBGS
- worksheets and having to work
- feeling bored and tired

i. Organisation of the day

The majority of students in this group have reacted negatively to some of the organisational elements of the day. For some students (eight students) there was too much walking between activity stops. They felt that they were rushed through the activity stops (five students) and that lunch was too short (three students). They did not

enjoy being put into their class groups (three students). The responses represent the nature of students' opinions in this category.

"Having to go around in class groups."
"Yes, the day was too rushed we should have longer time at each stop and maybe went into more detail about the plants."
"Walk too much, lunch too short. Write too much."
(SS School G 1997)

Response*	**Number of responses n = 100**	**%**
Organisation of the day	17	17
Specific activity stops	16	16
Stop 1 Algae	11	11
Stop 3 Fernery	1	1
- Stops 4&6 Cycads and conifers	5	5
RBGS; facilities of the RBGS	15	15
Worksheets and working	14	14
Feeling bored; tired; not interested	9	9

*Denotes multiple responses

Table 5.12 **School G: Aspects of the day not enjoyed by students**

ii. Specific activity spots

16 students had not enjoyed aspects of specific activity spots with the majority (eleven students) of these students not enjoying the agar jelly. Six of these students did not enjoy the taste of the jelly. Stops 3, 4 and 6 were said to be uninteresting.

iii. Worksheets and working

The formal input required by the students was to complete a set of worksheets on the day. 14 students did not enjoy the idea of having to do school work on the day. Eleven students did not enjoy completing worksheets. Two of these responses are included below as they provide a thoughtful rationale in the case against worksheets.

"Yes. The worksheets. It makes you analyse nature to the extent you start to dislike it."
"Worksheets. It would be better to find things that interest us rather than set us things."
(SS School G 1997)

iv. Feeling bored and tired

A group of nine students found the day a chore. They were not interested in the topic and were physically tired by the walking and bored by the end of the day.

v. Facilities of the RBGS

Limited toilet facilities and an expensive kiosk formed the bulk of items included in this category. Three students did not enjoy the RBGS.

c. Students' view of learning at the RBGS

Students' responses to two survey items provides an insight into their view of learning at the RBGS. Responses to the survey item 'What do you remember learning here today?' provided an insight into the correspondence between teachers' outcomes for the excursion and students' perceptions of what they have learned at the RBGS. Table 5.13 illustrates the nature of the responses and coded responses from students are presented in Appendix 5.6. Students' responses to the survey item 'Compared to learning science at school is learning here at the RBGS any different?' are located in Table 5.14 and their coded responses are presented in Appendix 5.7.

i. Students' view of what they have learned at the RBGS

A fundamentally important feature of an excursion to the RBGS is revealed by this response item and that is that these students have a clear perception that they have learned about plants at the RBGS. This data provides further evidence that the venue can be characterised by its clarity of focus. There are no competing (or distracting) themes and, as a result, more than four in every five Year 10 students from School G can explain that they have learned about plants at the RBGS.

Response	Number of responses n = 100	%
Learning about plants	80	80
Nothing/nil response/unrelated	11	11
Learning about other formal aspects	9	9

Table 5.13 **School G: Student responses to the survey item 'What do you remember learning here today?'**

Table 5.14 identifies the components of students' learning about plants. Students' responses to this question may have more than a single focus and hence the response is placed in a number of categories in the table.

Activity Stops

Inspection of the results in Table 5.14 reveals that students have responded to every activity stop in the day. More than one in four students remember learning about algae (or seaweed) and one in five students remember learning about cycads and conifers. Within this group were 15 responses that stated specific facts as what they had learned at the RBGS. Interestingly six of these responses are incorrect. It appears that specific details or factual information may not be retained accurately by students whereas more overall themes and ideas are securely grasped by most students.

Response*	Number of responses n = 100	%
Specific activity stops	61	61
Comprehensive response	45	45
Stop One – Algae	29	29
Stop 4&6 – Cycads and conifers	23	23
Stop Two – Aboriginal use of plants	14	14
Stop Five – Tropical Centre	12	12
Stop Three – Mosses/ferns	10	10
Stop Seven – Succulent plants	7	7

* Denotes multiple responses

Table 5.14 **School G: Components of students' responses to what they learned about plants**

Comprehensive responses about plants

Approximately half of the responses about learning about plants provide a comprehensive overview of the day. These responses are provided in one of two forms:

- the 'big idea' or theme of the excursion
- a string of three or more topics of the excursion.

Plants and plant diversity and adaptation form the theme of the day and can be seen as the 'big picture' learning for the excursion. All of the students' responses in this category are accurate and provide a sound summary of the day.

Some responses specifically mention the overall theme as seen in the following quotes.

> "An extension to the topic 'plants'. Learnt more about the plants habitats – seeing it in nature."
> "Lots! – different plants from different regions + climates and the way they have adapted to these."
> (SS School G 1997)

Other responses in this group have written a string of three or more plant groups relating to the activity stops.

> "All about algae, mosses, ferns, cycads, conifers, gymnosperms, tropical plants, angiosperms."
> "Aboriginal food + culture. Temps needed for certain plants seaweed, mosses + liverworts, gymnosperms."
> (SS School G 1997)

Some responses (six) placed in this category simply state that the students have remembered learning about plants.

ii. Learning is different at the RBGS

Question 5 of the student survey asked 'Compared to learning science at school, is learning different here at the RBGS?' As demonstrated in Table 5.15, the responses saying that learning was different at the RBGS totaled 95, with three nil responses and two responses saying 'no'. It appears that the majority of students have an opinion on this question.

Response	Number of students n = 100	%
Learning different at RBGS	95	95
Nil response	3	3
Learning not different	2	2

Table 5.15 **School G: Student responses to the survey item 'Is learning different at the RBGS?'**

In considering students' reasons for saying that learning is different, their responses could be placed in four broad categories:

- the personal learning experiences of the students
- being receptive to the learning
- the clarity of educational focus
- the authenticity of the experience.

Table 5.16 presents a summary of these broad categories which are described as follows.

Personal learning experiences

Students identify both the sensory and practical nature of the learning at the RBGS. This type of learning personally involves students in their learning. Some students make the observation that they are able to learn and experience for themselves as seen in the following quote.

"Yes, because it is very interactive and hands on. You can learn from your own experiences and senses."
(SS School G 1997)

In referring back to the complete questionnaire, ten responses indicate that active learning is also identified as being enjoyed by the same students.

Learning using the senses

This is the largest response category for this question item. More than one in three students report that the learning is sensory at the RBGS. They report that they use their senses of sight, smell, taste and touch. The sense of hearing has not been included in their responses. The following quotes are typical of responses included in this category

"Yes, more hands on things to do – like we had the chance to smell leaves and eat food."
"Yes as it is more practical and hands on we have to observe, touch etc instead of just reading information."
"Yes. I got to see actual samples of the plant."
(SS School G 1997)

Learning at the RBGS is practical and 'hands on'

The practical, 'hands on' nature of the learning is the second largest category of students' responses. Three in every ten students identify the practical nature of the learning at the RBGS as being different to the way that learning happens at school. Some students explain that the practical nature of the learning contributes to better understanding (three responses) and a more enjoyable experience (one response).

Being receptive to learning

This category of students' responses identifies a range of conditions that allow the students to be more responsive to the learning at the RBGS. As indicated by Table 5.16 the largest group in this category is that of the location for the learning. It is not the actual RBGS that students are identifying in their responses – it is more that they are

outside in an open space and away from school. Learning is also more enjoyable and interesting at the RBGS. Students and staff feel more relaxed and less pressured by time. Students feel that learning is more independent because they can walk around and discuss things with their friends. The following quotes provide an insight to the responses in this category.

"Yes – hands on experience; being outdoor, sitting on grass."
"Yes it is more relaxed, easier but you learn more (gymnosperms, angiosperm, ferns, algae, moss) you don't get bored it's practacly (sic) hands on too."
"Yes more enjoyable, teachers are nicer, talk to friends more time to learn, activities more fun and interesting."
"Yes. It's more fun + enjoyable. It's not always the teacher speaking. We get to do practical things and walk around. We can draw and TALK!!"
(SS School G 1997)

Response*	**Number of responses n = 100**	**%**
Personal learning processes		
- sensory	38	38
- 'hands on'; practical	29	29
- experience; see for ourselves	8	8
Receptive to learning		
- location	25	25
- enjoyable	15	15
- more interesting; want to learn more	8	8
- walk around; more freedom	7	7
- more relaxed; more time	4	4
Clarity of educational focus		
- see what learning about	27	27
- better understanding	14	14
- not out of a book	6	6
- relevant	2	2
Authentic		
- access to real plants	15	15
- surrounded by environment	7	7

* Denotes multiple responses

Table 5.16 **School G: Students' reasons for why learning is different at the RBGS**

Clarity of educational focus

Table 5.16 demonstrates that one in every four students report that they can see and identify the focus of their learning at the RBGS. Students can see the object of their learning at close range. The following quote demonstrate this aspect of the learning at the RBGS.

> "Instead of looking at pictures we got to see the plants we were studying up close in a beautiful environment."
> "Yes. You remember more because you can see the things up close and remember them easier."
> (SS School G 1997)

The first of these quotes also demonstrates another aspect of this response group and that is that learning at the RBGS is not out of a book nor does learning happen as a result of being told something by a teacher. One student in 20 would also say that learning at the RBGS is easier. Two students mention that the practical nature of the learning at the RBGS make their classwork relevant to the real world.

Learning by seeing the 'real thing'

In this category students state that they learn by having access to real plants and environments at the RBGS. The following quotes demonstrate this aspect of the responses.

> "Yes because all you see at school is words written about plants on the blackboard but in the Royal Botanic Gardens you can actually see the real plant."
> "Yes it is very different you have real life things to look at and touch."
> "Yes, as we are taught among surroundings and can observe and touch rather than just being told by words."
> (SS School G 1997)

The last quote in this series demonstrates another aspect of learning at the RBGS and that students are surrounded by the focus of the learning. Students are physically immersed in the learning environment. They have immediate physical access to what they are learning. They are learning in context.

5G.1.3 Student interview one week after the excursion

The same group of Year 10 students was interviewed one week after their excursion to the RBGS. It was a rainy day so the interview was held in a study room in their school library. The atmosphere was unsettled with many students sheltering from the weather in the library. The interview was tape-recorded.

a. Enjoyable experience

It is clear that the students have enjoyed the excursion. Their first response to the general opening question was to express their positive feelings about the day.

> K: "So how was it?
> Sa: I loved it
> Sb: It was good
> Sc: It was fun and I didn't expect that it would go so quickly.
> Sd: I thought it would be boring and drag on and we'd crawl from place to place – but it wasn't. It went really fast and we had a lot of fun."
> (SIAE School G 1997)

b. Organisation suits students

Students spend a very short time (17 minutes) at each one of their seven stops with four minutes to move between each stop. It could well be that students feel that they do not have enough time to take in the new environment at each location. Students find their own way between each stop using a map of the area. The following response reveals students' reactions to the organisation of the day.

Se: "I thought it was a good length of time. I wouldn't have wanted to spend any more time at one particular area. I would have gotten bored with it. And the entire purpose would have been undermined. It would end up like school – being bored.

Sf: When you're at school you sort of wait for the bell but when you're there (RBG) you're pushed on to the next thing.

Sg: It just keeps you going.

..

K: And how did you go about finding the different places?

Se: Oh they just said 'That way'.

S1: It was basically closer than we thought like looking at the map.

S3 And because we knew the teachers taking it. It was easy to follow. On the sheets it had the teacher taking it.

..

S3: I Liked the way the activities were varied – like at one stop we had to draw them and then we wrote about them.

..

Sf: And the worksheets weren't really hard.

Sg: And they gave you the answers."

(SIAE School G 1997)

These students enjoy controlling their own pace of learning and the freedom of being able to move independently through the RBGS guided by their map and looking out for the familiar face of their teacher who is waiting at the next location.

The student worksheet serves many purposes for the day. It is the organising element for the science content of the excursion, bringing together the activities at the seven stops and forming a coherent study of the five main plant groups and plant adaptations in rainforest and arid environments. The worksheet serves as the students' record of the day where they write responses to questions and making diagrams and sketches. It also acts as the running sheet for the day.

c. Recollections about places at the RBGS

The students from School G reinforce the strong message from students' involved in this research – the Tropical Centre and Succulent Garden form a major part of students' recollections about their excursion to the RBGS.

i. The Tropical Centre

This large glasshouse complex in the south-west side of the RBGS is a memorable place for these students. These students call the Tropical Centre by its name rather than – say the 'pyramid' or the 'glasshouse'. The following conversation indicates the students' recollection of the sensory nature of being in the Tropical Centre: it is hot in one area, cool in another and very humid; students can touch everything within their reach.

> Sh: "Tropical Centre.
> .K: Why do you remember the Tropical Centre? Is it just because it's a different place?
> Si: It's the environment, running in from hot to cold. When the waterfall comes on and when the sprinklers come on.
> Sj: Touching everything.
> Sk: It's an atmosphere we're not really used to it. Like being such a moist area.
> ...
> K: Is it because the Tropical Centre is a different place – like it's a glasshouse – or because of the plants that are in there or..?
> Sk: It's the excitement of glasshouse and steps, the waterfall and sprinklers.
> Sl: It's a totally different environment compared to outside.
> Sm: Isolated and enclosed."
> (Yr10 AEGI 97)

The building itself forms the major part of the recollections of these students. Immersion in a completely different environment and the structural features of different rooms, misting systems and waterfalls are memorable features for these students. The collection of plants growing in the Tropical Centre has not been part of this conversation.

ii. The Succulent Garden

Sn: "I like the succulents.

...

K: And what about the Succulent Garden?

So: There's really fat cactus and it's really cool.

Sp: Plants are really different – not just typical.

Sq: It's like the pyramid – the novelty of being in a different environment."

(SIAE School G 1997)

It is clear that students enjoy the novelty of the plants growing in this area as well as being in a different type of environment.

d. Recollections about the sensory nature of the activities

Students recalled the practical nature of the work. They are actively involved in tasks requiring observation using all their senses.

Sa: "It's very 'hands on'.

Sb: You get to look through the little microscopes.

Sc: And you can touch them and you can see that they're .. how they bend.

..

Sd: And you can touch it.

Se: We touched everything."

(SIAE School G 1997)

Students also recalled the tactile nature of their experience. It appears that being able to touch the plants had a significant impact on these students.

e. Students' view of learning at the RBGS

Before their excursion these students were very clear about going to the RBGS to learn about plants. During this interview the students (particularly Student 3) attempted to provide some thoughtful explanations about the nature of their learning at the RBGS.

i. Applying understandings

This student commented on the chance to use and contribute understandings that she had gained as part of her own life experience.

> S3: "I knew all the answers in the Aboriginal food garden.
> ....
> S3: I felt really smart.
> K: What – you'd done some work on it before?
> S3: I don't know I just did.
> ....
> S3: You get to show off your knowledge."
> (SIAE School G 1997)

This student is thrilled that she could apply understandings that she had learned elsewhere to this experience in the context of the RBGS.

ii. A student learning sequence

The following students attempt to explain how they went about working to learn about what they were seeing. The second student comments about the desirability of some previous knowledge about the object of attention.

> Sx: "You see it, then you learn about it and then you look at the little veins.
> S3: You have to learn about it first as well I think to know what you're looking for."
> (SIAE School G 1997)

The learning process for these students at the RBGS commences with attending to a particular plant. The student sees this plant then learns (is told) something about it, then she uses this understanding to make further observations about the plant. This sequence of steps illustrates Lai's first three levels of engagement (1999b) described in his taxonomy of learning experiences in fieldwork presented in the Literature Review: reception, focussing and engagement of the senses.

iii. Memorable learning

Excursions provide fertile ground for memorable learning as indicated by the following particularly insightful comment.

> S3: "Sometimes it's easier for people to learn if they can actually see the plant. It's like a memory thing. I know that I can learn it on the paper and I'll know it for a few weeks. But having a day where you go out and you see the plants you remember the day you remember what you learned. There's a lot of keys that unlock things in your memory.
> Sf: 'Cos you tend to remember more practical things than theoretical .
> Sg: But when you think about you can see it sort of thing – I can – I don't know about the rest of you. You can image, picture what it looks like and then it jogs your memory."
> (SIAE School G 1997)

It appears that for these students there are a number of aspects contributing to the memorable nature of learning on excursions. Firstly being able to see first hand the focus of learning. The second aspect is the novelty of being out of school, being out of the normal routine. Thirdly, Student 3 refers to the excursion providing a lot of 'keys' into her memory. It appears that the excursion provides a rich reservoir of experiences any one of which can be used as a pathway back to the particular memory about what had been learned. Fourthly Student D points out the practical 'hands on' nature of the experience helps her to remember more effectively.

5G.1.4 student interview one year after the excursion

The long-term nature of the school's relationship with the RBGS enabled the researcher to interview senior students who had been on the school excursion to the RBGS a year earlier. Year 11 students were interviewed for 20 minutes as a group of five outside in the school grounds.

a. Initial recollections

The students' first recollections about the day mainly involve the formal aspects of the day: the locations of the activity stops and the sensory experiences and specific activities

associated with these locations. There is also mention made of less formal aspects of the day – most notably lunch and the birds at the RBGS.

K: "If you remember last year it was a beautiful day – tell me what you remember about it.
Sh: The cactus garden and all the tropical house – hot and cold. The other garden .. the fern garden .. where we had to draw the diagrams and that. I remember sitting down for lunch .. at the pond. At the education centre seeing the sea weeds – they were really smelly. The birds were very nice – with the long beak."
(SIOY School G 1997)

An outstanding feature of this response is the long-term stability and persistence of students' sensory recollections. Students recall the temperature of the Tropical Centre and the smell of the seaweed in the Education Centre. Recollection of the physical experience of hot and cold is associated with a specific location – the Tropical Centre. This association has been made by both the Year 10 and the Year 11 students.

It appears that specific locations at the RBGS also form long lasting memories for these students. These Year 11 students do not use the exact name of the location however they do remember the place itself. The Succulent Garden and the Tropical Centre feature first in students' long term recollections. The following quote demonstrates the association between the Tropical Centre and a particular plant.

K: "What do you remember learning? Do any of the spots leap out at you?
Si: In the hot and cold – the house. I'll never forget it – the teachers were showing us – I can't remember what it's called. That the plant comes out and they have like this sack thing and it's all filled with water.
K: Like an insect eating plant?
Si: No it was a flower and it had like a cup thing to trap the water to get stuff to drink.
Sj: I think that was my favourite part to go in there. I really liked that. They showed us all different things like plants that trap insects and things.
K: It's a great spot in there – just so different to anywhere else.
Sk: They had some beautiful flowers – like aqua – so beautiful.
K: That was in the Tropical Centre?

Sk: Yep."
(SIOY School G 1997)

Students' recollections of places are associated with the activities that they were involved with at that location. Students also have memories of plants at these locations: smelly plants, unusual plants – plants that hold their own water and plants that trap insects, plants with beautiful flowers. The presence of teachers and their role of pointing out features is also mentioned.

b. Organisation of the day

Students were asked about organisation of the day. Their recollections about details of the trip and the management of the day were hazy. They were unclear about where they alighted from the train and corrected each other about being in groups with or without a teacher. However they made some comments about their attitudes to worksheets.

i. The worksheet

The following discussion reveals a range of views about the place of the excursion worksheet.

K: "What did you think about the worksheet?
Sa: I don't really like filling out worksheets. I thought it was pretty boring. I'd rather read about, I rather walk around and read.
Sb: It makes you focus on it – you notice differences when you have to jot it down.
Sc: A lot of stuff you remember from the worksheet.
Sd: We don't have to write – like huge amounts.
Sa: Admittedly they told you the answer. We just had to figure out .. That made you look as well.
Se: Didn't we use some of it in a test?"
(SIOY School G 1997)

After some strong statements from her peers, Student A reluctantly admits that worksheets may serve a useful purpose. These senior students see that the worksheet can be used as a focussing tool while they are on the excursion, a prompt for their memory after the excursion and as a source of information that could be used for a test. Hence, for these students, worksheets should:

- serve as a focussing tool to help them look for specific details within the mass of information available to them
- contain space for their own records
- not be a burden in terms of the difficulty of the worksheet nor its length
- help them to create an accurate record and a summary of the formal content of the day.

c. Students' view of learning at the RBGS

Year 10 students have created a framework for the exploration of students' ideas about what and how they learn at the RBGS. Senior students involved in this interview contribute to this growing body of understandings about their view of learning in a botanic garden.

i. Memorable experience

The longer-term recollections of senior students involve aspects of their excursion to the RBGS. The following quote demonstrates that teachers use these long-term recollections as part of classwork more than one year after the excursion to the RBGS.

> K: "Do you think you learnt much by going to the Gardens?
> S: Yep
> Sf:'Cause a lot of things you've heard about in theory that you could see and practice.
> Sg: And now when the teacher is talking about plants and stuff we can remember seeing them. When she talks about them she goes 'You remember seeing them?'"
> (SIOY School G 1997)

As for Year 10 students, senior students valued the opportunity to see and be surrounded by what they had been learning about. Senior students went on to explain this feature when they were asked to compare learning at the RBGS with being in a classroom.

K: "You know when you're at the Gardens how do you think learning is different at the Gardens? Is learning different in the Garden to being in a classroom?
Sa: It's more relaxed.
Sh: It's practical.
Si: 'Cause you're actually there and you can actually see what you're talking about.
Sj: Yeah.
K: So it's right there in front of you.
Sk: Yeah.
Sl: You can look at it. Lie on the grass."
(SIOY School G 1997)

The immediacy of real plants and environments that are the focus of learning is an important feature for both Year 10 and Year 11 students. Both groups also mention that learning at the RBGS is a practical experience. This group of students also identifies the more relaxed learning situation at the RBGS.

ii. Reservoir of experiences

This group of students confirms the Year 10 comment about the excursion providing many 'keys' to use as pathways into their memories.

Sm: "But it's easy to remember it – say because you can tie it in with the memories you have of your friends. You tend (to remember) things about what your friends do – more than, say, theory work at school. So this way you tie it in together. So you remember the Succulent Gardens because Jill pricked her finger – and she went and did it again. So then it sort of starts
to jog your memory about the different shapes. Like you can imagine her there and while you're imagining her you can imagine the plants and what you've learned about them.

K: So it's sort of like there's an event that happens – like if you see a spider .. or if your friend .. you seem to remember it because you remember your friends?
Sm: If you interact with people it works a bit better."
(SIOY School G 1997)

For this student memories of her friends are the key to recalling information about the plants in the Succulent Garden. The following student helps to coin the rather useful expression 'memory triggers' for situations that inspire a link to memories about a particular experience.

K: "When you went – you went like a year ago- what sort of things do you actually remember?
Sn: If I was trying to think what I remember – I may not remember it fully now .. but .. Like we did sexual reproduction in Biology and when we talked about sexual reproduction you remember the spores and you remember we looked for them. Like the topics that come up in Biology they trigger your memory rather than actually sitting down there and saying I remember going here and here. It's more the case when a teacher brings something up you think 'Oh yeah' and you can add to it."
(SIOY School G 1997)

Students are making connections between classwork and what they have seen or remember at the RBGS. In this case the classwork is more than one year after the excursion to the RBGS. It is clear that the search for fern spores on the underside of fronds in the Fernery has left a very useful memory for this student. The following quote may help to explain why this experience in the Fernery was so memorable.

So: "The ferns really stick out with the spores and looking for them .. it was good.
Sp: 'Cause you had to find it yourself then you had to draw it."
(SIOY School G 1997)

Similarly to the students in Year 10, these senior students recall activities where they could find things out for themselves.

e. Social aspects of the day

Students were asked about the more personal aspects of the day. Whether they found that there was opportunities to find out more about their friends and about their teachers.

> K: "If you're with your friends do you find out more about them or do you find out more about your teachers on a day like that?
> Sa: Yeah. Do with your teachers I think.
> Sb: And you get to spend more time with your friends. You get to talk about things. I mean if you're curious about something that's totally unrelated – like a plant over there that's not supposed to be learned about you can sort of wander off and it's not 'Oh you can't do that'. They're (teachers) more tolerant."
> (SIOY School G 1997)

This quote also relates to the relaxed nature of the event. Teachers appear to be more relaxed and willing to allow students to explore their interests as well as complete the work at hand.

5G.2 Teachers' experiences of the excursion

Eight science teachers accompanied the Year 10 students to the RBGS. Three of these teachers including the organising teacher were interviewed about the excursion a week before the event. The data from these interviews provides an in-depth insight into the nature of the excursion experience and the nature of the learning that happens on an excursion to the RBGS. The remaining five teachers completed a written survey at the end of the excursion day. This exploration of the teachers' experience of excursions to the RBGS commences with the results of the survey.

5G.2.1 Teacher survey

The one-page written survey (see Appendix 2.7) was designed primarily to probe teachers' perceptions of the learning experience at the RBGS. The five teachers contributing to the survey have been long-standing members of the science faculty at

School G. They have had extensive experience with this Year 10 science excursion and each teacher has had experience at conducting at least one of the activity stops.

a. Enjoy about the day

The survey asked teachers 'What (if anything) do you enjoy about the day?' Their responses to this item are listed below. Two of the five responses immediately respond with 'everything'. These same two responses go on to describe a mixture of the formal and informal aspects of the day. The third response relates to the formal aspects of the day and the last two responses refer to the informal aspects of the day.

1. "Everything – worksheet works well. It is a quite leisurely approach to learning. Great when the weather's nice. Relaxing. Great presentation by education officers."
2. "Everything, the atmosphere, the excellent mini environments. Lunch."
4. "Relaxed learning mode."
3. "Relaxed, informal atmosphere in a different setting – an 'oasis' in the city."
5. "Sun. The 'experience' of the garden."

(TS School G 1997)

The responses of the three teachers who describe their enjoyment of formal aspects of the day include:

- the relaxed learning mode (2)
- the 'mini' environments at the RBGS
- the presentations given by the RBG education officers
- effective worksheet.

The informal aspects of the day enjoyed by four teachers include

- sunny weather (2 responses)
- relaxed, informal atmosphere
- being in a different setting
- lunch.

Comparing these responses to those from the student survey it is clear that both students and teachers enjoy the day. Both groups enjoy the specialised environments at the RBGS, with teachers being more responsive to the expertise of staff at the RBGS and to the effectiveness of the worksheet. Both groups respond to the relaxing and informal aspects of the excursion as well as the opportunity to work in a different setting.

b. Teachers' view of learning at the RBGS

Three survey items explored teachers' views of the nature of learning at the RBGS:

- 'What do you expect your students to learn at the RBGS?'
- 'How do you prepare their students for the excursion?'
- 'How do you use this excursion experience in your classwork?'

i. Expectations of student learning

Teachers expectations for student learning are listed below. All responses related to 'big picture' ideas about plants. Three responses stated cognitive aspects of plants: plant variety and diversity (3 responses), plant structure and function (1 response) and Aboriginal plant use (1 response). Two responses stated affective aspects about plants: appreciation for plants (1 response) and love of plants (1 response).

1. "Lots! Since we do diversity – the diverse nature of plants plus I love the Aboriginal Plant Use."
2. "Love of plants."
3. "Appreciation for plants."
4. "Variety / diversity."
5. "Variety of plants. Structure and function."

(TS School G 1997)

The unanimous consensus on the focus of this excursion is an obvious feature of these responses. These responses add further weight to a distinguishing feature of this

excursion and that is its clarity of focus. Every staff member states that the focus is on plants and four out of five students can state that they learn about plants at the RBGS.

ii. Using the excursion as part of a teaching program

Responses to the next two questions about the placement of the excursion within a teaching sequence would provide some indication of how the excursion related to normal classwork. Teachers' responses to both questions follow.

1. Prepare: "Basic intro to plant structure and differences between plants."
   Use: "Forms the major part of the work that we do on the topic of Plant Diversity."
2. Prepare: "Try to tell them about the plant phlya. Show them mosses/ferns so they know what to look at."
   Use: "Keep referring to it all the time. 'Remember when you were in the succulent garden and how it felt.'"
3. Prepare: "Through discussion / lectures and use of our own native garden."
   Use: "By pulling all the threads together on plant classification."
4. Prepare: "No content prior to excursion but instructions given and motivational talk."
   Use: "To cover content in program."
5. Prepare: "Not much."
   Use: "De-brief – pull it all together."

(TS School G 1997)

Two distinct approaches to student preparation for the excursion were illustrated in teachers' responses to this item. One approach adopted by three teachers was to provide introductory lectures and practical work to familiarise students with plant groups.

The second approach adopted by two teachers was to provide the students administrative information about the excursion. These teachers did not provide any content about plants to students before the excursion. Rationales for these two approaches are developed further in next section with discussion of the interviews held with teachers.

There are three groups of responses to the question 'How do you use this excursion experience in your classwork?"

1. Excursion forms the major part of a unit of work on plant diversity (2 responses)
2. Follow-up debriefing to 'pull all the threads together'
3. On-going reference to experience to highlight classwork.

It seems apparent from this group of responses that the excursion represents an almost 'self-contained' unit of work. It is quite plausible that approximately one school week's work would be required to complete the unit. Responses indicate a teaching sequence for the topic 'Plant diversity and Adaptation' that includes the excursion. Firstly students are introduced to the topic with discussion and observation of the sorts of plants that they might see at the RBGS. The excursion would link into classwork at this point. The excursion would then be followed up by lessons to draw out the major ideas on plant diversity and adaptation.

The response from Teacher 2 suggests that he/she incorporates the experiences students have on the excursion into on-going classwork. The Year 11 students in their interview also referred to this situation happening in class. It is interesting to consider that all the results from the students involved with this excursion indicate that the succulent garden is one of the memorable features of the visit to the RBGS. This teacher can expect his/her students to recall the physical conditions in the succulent garden and we could also expect the students to have a visual memory of the type of plants in this garden.

iii. Special features of learning at a botanic garden

Teachers were asked 'How do you see this differing from what your students would learn in your classroom?' The responses are listed below.

1. "They would be learning in a different way – thro' observation of natural specimens + the environment of the Gardens provides a good learning setting."
2. "Seeing, touching plants. Feeling tropical environment. Seeing good examples of plants."

3. "Hands on experience with plants showing the features I want them to study."
4. "Greater appreciation of diversity."
5. "A lot – more variety and the experience of experts talking to them."
(TS School G 1997)

For these teachers learning at the RBGS is different to that in the classroom. Students have practical experience with real plants in specialised environments. It is also apparent that the experiences that the students will have will result in greater understandings about plants.

These responses can be compared to the student survey responses to a similar question discussed in the previous section. 95% of the students commented that learning was different in a botanic garden. They considered that they were able to be involved in their learning by using their senses and having practical experiences. Students also felt that is was easy for them to see the focus of the learning activities and they learned from having access to the real plants that they were studying.

iv. The best way to learn at the RBGS

Teachers were asked 'How do students learn best in the RBGS?' The responses are listed below.

1. "Thro' hands on experiences and a quiet relaxing atmosphere. Being surrounded by plants is the best way to learn about plants."
2. "Being close to plants; touching if possible. Reading simple labels."
3. "Having hands-on experience with living not preserved plants."
4. "'Hands-on' learning."
5. "Hands-on."
(TS SchoolG 1997)

The first quote demonstrates an all-encompassing awareness of the effectiveness of learning at the RBGS. It appears that simply by being immersed in the environment at the RBGS students will learn best about plants. Furthermore all of the quotes suggest

that students should be able to physically interact with the plants. The first quote also alludes to the importance of the aesthetic nature of the environment at the RBGS.

The next section of this chapter investigates further detail of teachers' excursion experience by discussing responses to interviews held at school.

5G.2.2 Teacher interviews

The organising teacher (KL) and two of the seven accompanying classroom science teachers were interviewed a week before the excursion to the RBGS. KL was interviewed with a male colleague (JJ) and a second interview was conducted with the third female teacher HR. The interviews were held at the school in the science staff room in the teachers' 'free' time during the day. The interviews were tape-recorded.

KL had organised this excursion to the RBGS and HR had accompanied the students for approximately 16 years. This group of experienced science teachers was asked why they visit the RBGS and what they achieve at the RBGS that they could not achieve in their classrooms.

a. Reason for the excursion

Teachers' reasons for the excursion can be listed as follows:

- Access to the resources of the RBGS.
- Relevance to the school science curriculum
- Excursion is part of a teaching sequence
- The excursion to the RBGS 'works'
- Teachers' perception of student experiences

i. Access to the resources of the RBGS

KL's immediate response to the question about reasons for the excursion explained that the resources of the RBGS and her knowledge of the venue were her reasons.

KL: "There are healthy, good specimens, helpful staff .... I know the layout of the plants, but the specimens really do show the structures we are looking at."
(TI1 School G 1997)

This quote indicates three aspects of the use of the resources at the RBGS. Firstly the availability of a well-managed collection of plants that secondly, show the features that are required by the school program. The school has overlaid its educational requirements on the plant collection at the RBGS. This response infers that the plant collection at the RBGS is relevant to school curriculum requirements and this curriculum relevance provides the basic reason for the science excursion.

The third aspect of the resources at the RBGS demonstrated by KL's quote is the availability of an education service. KL comments further on in the interview that the education staff know the RBGS and are able to provide advice on the location of plants showing the features that are required e.g. the location of cycads with mature cones. This advice can be provided over the phone and allows easier organisation of activity stops for the day.

A fourth aspect of the living resources of the RBGS demonstrated by the following quote is that they are real.

JJ: " They (RBGS) have a lot of specimens. It's good to see real trees. And there's enough species that you can find specimens that have different characteristics."
(TI1 School G 1997)

This quote from JJ highlights a fifth aspect of the resources at the RBGS and that is their accessibility to a large group of students. JJ indicates that there are plenty of specimens that illustrate the particular educational feature required by the science focus of the excursion.

Hence we can summarise the features of the resources of the RBGS demonstrated in these quotes as follows:

- the living collection of plants at the RBGS is well managed with mature, healthy specimens of trees and other plants.
- the plants demonstrate physical features required by school curriculum documents.
- the plants at the RBGS are real.
- the plants at the RBGS are accessible to students and they can interact with specific plants
- the RBGS has an education service with an understanding of the resources required by schools.

Teachers also value the aesthetic nature of the venue as demonstrated by the following quote.

> HR: "It is the only actual Science excursion that we have for Year10. And I think one of the reasons is it's easily accessible, it's a beautiful place to be. There's a lot to look at and it's something we can cope with – in terms of teaching ourselves – with a little bit of help from the Education Officers .... It should be good fun."
> (TI2 School G 1997)

HR also touches on the physical access to the RBGS by public transport. The school travels to the RBGS by train as there is a rail link between the two sites. This relieves the school of the expensive exercise of having to hire buses to transport a large number of students to the RBGS.

A further aspect to this quote that will be taken up in further discussion is the perception that the excursion is manageable. Teachers from School G run all but two of the seven activity spots on the day and feel confident in their competence to move the site of their teaching from their classroom to the RBGS. The teaching strategies adopted by these classroom teachers when they teach at the RBGS are discussed in a later part of this section.

ii. Relevant to the school science curriculum

HR's immediate response to the issue of the reason for the excursion was that the excursion forms part of the science program for Year 10.

> HR: "It fits into the teaching program which is Diversity and Adaptation for Year 10."
> (TI2 School G 1997)

HR's reason is the fundamental response of many school teachers using the RBGS – the excursion is relevant to the school science curriculum. KL and HR explain that the excursion is used to cover the bulk of the unit of work 'Diversity and adaptation' in the one day. The excursion is compulsory for all students and the content of the day is examinable and the worksheet from the excursion can be marked as part of Year 10 assessment.

> HR: "They (students) all go. They have a worksheet. It's part of their course and we have a content test at the beginning of Term 4 including the worksheet on the Garden as part of the test. It gives them something to focus on."
> (TI2 School G 1997)

This quote also demonstrates a strong expectation that students will be engaged in activities that will form part of their conceptual understandings in science. These understanding are clear to students as they form the questions on their worksheets.

A further aspect of the curriculum focus of the excursion is the inclusion of an indigenous component to work in science. The excursion is seen by the school science faculty as an opportunity to incorporate an indigenous perspective into science by exposing students to Aboriginal use of plants at the RBGS.

> K: "So what's the topic that you cover?
> KL: It's called plant diversity.
> K: But you tie other things in as well.

KL: Oh yes – we have uses of plants. Like Aboriginal uses. Mainly because we had a staff development day where our Aboriginal policy was discussed and I've tried to implement this in our program. I know it doesn't fit quite neatly – but it's still plants. It's uses of plants so you can look at structures."
(TU1 School G 1997)

This quote is a further demonstration of the ability of school teachers to overlay their curriculum requirements on the plant displays at the RBGS. The quote also demonstrates the use of the RBGS for multidisciplinary studies. The resources of the RBGS have broad application to a number of curriculum areas.

iii. Using the excursion as part of a teaching sequence

Each of the three teachers participating in these interviews had their own way of approaching the sequencing of the excursion in their teaching programme for the unit of work. KL has a lower ability group of students who can see little relevance in science and hence often demonstrate a lack of interest in classwork.

KL: "My students go in blind.... Because I don't like teaching them about plants until they're motivated."
(TI1 School G 1997)

KL uses the excursion at the beginning of her program for the unit where the excursion experience provides the motivation for her students to demonstrate an interest in learning about plants.

KL: "Before they go they say plants are boring – that's what one of my kids said during a lesson."
K: What sort of behaviours in them (students) make you think it's successful?
KL: I don't usually ask them they just tell me. They say little things about it – they say 'That was a really fantastic excursion'.
..

KL: You can cover this whole topic mostly on that one day – with a little follow-up afterwards."
(TI1 School G 1997)

KL will use the positive experience that her students gain from the excursion to fire their enthusiasm to learn a little more about plants on their return to class. She is counting on students' enjoyment of the event and the clarity of the educational intention to involve students in this unit of work. Science learning by stealth! This approach is contrasted with that of HR who has a more academically inclined group of students and approaches the unit of work by introducing students to plant diversity before the excursion.

HR: "I like to give them some preparation and take it from there and then develop the adaptations part. We'll do diversity the week before – so they'll know what a gymnosperm is, they'll know what a bryophyte is. And they'll look at examples in a different situation. Then I might do some plant structure and function as extension."
(TI2 School G 1997)

HR is able to introduce her students to science-based botanical terms such as gymnosperms, bryophytes etc. Many of her students would obviously relish this content-laden academic approach. JJ has a mixed group of students and also likes to prepare his students for the excursion. His quote also provides an insight into the potential for learning provided by the excursion to the RBGS.

JJ: "See we've all gone through plant classification before they go there and so the good students will have picked up in theory that there's this way of organising plants. So when they go in there (RBGS) and say 'This is how all these plants fit into theory.' For the good students that's really great. The other students pick up something of the significance of it."
(TI1 School G 1997)

Irrespective of the placement of the excursion within each individual's teaching sequence for the unit of work, the excursion provides a day of sustained focus on plant

diversity and adaptation. This excursion serves as a novel teaching strategy well suited for this particular topic as HR explains in the following quote.

> HR: "I think just the idea of an outing makes it special. Getting away from other noises, other distractions. That's what we all like too!
> K: Yes a break in the routine.
> HR: Focussing on something for a whole day rather than just say 40 minutes is good too."
> (TI2 School G 1997)

iv. The excursion to the RBGS 'works'

It is clear that a school excursion that is run every year – rain, hail or shine – would be perceived by many to be a successful and worthwhile experience. The event forms part of the school science tradition. Data from the teacher survey expressed the notion that teachers from School G perceive that the excursion to the RBGS is a worthwhile experience. KL as the organising teacher feels that the event is easy to organise and the large number of students is well catered for at the RBGS.

> KL: " You can ring up and ask 'Is there a cycad with cones and if so where is it?' So it is easy for me to plan my excursion. It takes me far less time 'cos I can go through you and because I'm familiar with the grounds. To go somewhere else where I'm not familiar and I don't get the help .... (shrugs)
> K: And it's been going for such a long time.
> KL: And it works.
> K: What sorts of things tell you that it works?
> KL: Well it goes smoothly. There aren't any delays with the kids – we've got too many! The kids stay in their class groups and they do actually take interest. I take photos at the time and you can see their faces light up when they see plants they haven't seen before. So it does seem to work."
> (TI1 School G 1997)

It could be perceived that such a long standing event may be moribund and exist in the science program as a white elephant too difficult to replace with another type of

excursion experience. This does not appear to be the case for School G as the range of activities have changed to accommodate a new curriculum focus – Aboriginal Studies. Furthermore reactions of both students and teachers demonstrate a positive attitude towards the event. It is a highlight of the science program for Year 10.

v. Teachers' perception of students' experiences while on excursion

Data from the teacher surveys and from teachers' interviews demonstrates there is a strong expectation that students will be engaged in activities that focus on cognitive understandings for a Year 10 science topic. This experience surpasses that which students would have in their classroom and is a superior way of encountering plants and the full picture of the plant world. Students will be immersed in the environment of plants. They will use their senses to explore and interact with this world. HR and KL discuss some of the experiences that they expect their students to have during the excursion.

> HR: "Instead of showing them a video tape or bringing in a few specimens into the classroom. They get to see the full picture. I suppose they see the scope of plant life. The smells, the sounds, the whole appeals to more senses than just looking at something through a microscope. It is something nice. Scrunching up a leaf and smelling it – the smell of pine needles. The chance to interact with plants that you wouldn't other wise see in a classroom situation."
> (TI2 School G 1997)

> KL: "The girls get to see plants that they're not familiar with. They get to see healthy plants. They get to think about what the structures could be used for by the plant."
> (TI1 School G 1997)

Students will have the opportunity to increase their experiences with plants beyond their normal opportunities. HR discusses the sensory aspects of the experience and the opportunity to physically interact with a whole environment. This experience is real and beyond what can be offered to students in a normal classroom. This experience is

superior to what students would otherwise experience through books or videos or even live material bought into the classroom.

KL's quote includes the notion that students will move from making observations to hypothesising about the function of the parts of plants that they are observing. Teachers involved in these interviews expect that students may not remember specific facts about the excursion however they will broaden their understandings.

> JJ: "I wouldn't expect them (students) to remember specific details. I see it more as a big picture, positive attitude sort of thing. I'm sure some of them do recall the details and that's a good thing.
>
> ..
>
> K: If you think that the girls get something out of it what would you say it was?
> KL: An appreciation of plants. A lot of them do remember those adaptations and some of the reproductive features. So yes, certainly some content about plants. But mainly I think it is worthwhile that they do appreciate plants and see how beautiful they are."
> (TI1 School G 1997)

It is clear from the discussion of the student survey that students do recall the overall idea that they at the RBGS to learn about plants. Furthermore many of the discrete facts recalled by students are incorrect. Hence these teachers have an accurate perception of the experiences their students will have. These teachers also have realistic expectations of the science understandings their students will be able to achieve at the RBGS. The next section will continue the discussion of learning outcomes expected by these teachers and the nature of learning experiences that students have at the RBGS.

The three teachers involved in these interviews also expect that their students will enjoy the experience.

> JJ: "I think creating a good, enjoyable day for the students – if you have students that are cooperative, they are more than likely to take to take things in what you want to teach them."
> (TI1 School G 1995)

JJ indicates that the excursion is an enjoyable break in classroom routine and this experience creates a more receptive attitude towards learning for his students. It also appears that these teachers promote the idea to their students that the excursion experience will be enjoyable. Enjoyment is associated with the informal aspects of the day and these aspects form an important component of the excursion experience for School G.

KL: " They actually have a nice little picnic down by the Gardens and to sit in a really nice little reserve in the middle of the city and just to appreciate it. The girls actually come back and say that they really did enjoy that excursion.... They enjoy the picnic. They enjoy sitting in the sun."
(TI1 School G 1997)

K: "The girls were telling me what they would take for a picnic.
HR: Well I suggested that the other day. We make a day of it – the staff – because it's really a nice place to be .... It's certainly one of the high points to sit there and they're all around us and we're supervising....
K: I think it's a priority too – that social aspect.
HR: Yes I think just the surroundings – the environment makes that – there's something to see and something to do. Some of the girls have not really travelled to the city at all. Not very often."
(TI2 School G 1997)

These two quotes demonstrate that both teachers promote the idea that students are prepared for a 'high point' of the day – lunch! It is clear that the teachers are looking forward to sitting in the sun enjoying lunch and a less intense time to soak in the surroundings and keep a friendly eye on the students.

The quote from HR also illustrates the notion that the excursion is also used to widen students' horizons. Year 10 students travel to the RBGS by train with minimal

surpervision by adults. Perhaps for some of these students this trip is a first step towards asserting their independence as they realise that they can make their own way to the city.

Towards the end of her interview HR points out that the excursion does not suit every student. A situation that is confirmed by the handful of student surveys that demonstrate an 'off task' attitude to the day.

> HR: "I must say that there are some girls that don't enjoy it. A few girls with walkmans plugged in their ears and all they want to do is sit and talk. It does depend on their enthusiasm and interest. It's sometimes hard to get them to bother to look. But for the most part I'd say the majority of them really get into it."
> (TI2 School G 1997)

b. Teachers' view of learning at the RBGS

It is clear from the previous discussion about the excursion experience that teachers hold strong expectations about the excursion being a learning experience for their students. This section considers teachers' view of learning under the following headings:

- A global view of learning
- The nature of the learning process at the RBGS
- Conceptual understandings
- Learning and experience
- A botanic garden as a learning environment

i. A global view of learning

The following quote from JJ demonstrates a global view of the learning experiences provided by this excursion.

> K: "So how can you tell if students have learned anything?
> JJ: I've not really tested that. I don't know if they have learned anything or not but I don't think it matters because it's just one part of their science education and I think it's a good

part. It's real science that they do and I think it gives them (students) some appreciation of what science is. Science is getting in there with a mass of plants with different shaped leaves and all different sorts of plants and starting then to organise them into logical groups and say 'OK these ones are similar to those ones because they have these characteristics' and just trying to pick up on that idea of a way of looking at nature and organising it based on characteristics.

I think they get that well at the Gardens by seeing the variety and the organisation. They don't necessarily need to get all the details – rather than just get that idea."

(TI1 School G 1997)

It is apparent that JJ is expecting a range of science-based cognitive outcomes from the excursion. He is not concerned with specific factual detail he is concerned with the following:

- operating within a science-based conceptual framework
- directed student-centred activities:
  - observation and interaction with a wide range of plant types
  - grouping these plants based on observable characteristics
- through these practical experiences students build their understanding of the nature of science and of science-based methods for grouping plants.

HR provides further insight into the learning activities that occur at her particular activity stop – the Fernery.

HR: "(In the Fernery) they're asked to actually look at the spore patterns on two different varieties of ferns and draw them. That leads them to look and they can observe that there is a wide variety.... It's really about using powers of observation. Encourage them to look around. In doing that they see 'Oh there's several different kinds here – which one will I draw?' So they get an awareness."

(TI2 School G 1997)

HR also demonstrates that the learning for these students is more than that of conceptual understanding. Learning at her activity stop concerns student engagement with the plants

in the Fernery. Students make their own observations within a specific framework. The variety of plants in this location is critical to students achieving a sense of the 'big picture' of plant diversity.

It is clear from these two quotes that the learning experience at the RBGS is not only concerned with what students are learning it is concerned with how and where students learn.

ii. The nature of the learning process at the RBGS

HR describes the teaching strategy that she uses at her activity stop at the RBGS. She is encouraging students to make their own observations within a framework that focusses student attention on specific details of plants that are relevant to the educational requirements of the excursion. Similarly to JJ's quote it appears that there is a sequence of experiences that lead to broad conceptual understandings.

Firstly students are involved in sensory experiences: looking at and then for particular aspects of the plants in a garden display. These concrete experiences can then be used to form the generalisation that there is a great variety in plants. This realisation can then lead students to achieve an awareness of the 'big picture' of plant diversity. Hence students move from concrete experiences to making generalisations to forming concepts about plant diversity.

It is clear from these two quotes that learning is drawn out of students' concrete experiences. These learning experiences are personal as they involve the individual student using their senses to develop an awareness of the types of plants and physical features of the habitat that surrounds them. Students are also able to interact with specific living plants by making observations and noting details. Student attention can then be drawn to comparing plants, noting similarities and differences between plants. Decisions can then be made about grouping similar plants and creating a system for these groups.

This learning process operates within a science-based conceptual framework. The unit of work on plant diversity provides this conceptual framework for School G. The RBGS has been selected by the school because it is a scientific institution which displays the range of plant groups. Specific sites at the RBGS are selected for their use in displaying particular plant groups or plant adaptations. Activities are then created that involve student observation and interaction with these plants. Hence student learning is orchestrated and focussed by a science educator whose activities are informed by science curriculum documents.

It is apparent from the organisation of the worksheet that students have little opportunity to create their own groups for the plants that they see at the RBGS. It is clear that students are presented with the scientific view of plant classification. However the excursion provides students with the opportunity to be exposed to the 'scope' of plant life and to see for themselves the physical characteristics of plants that place them in a particular plant group.

As illustrated in Figure 5.1 below, JJ's quote can be used to create a learning sequence where students move from sensory experiences to conceptual understanding. The diagram illustrates that this learning sequence occurs within a conceptual framework that focuses and directs student experiences and learning outcomes.

Firstly students use their senses to become aware of the plants that surround them in a specific location at the RBGS. Students are then able to make directed observations of the plants and their habitat. As discussed previously, it is critical that both these steps occur at the RBGS. There is evidence from the worksheet that students use this personal experience to compare and contrast the plants they observe at the RBGS. For example at Activity Stops 4 and 6 students are asked to list differences between cycads and conifers.

This process of comparison can lead to organising plants into groups based on their physical similarities. The last page of the worksheet contains a table for students to match physical features with a particular plant group. This appears to be the only formal

activity where students might be able to see the relationships between the main groups of plants. This activity presents students with the 'science idea' about how plants are grouped. Hence there is little opportunity for students to explore their own way of organising plants into groups based on their own observations. There is obviously a 'right' response that links pre-selected physical characteristics to a particular plant group.

SCIENCE-BASED CONCEPTUAL FRAMEWORK

sensory awareness of habitat → making observations →

making comparisons → grouping plants →

reflection on process → understanding process as a key process in science.

Figure 5.1 **Learning sequence for student understanding of classification**

It seems clear that students need to reflect on these experiences so that they can make connections between their experiences and the 'big picture' ideas of science. JJ states that, as a result of this process, students will be able to gain an appreciation of the 'big idea' of the nature of science – science is a way of looking at and organising the world.

In a similar way we could use HR's example to draw up a learning sequence for students to achieve an understanding of the variety in plants. This sequence is illustrated in Figure 5.2. This figure presents a less complex sequence however it retains the elements of sensory-based experience and directed observation. It is also clear that students may need an opportunity to reflect on their experience of searching for and selecting spore patterns to make connections between this experience and the realisation that there are a wide variety of ferns and furthermore there is a wide variety of plants.

SCIENCE-BASED CONCEPTUAL FRAMEWORK

sensory awareness of habitat → making observations →

selection of material → making observations

reflection on activity → understanding of plant diversity.

Figure 5.2 **Learning sequence for student understanding of plant diversity**

It is becoming apparent that a learning sequence can be developed that uses a taxonomy of activities and suggests a process for achieving understanding using students' experiences.

iii. Conceptual understandings

The discussion from the previous two sections demonstrates that conceptual understandings in science form the framework within which student experiences at the RBGS can be focussed and directed. The event is closely tied to the science program and it is anticipated that it will form the major part of a unit of work on plant diversity. It is clear that the teachers involved in this interview expect students to achieve 'big picture' understandings and a range of cognitive outcomes that are relevant to their unit of work in science.

The following statements could be made to outline the range of 'big picture' understandings for this school excursion.

Students will use their senses to interact with the living plant displays at the RBGS to:

- appreciate that science is a way of looking at the world
- encounter the full range of plant groups
- appreciate the variety and beauty of plant life

- show awareness that some plants have special features that help them to survive in particular habitats
- understand that Aboriginal people use plants to satisfy their needs.

Referring to both the teacher interview data and to the worksheet a list of content areas can be drawn up. HR reports that the worksheet is a concrete record indicating what students have learned in the day. HR marks this worksheet as a 'field study report'. The completed worksheet forms the major record for this unit of work for the students.

Students will recall

- features of plants that help them survive in a rainforest and an arid area.
- plant structures especially reproductive structures such as cones
- names of specific groups of plants
- some uses of plants by Aboriginal people.

It is apparent there could be a discrepancy between the notions that students are not expected to recall specific details and the reality that students can be tested on the content of their worksheet. HR describes possible items that she would consider for the forthcoming test.

> K: "What sort of questions would you ask them?
> HR: Classification-type questions e.g. give them a description of a plant and ask them to identify it as a moss or fern. We might have a key. We haven't actually prepared the test – we decided to do it this year. Adaptations – e.g. adaptations to particular problems."
> (TI2 School G 1997)

Clearly, the teaching staff at School G would need to clarify the conceptual understandings required by their students if these understandings are to be tested. Furthermore the questions items included in the test need to reflect the type of understandings that can be achieved at the RBGS.

iv. Learning and experience

The previous section of this case study revealed that how students learn is a critical factor in learning at the RBGS. It is clear from these discussions with teachers that cognitive understandings are derived from student experiences. These experiences directly involve students and focus on sensory interaction with real materials. This section examines teaching strategies used by these teachers and the factors that promote learning.

Teaching strategies that promote learning at a botanic garden

HR explains her teaching strategy in the Fernery.

> HR: " There's a lot of student-centred activity at the Gardens. I do a little preamble usually and then I go around and help them and they have their own answers to seek out.... They're free to move about a little bit and talk about things.... It's not as restricted as the classroom." (TI2 School G 1997)

Clearly HR sees her role as focussing and guiding the activity. She orients the students to the area and outlines the required task. She then encourages students to explore the area for themselves while she assists students to focus their observations and complete the task at hand. She promotes student interaction with their peers and freedom of movement through the area.

Clarity of focus and intention is apparent in this learning situation. HR orients students to her stop and directs their attention to the focus of their activity. Furthermore there appears to be close physical access between the students and the focus of their attention. This situation is reinforced by students' survey comments that they could actually see the focus of the learning activity.

HR demonstrates the attitude that learning will happen at this activity stop and this attitude is reinforced by the requirements of the worksheet. However HR indicates that

the atmosphere is more relaxed and both she and the students are free to move around the space.

Disposition towards learning

It is apparent that students demonstrate a disposition towards learning that is encouraged by HR. The factors that promote a positive disposition for learning can be derived from the data from both students and teachers involved in this case study and are listed as follows.

- the event is enjoyable
- students and teachers are relaxed
- the excursion represents a break in the normal school routine
- the RBGS is an aesthetic environment
- informal aspects of the day such as lunch are valued and promoted by teachers
- the formal work is not perceived as being too difficult
- a short burst of formal activity is followed by a walk to the next stop
- there is a variety of activities
- students have the opportunity to interact with their peers during the formal part of the day
- students have the opportunity to walk around during the formal part of the day
- students can select their own components of the activity

It is obvious that students engage with the learning experience. However it seems clear from HR's comments elsewhere in this discussion and from the discussion of the results of the student survey that a handful of students do not engage with the event.

Furthermore is could be stated that student engagement with the sensory, interactive components of the learning experience is a critical factor for learning at the RBGS. It may well be the case that students could complete the required worksheet without this physical engagement with the environment. Indeed this precise situation can often be detected during fieldwork situations in general. Perhaps it is adequate that students have

simply visited the excursion venue however, it appears that, in the light of this discussion so far, the full learning potential of the excursion would not be realised.

v. A botanic garden as a learning environment

The data has revealed that the third critical component of the learning experience is the site for the learning. Teachers involved in these interviews state that they do not have access to the type and quality of the resources that can be found at the RBGS.

> HR: "They (students) can see a wider variety that what we can show them in the classroom. They can see specimens full size. We can only bring in cones to show them. We don't have any female cycads to show them here. We don't have a variety of succulents. The Succulent Garden is great. And again the ferns and the mosses. There might be a few around here but not like in the Gardens. The tropical garden is another specialised area. So there's much more scope basically. There's much more variety."
> (TI2 School G 1997)

Students have immediate physical access to the real object of their learning. They are immersed in authentic experience in the world of plants. This experience cannot be duplicated by a video or specimens laid out in a classroom or school yard.

5G.3 Discussion

This case study illumates the role of the excursion and its place within science classwork for Year 10 students. The excursion forms the major part of a complete unit of work on Plant Diversity and Adaptation. For the teachers and students this role is clear and the experience is anticipated as a highly enjoyable, productive event in the year. Teachers demonstrate a range of pedagogical approaches to the placement of the excursion in their teaching sequence for the unit of work. They hold specific cognitive outcomes for the event and these will be tested. The cognitive load achieved by the students on this excursion can be viewed as evidence of an increasing capacity to be able to focus on learning in an environment beyond the classroom – a capacity that has been fostered from the early years of schooling. Students from School G hold long-term memories of

the event and teachers call on these recollections for classwork some years after the event.

Teachers and students consider that they will be learning in a different way at the botanic garden. Students are immersed in a learning environment where they can see and touch the plants that are the focus of their investigations. Physical interaction with plants and environments forms the basis of a set of activities requiring students to observe, record, compare and contrast. These activities demonstrate a range of learning sequences that move students from identifying and locating plants from their class work, to observing and recording details. Further activities require students to summarise and compare their observations. Teachers' hold an expectation that the worksheet will serve as a record of students' observations and considerations and its contents form the basis of a class test held after the excursion.

The methodological approach of this case study has allowed exploration of students' recollections of the excursion immediately after the event and approximately one year after the excursion. The data demonstrates that two tiers of learning are evident as components of this excursion. Firstly there is a short-term element of learning. This aspect of learning relates to the cognitive requirements of teachers evident in the selection of activities, in the worksheet as a record of students' involvement with these activities and in the requirement to test the students' cognitive gain from the excursion. A second type of learning is evident in the students' long-term recollections of the event. Associated with memories of the excursion are students' understandings about plants. According to the students involved in this study, visual images of cycads, cactus plants, tropical plants etc are triggered by their recollections of being at the RBGS, locations they visited, by the activities they were involved in on the day and by the friends that accompanied them throughout the day. Students have broadened their understandings of plants, plant diversity and plant adaptations.

Chapter Six TEACHER SURVEYS RESULTS AND DISCUSSION

6.1 Introduction

This chapter presents the data obtained from teachers in two separate surveys conducted throughout 1996. The first survey was conducted throughout Term Three of 1996 and teachers visiting the RBGS for lessons as part of an excursion were asked to complete and return a one-page survey (Appendix 2.8) while they were at the RBGS. The second survey was posted to teachers who had visited the RBGS during Term Two of 1996 for lessons as part of their excursion. These teachers were asked to complete the one-page survey (Appendix 2.9) and return it by using a reply-paid envelope.

The purpose of the surveys was to:

1. investigate teachers' reasons for conducting an excursion to the RBGS
2. investigate learning outcomes teachers have for their excursion to the RBGS
3. investigate teachers' perceptions of the use of the RBGS as a resource for learning
4. triangulate data with that from the case studies
5. seek evidence of differences between infants, primary and secondary teachers in their expectations and experiences of their excursion to the RBGS.

Table 6.1 presents the survey items that are discussed in this chapter. An unexpected outcome of this part of the research was to enable comparisons to be made between different research tools and techniques. In the case of these written surveys consideration of the results of both methods of administering a written survey revealed strengths and weaknesses of both approaches. Surveys given to teachers to complete at the RBGS provide immediate feedback and insight into the on-the-spot reactions of the visiting teacher to their excursion experience. However, in spite of a personal request to complete the form, teachers visiting the RBGS on excursion may not have the time or

Survey Item	Data Blocks
Why did you choose to bring your students to the Royal Botanic Gardens Sydney?	Teacher Use Survey 1996 (TUS96) n = 14 Teacher Use Survey Term 11, 1996 (TUSII96) n = 28 (two nil responses)
List the objectives/outcomes you have for this excursion.	Teacher Use Survey 1996 (TUS96) n = 14 Teacher Use Survey Term 11, 1996 (TUSII96) n = 30
What can/did you achieve at the RBGS that you may not have achieved in your classroom?	Item not included in TUS96. Teacher Use Survey Term 11, 1996 (TUSII96) n = 30

Table 6.1 **Data blocks for teacher survey items**

the opportunity to complete a survey during their visit. On return to school these teachers rarely return their completed survey to the RBGS Community Education Service. The posted survey achieved a return rate of 56%. Teachers completing this survey have had time to reflect on the excursion and its consequences. However this method of conducting surveys requires some administrative resources. Time is required to post surveys and wait for responses. Further time was taken to phone each school to confirm receipt of the survey and to request a reply.

The next three sections of this chapter present and discuss teachers' written responses to the three survey items listed in Table 6.1. A summary of the findings of the teachers' surveys is presented in the last section of this chapter.

6.2 Teachers' reasons for their excursion to the RBGS

The decision to visit the RBGS for an excursion is made by classroom teachers. These teachers must perceive that the excursion to the Gardens will be of value to their students and is worth the effort that it takes to organise such an event. This section of the thesis investigates the range of reasons classroom teachers have for their visit the RBGS.

To determine the main categories of responses to this survey item the responses were read and re-read to determine the main areas of similarity. Then like-responses were

grouped under tentative headings. This procedure of grouping like responses together enabled a response category to be created for a particular response type. Table 6.2 presents the main response categories that have resulted from this procedure and the frequency of responses from each survey group. Within each main category a number of further sub-categories are identified and these have been described in the sections that follow.

Response category*	Teacher Use Survey 1996 Infants:Primary:Secondary 7:6:1 n = 14	Teacher Use Survey Term II 1996 Infants:Primary:Secondary 6:11:11 n = 28	TOTAL Infants:Primary:Secondary 13:17:12 n = 42
Excursion relevant to classwork	5:2:1 57% (8)	5:8:8 75% (21)	**10:10:9** **69%** **(29)**
RBGS as the excursion venue	3:6:0 64% (9)	4:5:6 54% (15)	**7:12:6** **57%** **(24)**
Teachers' pedagogy for the excursion	1:4:1 43% (6)	1:4:6 39% (11)	**2:8:7** **40%** **(17)**
Student experiences	2:2:0 29% (4)	0:5:3 29% (8)	**2:7:3** **29%** **(12)**

*Denotes multiple responses.

Table 6.2 **Teacher responses to survey item 'Why did you choose to bring your students to the RBGS?'**

This table also includes the ratio of infants: primary: secondary teachers in the survey to track differences across the years of schooling. It is clear from the table that teachers have made more than one response to the survey item.

Teachers' responses to the written surveys cluster around four overlapping categories:

- Excursion is relevant to classwork
- RBGS as the excursion venue
- Teachers' pedagogy for the excursion
- Experiences students have at the RBGS

A typical response of teachers to this survey item includes concerns that the excursion is relevant to the unit of work that they are studying with their students, the RBGS is accessible and close to other excursion venues and that they have been before and found the excursion worthwhile.

6.2.1 Excursion is relevant to classwork

This theme involves responses that link the excursion directly to topics of classwork being studied at school. Table 6.2 demonstrates that more than two thirds (69%) of the teachers involved in the written surveys state that the excursion is directly linked to their classwork. Furthermore relevance to classwork is a high priority for the infants, primary and secondary teachers involved in these surveys.

Closer investigation of this category of responses reveals that this theme is the single-most important to these two groups of classroom teachers. One third of teachers (33%) placed this response as their first reason for the visit and 13% of the teachers involved in the written surveys put this response as their only reason for the excursion. The data indicates that teachers' most direct response to the question of why choose to visit the RBGS relates to the relevance of the excursion to a specific unit of work that they are doing with their students at school.

Table 6.3 lists the responses placed in this category and indicates infants, primary and secondary responses. This response category can be used to identify the syllabus areas that are relevant to school excursions to a botanic garden. The responses from infants and primary teachers in this category also indicate the close relationship between the topics teachers choose to teach and the topics suggested in syllabus documents. The units of work that were relevant to the teachers involved in this study relate to and can be taken from specific school syllabus documents. For secondary schools the RBGS is used primarily as a resource for science teaching with the main topics including: plant

Teacher Use Survey 1996 (TUS96)

2. It was a place within easy travel distance to *fulfil the requirements to fit in with a unit of work being studies on Aborigines*. (Yr1)
3. *Link with our Aboriginal Unit of work.* (Yr2)
5. *Yr1 doing a unit on 'How Plants grow'* Spring is a wonderful time to see the Gardens. Because of the Education Centre. (Yr1)
6. *We are studying/learning about plants / living things / growing. (parts of plants, needs of plants / living things etc)* (Yr1)
7. *We are doing a unit of work on PLANTS.* (Yr1)
9. Have been before and found it a worthwhile and enjoyable experience, *also the lesson provided fitted in very well with unit of work being taught at school.* [*Aboriginal Studies*] (Prim)
13. *Covers things like plants, made aware of things Aboriginals* (sic) *eat and use.* Allow children to see a large expanse of grass. (Yr3)
14. Field trips are an integral part of Science teaching. *This is an extension of classroom activities.* (Yr8)

Teacher Use Term II 1996 (TUSII96)

1. *Kinder were doing a unit of work 'Where does our food come from?' HSIE and 'What's for lunch?' S&T. we used 'Living off the Land' as a component/perspective for AbEd.* (Inf)
2. *We were studying the S&T unit 'Growing Things'* (Inf)
3. *My class was doing a unit on Trees/Plants.* We had just completed a unit on the Solar System, So we combined visits to Observatory and Botanical Gardens. (Inf)
4. *As an introduction to a unit of work on Natural Environments.* (Inf)
5. Close to the Australian Museum. *Link with Aboriginal Studies.* (Inf)
7. *We had been doing work on area and time in Maths* (Yr 5)
8. *To give the children a chance of hands on activities to complement concepts of time and length measurement in relation to shadows.* (Yr5)
10. Ease of access for *study of 'Rainforest'* (Yr3/6)
11. *My class was studying 'Adaptations and Change' as part of their S&T unit therefore this excursion enabled them to discuss various forms of plant life and its ability to survive in a variety of areas. We also had finished a topic on 'food'* (Yr5)
12. *My class was studying Aboriginal culture and I wanted them to find out what local vegetation would have been utilised by Sydney based tribes.* (Yr5)
13. *The Grade was studying the Environment.* We also combined the Gardens to a trip to the Mint and Parliament House. (Yr5)
14. *We were studying rainforests it would consolidate their learning – Make the pictures they had seen seem real.* (Yr5)
17. Close to school and it offered *a lesson and experience for the class that supported the unit on Native Flora.* (Yr3)
19. *We were studying 'Classification' with Yr 10* and were visiting the Museum for 'Evolution' therefore close enough to *see plant groups.* (Yr10)
20. *To study evolution and classification of plants.* (Yr10)
22. *The students study plants in detail in Yr 8 and classification in Yr7 so it is important to reinforce the knowledge with observation.* (Yr8)
23. *It compliments Yr8 course work* and we have been pleased with the Gardens in the past. (Yr8)
24. To provide an interesting learning experience and to enjoy one of Sydney's most scenic spots and at the same time *it related to a topic just completed at school.* (Yr8)
26. *To augment their experience in this area of study, Plant variety and adaptation.* (Yr8)
27. *Yr 8 plants topic* combined with fossil at the Australian Museum. (Yr8)
29. For Yr10/9 extension history we were studying Aboriginal survival techniques. (Yr9)

Table 6.3 **Teachers' survey responses placed in category: Excursion is relevant to classwork**

diversity; plant adaptations; plant structure and function; plant evolution; plant classification. The other secondary syllabus area involved in this written survey was history.

Table 6.4 demonstrates the syllabus areas and topics discussed by infants and primary teachers in the written surveys. The topics marked (*) are taken directly from syllabus documents. The table also indicates a multidisciplinary approach to learning where primary teachers appear to be using the excursion to combine Science & Technology (S&T) and Human Society and its Environment (HSIE).

Science and Technology (S&T) K-6	**Human Society and Its Environment (HSIE) K-6**
Infants (K-2)	
Plants	
Living things	
Growing things; How plants grow	
The Seasons	
Natural environments	Natural environments
What's for lunch*	Where does our food come from?*
What's for lunch*	Aboriginal use of plants
Australian native plants	The first Australians*
Minibeasts	
Primary (Yr3-Yr6)	
Rainforest habitat Rainforest plants Plant adaptations	Rainforests*
Plant adaptations	Arid environments
Adaptation and change	
Australian native plants	
Australian native plants	The first Australians*
Plants used for food	British colonisation*
Sydney's native plants	Aboriginal People of Sydney

* denotes topic directly from syllabus support document

Table 6.4 **Units of work from infants and primary classes**

The following response demonstrates that the teacher has combined three syllabus areas for the lesson offered by the RBGS on using Australian native plants (Living off the Land).

> "Kinder were doing a unit of work 'Where does our food come from?' HSIE and 'What's for lunch?' S&T. We used 'Living off the Land' as a component/perspective for AbEd."
> (1. Kindergarten TUSII96)

This response reflects a thematic approach to infants and primary teaching where teachers weave outcomes from a number of syllabus documents into a particular unit of classwork. The unit of classwork for this Kindergarten group is 'Food' and the teacher has incorporated perspectives from S&T, HSIE and Aboriginal Studies.

It appears that infants and primary teachers link a range of key learning areas while on their excursion. Further exploration of these written surveys revealed that 77% (23/30) of the infants and primary teachers involved in the survey could demonstrate that they were relating the excursion to two or more syllabus areas. Table 6.5 indicates the relationships between the K-6 syllabus areas and the frequency of these multidisciplinary approaches.

Science & Technology	HSIE	English	Mathematics	Visual Arts	TOTAL
*	*				16
	*	*			2
			*	*	2
*				*	1
*		*			1
*	*	*			1

Table 6.5 **Multidisciplinary approaches in infants and primary excursions**

Teachers involved in the written surveys were not asked to record the multidisciplinary nature of their excursion. However Tables 6.4 and 6.5 indicate the extensive nature of the multidisciplinary approach taken by infants and primary teachers.

Hence this section of the data has indicated that the majority of teachers involved in this survey can relate their excursion to a specific unit of work that they are doing with their students at the time of the excursion. For infants and primary teachers the excursion can also be multidisciplinary in nature. Further exploration of the data will reveal the relationship between the excursion and the classwork back at school.

6.2.2 The RBGS as an excursion venue

More than half the teachers involved in this study use reasons relating to the RBGS as a venue as either the basis of or part of their reasons for their excursion. This is a wide category for teacher responses and has been divided into a number of sub-categories as follows:

- Education service at the RBGS
- Geography of the RBGS
- RBGS as an aesthetic venue
- Resources of the RBGS

Table 6.6 demonstrates that teachers – especially primary teachers are concerned with the availability of a service to schools and that the venue is both close to other venues and easily accessed. Table 6.7 lists the responses placed in this category and indicates infants, primary and secondary responses.

a. Education service at the RBGS

More than half of the infants, primary and secondary teachers involved in these surveys included the education service at the RBGS as part of their reasons for their visit. The majority of these responses comment that the RBGS offers lessons.

Response category*	Teacher Use Survey 1996 Infants:Primary:Secondary 7:6:1 n = 14	Teacher Use Survey Term II 1996 Infants:Primary:Secondary 6:11:11 n = 28	TOTAL Infants:Primary:Secondary 13:17:12 n = 42
RBGS as the excursion venue	**3:6:0 64% (9)**	**4:5:6 54% (15)**	**7:12:6 57% (24)**
Education service at the RBGS	1:4:0 36% (5)	2:2:3 25% (7)	**3:6:3 29% (12)**
Geography of RBG	1:1:0 15% (2)	2:4:2 29% (8)	**3:5:2 24% (10)**
- close to other venues	7% (1)	18% (5)	
- ease of access for school	7% (1)	11% (3)	
RBGS as an aesthetic venue	1:1:0 7% (1)	0:1:2 11% (3)	**1:2:2 12% (5)**
Resources of RBG	1:1:0 21% (3)	0:0:2 7% (2)	**1:1:2 10% (4)**

*Denotes multiple responses

Table 6.6 **Sub-categories of responses: RBGS as the excursion venue**

b. Geographical location of the RBGS

Teachers include the geography of the RBGS as a part of their response to reasons why they choose to bring their students to the venue. Teachers say that the RBGS is close to other venues that they wish to visit on the same day and/or is accessible to their school.

The RBGS is situated on the eastern side of the city of Sydney and is geographically close to other excursion venues such as the Art Gallery of New South Wales, the State Library, Parliament House and the Australian Museum. This feature of the Gardens is highly attractive to 14% of the teachers involved in this research. For some schools the

Education service at the RBGS

5. Yr1 doing a unit on 'How Plants grow' Spring is a wonderful time to see the Gardens. *Because of the Education Centre.* (Yr1TUS96)
8. *Offers lessons.* Close to other excursion centres eg art galleries and museums. (Prim TUS96)
9. Have been before and found it a worthwhile and enjoyable experience, *also the lesson provided fitted in very well with unit of work being taught at school.* [*Aboriginal Studies*] (Prim TUS96)
10. Good memories of a *lesson* a few years ago (PrimTUS96)
12. Had been before and was impressed with *the information given and service.* (Yr3 TUS96)
1. Kinder were doing a unit of work 'Where does our food come from?' HSIE and 'What's for lunch?' S&T. *we used 'Living off the Land' as a component/perspective for AbEd.* (Inf TUSII96)
6. *I saw some information at school telling me about your excursion.* (Inf TUSII96)
15. Because it's beautiful. *I've taken another class to the lesson about 3 years* ago and it was very successful. (Yr6 TUSII96)
17. Close to school and *it offered a lesson* and experience for the class *that supported the unit on Native Flora.* (Yr3 TUSII96)
18. Additional resources; *classroom activities and outdoor excursion formal.* (Yr8 TUSII96)
21. A regular excursion – *the lecture etc was a bonus* (Yr8 TUSII96)
28. To learn in a pleasant environment. I had also brought my own children to workshops in the holidays and *knew it offered good quality lessons.* (Yr7 TUSII96)

Geographical location of the RBG: close to other excursion venues and accessible to school

2. *It was a place within easy travel distance* to fulfil the requirements to fit in with a unit of work being studied on Aborigines. (Yr1 TUS96)
8. Offers lessons. *Close to other excursion centres eg art galleries and museums.* (primTUS96)
3. My class was doing a unit on Trees/Plants. We had just completed a unit on the Solar System, So *we combined visits to Observatory and Botanical Gardens.* (2/3 InfTUSII96)
5. *Close to the Australian Museum.* Link with Aboriginal Studies. (Inf TUSII96)
9. *Ease of access and transport.* Many of our kids hadn't been before. (K/2/3/6 TUSII96)
10.*Ease of access* for study of 'Rainforest' (K/2/3/6 TUSII96)
13. The Grade was studying the Environment. We *also combined the Gardens to a trip to the Mint and Parliament House.* (Yr5 TUSII96)
17. *Close to school* and it offered a lesson and experience for the class that supported the unit on Native Flora. (Yr3 TUSII96)
19. We were studying 'Classification' with yr 10 and *were visiting the Museum for 'Evolution'* therefore close enough to see plant groups. (Yr10 TUSII96)
27. Yr 8 plants topic *combined with fossil at the Australian Museum.* (Yr8 TUSII96)

RBGS as an aesthetic venue

5. Yr1 doing a unit on 'How Plants grow' *Spring is a wonderful time to see the Gardens.* Because of the Education Centre. (Yr1TUS96)
15. *Because it's beautiful.* I've taken another class to the lesson about 3 years ago and it was very successful. (Yr6 TUSII96)
13. Covers things like plants, made aware of things Aboriginals (sic) eat and use. *Allow children to see a large expanse of grass.* (Yr3 TUS96)
24. To provide an interesting learning experience and to enjoy *one of Sydney's most scenic spots* and at the same time it related to a topic just completed at school. (Yr8 TUII96)
28. *To learn in a pleasant environment.* I had also brought my own children to workshops in the holidays and knew it offered good quality lessons. (Yr7 TUSII96)

Resources of the RBGS

4. To experience a *large variety of plants and seeds in their natural or a developed habitat.* (Yr1 TUS96)
11. I have brought a class here before and the experience was excellent – I knew there was so much more to do. I wanted the children to *experience the gardens from an historical perspective* rather than only a Sunday outing – as well as for those who hadn't been to bring their parents back. (Prim TUS96)
18. *Additional resources*; classroom activities and outdoor excursion formal. (Yr8 TUSII96)
19. We were studying 'Classification' with yr 10 and were visiting the Museum for 'Evolution' therefore close enough to *see plant groups.* (Yr10 TUSII96)

Table 6.7 **Teachers' survey response category: RBGS as the excursion venue**

RBGS is easily accessible by public transport: bus, train and ferry. The accessibility of the RBGS was an important factor for 10% of the teachers in this written survey. The cost to schools of hiring a special bus to transport students to an excursion venue can represent up to 80% (data from School C) of the total excursion cost. Hence many schools opt to take their students to the venue using public transport.

c. RBGS as an aesthetic venue

Undoubtedly the RBGS is one of Sydney's most beautiful venues. One in every ten teachers involved in this survey give the aesthetic nature of the Gardens as part of their reason for their visit. The following responses from Table 6.7 provide an insight into teachers' appreciation of the aesthetic nature of the RBGS.

> "Yr1 doing a unit on 'How Plants grow' *Spring is a wonderful time to see the Gardens.* Because of the Education Centre."
> (5. Year 1 TUS96)

In this response the teacher indicates that the beauty of the RBGS in spring is associated with her young students doing plants as their classwork.This Infants teacher clearly has a strong attachment to the RBGS and appears to consider that her young students may share her enjoyment of the environment. Responses in this sub-category indicate that there is a link between the success of the excursion and the aesthetics of the RBGS.

> "*Because it's beautiful.* I've taken another class to the lesson about 3 years ago and it was very successful."
> (15. Year 6 TUSII96)

This primary teacher links the beauty of the RBGS with the success for her excursion. The cluster of responses from secondary teachers provides further indication of a requirement for student enjoyment of their excursion experience. This aspect is clearly demonstrated in the following quote.

"To provide an interesting learning experience and to enjoy *one of Sydney's most scenic spots* and at the same time it related to a topic just completed at school."
(24. Year8 TUII96)

The RBGS is often referred to as the 'lungs' of the city. One teacher commented that she comes to the RBGS to "allow children to see a large expanse of grass" (13. Year 3 TUS96). Data from the case study schools confirms the importance of this feature of the RBGS especially for students in inner city schools.

d. Resources of the RBGS

This group of responses provides some insight into the special resources that attract teachers to the RBGS. Close inspection of the responses in Table 6.7 indicates that teachers expect a wide variety of well displayed plants that can be linked to their classwork. The plant resources at the RBGS are perceived as being linked to classwork and add to what is available at school. They are also recognised as being well maintained and of a high standard. A primary teacher also draws her students' attention to the historical nature of the RBGS – it is more than a place for Sunday outing.

6.2.3 Teachers' pedagogy for the excursion

This category of responses relates to the way the classroom teacher sees the excursion being used firstly within his or her teaching strategies or teaching approaches for the unit of classwork and secondly for his/her students beyond the classroom. This category also includes the notion that teachers have been to the RBGS before or have heard about the RBGS from other teachers and hence reveal their professional judgement that the excursion is a worthwhile experience. Table 6.8 demonstrates that approximately one quarter of the teachers involved in this survey use their professional judgement to evaluate the worth of the excursion. 14% of teachers reveal decisions they make about how the excursion will be used within their teaching sequence for current classwork. Teachers also determine the place of the excursion as a technique to motivate their students and socialise them into the possibility of visiting the RBGS at a later time.

The groups within this theme are as follows.

- Teachers' previous positive experience
- Excursion is part of the teaching strategy for the unit of work
- Provide an interesting, enjoyable experience
- Broaden students' horizons.

Response category*	**Teacher Use Survey 1996** Infants:Primary:Secondary **7:6:1** **n = 14**	**Teacher Use Survey Term II 1996** Infants:Primary:Secondary **6:11:11** **n = 28**	**TOTAL** Infants:Primary:Secondary **13:17:12** **n = 42**
Pedagogy of the excursion	**1:4:1** **43%** **(6)**	**1:4:6** **39%** **(11)**	**2:8:7** **40%** **(17)**
Previous positive experience	1:4:0 36% (5)	0:2:3 18% (5)	**1:6:3** **24%** **(10)**
Excursion part of teaching strategy	0:0:1 7% (1)	1:1:3 18% (5)	**1:1:4** **14%** **(6)**
Provide interesting enjoyable experience	0:1:0 7% (1)	0:0:2 7% (2)	**0:1:2** **7%** **(3)**
Broaden horizons	0:1:0 7% (1)	0:1:0 4% (1)	**0:2:0** **5%** **(2)**

*Denotes multiples responses

Table 6.8 **Sub-categories of responses: Teachers' pedagogy for the excursion**

Table 6.8 indicates some differences between infants, primary and secondary teachers. Teachers – particularly primary teachers act on previous positive experiences. Secondary teachers are concerned with an excursion rationale that demonstrates the place of the excursion in a unit of work and also that their students find the experience interesting and enjoyable. Infants and primary teachers appear to be less concerned about the placement of the excursion in a particular unit of work and infants teachers may be less likely to have visited the RBGS than primary and secondary teachers.

Table 6.9 lists the responses placed in this category and indicates infants, primary and secondary responses.

Previous positive experience

1. *Our school had a previous excursion through you two years ago* and found it to be a positive experience (Kinder TUS96)
9. *Have been before* and found it a worthwhile and enjoyable experience, also the lesson provided fitted in very well with unit of work being taught at school. [*Aboriginal Studies*] (PrimTUS96)
10. Good memories of *a lesson a few years ago* (Prim TUS96)
11. *I have brought a class here before* and the experience was excellent – I knew there was so much more to do. I wanted the children to experience the gardens from an historical perspective rather than only a Sunday outing – as well as for those who hadn't been to bring their parents back. (Prim TUS96)
12. *Had been before* and was impressed with the information given and service. (Yr3 TUS96)
15. Because it's beautiful. *I've taken another class to the lesson about 3 years ago* and it was very successful. (Yr6 TUSII96)
16. *We came last year* as a result of a recommendation from a teacher at another school. (Yr3 TUSII96)
21. *A regular excursion* – the lecture etc was a bonus (Yr8 TUSII96)
23. It compliments Yr8 course work and *we have been pleased with the Gardens in the past.* (Yr8 TUSII96)
28. To learn in a pleasant environment. *I had also brought my own children to workshops in the holidays* and knew it offered good quality lessons. (Yr7 TUSII96)

Excursion as part of teaching strategy

14. *Field trips are an integral part of Science teaching. This is an extension of classroom activities.* (Yr8 TUS96)
4. *As an introduction to a unit of work* on Natural Environments. (Inf TUSII96)
14. We were studying rainforests it would *consolidate their learning* – Make the pictures they had seen seem real. (Yr5 TUSII96)
22. The students study plants in detail in Yr 8 and classification in Yr7 so *it is important to reinforce the knowledge with observation.* (Yr8 TUSII96)
23. It *compliments Yr8 course work* and we have been pleased with the Gardens in the past. (Yr8 TUSII96)
26. *To augment their experience* in this area of study, Plant variety and adaptation. (Yr8 TUSII96)

Provide an interesting and enjoyable experience

9. Have been before and found it a worthwhile and *enjoyable experience*, also the lesson provided fitted in very well with unit of work being taught at school. [*Aboriginal Studies*] (PrimTUS96)
24. To provide *an interesting learning experience* and to enjoy one of Sydney's most scenic spots and at the same time it related to a topic just completed at school. (Yr8 TUSII96)
28. *To learn in a pleasant environment.* I had also brought my own children to workshops in the holidays and knew it offered good quality lessons. (Yr7 TUSII96)

Broaden students' horizons

11. I have brought a class here before and the experience was excellent – I knew there was so much more to do. I wanted the children to experience the gardens from an historical perspective rather than only a Sunday outing – *as well as for those who hadn't been to bring their parents back.* (PrimTUS96)
9. Ease of access and transport. *Many of our kids hadn't been bef*ore. (K/2/3/6 TUSII96)

Table 6.9 **Teachers' survey response category: Teachers' pedagogy for the excursion**

a. Previous positive experience

Approximately one quarter of the teachers surveyed said that they had been to the RBGS before and found it to be a worthwhile experience. Some of the observations made by these teachers include that their excursion runs smoothly and the experience is

enjoyable. It appears that teachers make professional judgements about their excursions and choose to repeat those excursions that are deemed to be successful. The notion of a worthwhile excursion is an example of a recurring theme through out this research and will be explored further at the end of this chapter.

b. Excursion is part of the teaching strategy for the unit of work

There is an obvious overlap of this part of the 'pedagogy' theme with the theme 'relevance to classwork'. Responses in this group begin to reveal how teachers use the excursion as part of their teaching sequence for their unit of work. Responses indicate that the excursion can be used to introduce a topic or to consolidate and reinforce classroom learning. The responses placed in this group also demonstrate how teachers view the relationship of the excursion to the unit of work being studied by the class. The excursion also extends student experiences by providing experiences that students would not otherwise have in their classroom.

This category of responses demonstrates the idea that the excursion is used by teachers as providing a real context for their work at school – that schoolwork relates to the real world. The following response item taken from Table 6.9 demonstrates this notion of the excursion providing a real context for student learning. It introduces the idea that students will see for real what they have seen in pictures.

> "We were studying rainforests it would consolidate their learning – Make the pictures they had seen seem real."
> (14. Year 5 TUSII96)

The Year 8 teachers' response below describes how many secondary science teachers view the excursion as an essential component of the science syllabus. For this Year 8 teacher, the excursion is obviously an essential part of his classwork.

> "Field trips are an integral part of Science teaching. This is an extension of classroom activities."
> (14. Year 8 TUS96)

Many approaches to the use of the excursion as a teaching strategy have emerged from this survey data and these will be discussed at the end of this chapter and combined with case study data and discussed in the final chapter of this thesis.

c. Provide an interesting and enjoyable experience

The 'pedagogy' theme includes responses that state a number of affective outcomes that teachers hold for their excursion. Firstly teachers' desire for the excursion to be motivating, interesting and enjoyable for their students. Secondly, some teachers view the excursion as a way to extend the horizons of their students – especially those students who haven't visited the RBGS before. These aspects of the responses also link with the theme of 'student experiences' however the responses placed in these two categories of the 'pedagogy' theme relate more to broader approaches to the learning experiences that teachers want to provide for their students.

This survey data has provided further evidence to support the theme that the excursion should be enjoyable. Responses indicate that teachers consider a link between student enjoyment of the excursion and an increase in student motivation to learn more about the topic. The responses in Table 6.9 indicate that teachers also enjoy the event. Another aspect of this group of responses is the notion revealed in this discussion that teachers require students to realise that they can learn in places beyond the classroom.

d. Broaden students' horizons

This second group of affective responses relates to the teachers' view that students should visit a range of venues over their school years. Both primary and secondary teachers feel a responsibility to introduce their students to recreational venues that they may visit outside school. This group of responses indicate that teachers may play a part in socialising students into returning to the venues they encounter on their school excursions.

6.2.4 Experiences students will have at the RBGS

Closely linked to the teachers' pedagogy for the excursion are teachers' statements concerning the specific experiences that they want their students to have at the RBGS. This separate category for such statements allows closer inspection of the nature of these responses. These experiences can be grouped as follows:

- Student access to specific resources, information and practical activities relevant to their classwork
- Students learn by having experiences
- Students develop an appreciation of plants / aesthetic appreciation

The following table (Table 6.10) demonstrates the number of responses in each group. Table 6.11 lists the responses placed in this category and indicates infants, primary and secondary responses.

Response category	**Teacher Use Survey 1996** Infants:Primary:Secondary **7:6:1** **n = 14**	**Teacher Use Survey Term II 1996** Infants:Primary:Secondary **6:11:11** **n = 28**	**TOTAL** Infants:Primary:Secondary **13:17:12** **n = 42**
Student experiences	**2:2:0** **29%** **(4)**	**0:5:3** **29%** **(8)**	**2:7:3** **29%** **(12)**
Student access to info, resources, practical activities	nil	0:4:2 21% (6)	**0:4:2** **14%** **(6)**
Students learn by having experiences	1:1:0 14% (2)	0:1:1 7% (2)	**1:2:1** **10%** **(4)**
Students develop an appreciation of plants	1:1:0 14% 2	nil	**1:1:0** **5%** **(2)**

Table 6.10 **Sub-categories of responses: Student experiences**

a. Student access to specific resources, information and practical activities

This category of responses relates to the content, practical activities and resources that teachers want their students to access at the RBGS. This category links with the unit of work that teachers are doing at school as all six responses in this category state the specific unit of work that is related to the excursion.

Student access to information, resources, practical activities
8. *To give the children a chance of hands on activities* to complement concepts of time and length measurement in relation to shadows. (Yr5 TUII96)
11. My class was studying 'Adaptations and Change' as part of their S&T unit therefore *this excursion enabled them to discuss various forms of plant life and its ability to survive in a variety of areas.* We also had finished a topic on 'food' (Yr5 TUII96)
12. My class was studying Aboriginal culture and *I wanted them to find out what local vegetation would have been utilised by Sydney based tribes.* (Yr5 TUII96)
14. We were studying rainforests it would consolidate their learning – *Make the pictures they had seen seem real.* (Yr5 TUSII96)
19. We were studying 'Classification' with yr 10 and were visiting the Museum for 'Evolution' therefore *close enough to see plant groups.* (Yr10 TUII96)
20. *To study evolution and classification of plants.* (Yr10 TUII96)

Students learn by having experiences
4. *To experience a large variety of plants and seeds in their natural or a developed habitat.* (Yr1 TUS96)
11. I have brought a class here before and the experience was excellent – I knew there was so much more to do. *I wanted the children to experience the gardens from an historical perspective* rather than only a Sunday outing – as well as for those who hadn't been to bring their parents back. (Prim TUS96)
17. Close to school and it offered a lesson and *experience for the class that supported the unit on Native Flora.* (Yr3 TUSII96)
26. *To augment their experience in this area of study,* Plant variety and adaptation. (Yr8 TUSII96)

Students develop an appreciation of plants / aesthetic appreciation
5. Yr1 doing a unit on 'How Plants grow' *Spring is a wonderful time to see the Gardens.* Because of the Education Centre. (Yr1 TUS96)
13. Covers things like plants, made aware of things Aboriginals (sic) eat and use. *Allow children to see a large expanse of grass.* (Yr3 TUS96)

Table 6.11 **Teachers' survey response category: Student experiences**

Teachers have specific information that they want their students to access at the RBGS. The following quote describes content that students can find out about while they are on their excursion. This response indicates that the teacher is aware that her students can learn in a different environment to the classroom. This teacher requires her students to learn in the informal setting of the RBGS. Teachers have a strong expectation that

students will learn while on their excursion and this is an important aspect to highlight throughout this discussion of results.

> "My class was studying Aboriginal culture and I wanted them to find out what local vegetation would have been utilised by Sydney based tribes."
> (12. Year5 TUII96)

Teacher also want their students to be involved in practical activities that are relevant to their unit of classwork as demonstrated by the following response. This teacher indicates that the practical activities available at the RBGS may not be available to her class at school.

> "To give the children a chance of hands on activities to complement concepts of time and length measurement in relation to shadows."
> (8. Year5 TUII96)

The following response from a primary teacher highlights the importance of students being able to place learning in the classroom into a more real context beyond the school environment. This response also gives a sense that students will be able to see for real what they had studied in pictures back at school.

> "We were studying rainforests it would consolidate their learning – *Make the pictures they had seen seem real.*"
> (14. Year5 TUSII96)

A further response included in this sub-theme relates to the learning behaviour that students demonstrate on their return to class as a result of their excursion to the RBGS. The following quote serves as a powerful indicator of the learning that students demonstrate on their return to class after the excursion.

"My class was studying 'Adaptations and Change' as part of their S&T unit *therefore this excursion enabled them to discuss various forms of plant life and its ability to survive in a variety of areas*. We also had finished a topic on 'food'"
(11. Year5 TUII96)

This response demonstrates that students have comprehended what they have seen at the Gardens. Students draw on this learning experience to communicate their observations. Students are also able to use their accumulated observations to create hypotheses about plants and reasons why they are able to survive in a particular environment. This response signals that a range of learning outcomes can be drawn from the data. Furthermore this range of learning outcomes may be compared to the taxonomies of learning outcomes identified in the literature review. This aspect of the data will be discussed further in this chapter and will be compare with case study data and discussed in the final chapter.

b. Students learn by having experiences

This group of responses contains a range of ideas about student experiences at the RBGS. Inspection of the responses in this sub-category reveals that teachers from across the range of school years use the term student 'experiences'. Further study of the data – especially case study data provides a sense of the meaning of the term. The responses below indicate that learning from experience is a relevant issue in prescribing the excursion experience that teachers are seeking for their students.

"To experience a large variety of plants and seeds in their natural or a developed habitat."
(4. Year1 TUS96)
"I have brought a class here before and the experience was excellent – I knew there was so much more to do. I wanted the children to experience the gardens from an historical perspective rather than only a Sunday outing – as well as for those who hadn't been to bring their parents back."
(11. Primary TUS96)
"To augment their experience in this area of study: Plant variety and adaptation."
(26. Year 8 TUSII96)

The responses indicate that students are immersed in an environment that is relevant to their schoolwork. There is a sense of focussed interaction with this environment and that this interaction provides enrichment of students' learning that could not take place in their classroom at school.

c. Students develop an appreciation of plants / aesthetic appreciation

This group of responses clearly overlaps the set of responses placed in a sub-category of the RBGS as a venue. However the two responses placed in this sub-category have a sense of student interaction with the aesthetic nature of the RBGS. The infants teacher has brought her students in Spring at a time when students' attention is more likely to be drawn to the seasonal display of blooming flowers. The primary teacher may draw her students' attention to the wide, green spaces – perhaps as a means of developing student appreciation of plants and green spaces.

6.2.5 Discussion

This survey item provides further insight into the range of teachers' reasons for conducting an excursion to the RBGS. Survey technique has been able confirm, amplify and extend the range of responses teachers' have provided in the case studies. This survey data provides the following reasons for an excursion to a botanic garden in order of frequency:

1. excursion is relevant to classwork
2. education service provided by the RBGS
3. geographical location of the RBGS – its proximity to other excursion venues and ease of access for school groups
4. teachers have been before and found the experience to be 'worthwhile'
5. students have direct access to and experience of the resources of the RBGS
6. excursion is part of a teaching strategy for a unit of classwork
7. RBGS is an aesthetic venue
8. resources of the RBGS are relevant to the requirements of school curriculum

9. excursion is an interesting and enjoyable experience for students
10. to broaden students' horizons
11. increase students' appreciation of plants.

This list of reasons for an excursion to the RBGS can be contrasted with the list generated in the Literature Review from data provided by secondary science and geography teachers (Sorrentino and Bell 1970, Hearder 1994, Mitchie 1998) which is re-presented as follows:

- to provide first-hand experiences which students could not have in a classroom
- to give meaning to learning
- to stimulate student interest and motivation in the subject
- to improve students' observation and perception skills
- to use cooperative learning strategies
- to improve subsequent classroom behaviour by improving socialisation between students and rapport between teachers and students.

Both lists of reasons are complimentary however there is little evidence in this survey data from the RBGS for the last two points in the generated list. Case study data provides evidence for the socialisation aspects of the excursion however this thesis provides little indication of a requirement for cooperative learning strategies.

The overwhelming finding of this block of data is that teachers from infants, primary and secondary schools visit the RBGS because of its relevance to their classwork – particularly in curriculum areas relating to science and the social sciences. The next section in this chapter explores the outcomes that teachers hold for their excursion to the RBGS.

6.3 Teachers' statements of outcomes for their excursion to the RBGS

Both groups of teachers were asked to write the objectives/outcomes that they have for their excursion and these blocks of data have been illustrated in Table 6.1. The responses to this survey item were read and re-read to determine the similarities and differences between the responses. The results of this process suggest that there are a number of ways of approaching the presentation and analysis of this data. Firstly it is clear that there is a cognitive focus for this group of outcomes and this focus is presented in Table 6.12. The responses grouped under each heading are presented in Table 6.13.

Content focus*	**Teacher Use Survey 1996** Infants:Primary:Secondary **7:6:1** **n = 14**	**Teacher Use Survey Term II 1996** Infants:Primary:Secondary **6:11:13** **n = 30**	**TOTAL** Infants:Primary:Secondary **13:17:14** **n = 44**
Plants	4:1:1 43% 6	1:4:10 50% 15	**5:5:11** **48%** **21**
Aboriginal people & their use of plants	2:6:0 57% 8	1:2:1 13% 4	**3:8:1** **27%** **12**
Environments at the RBGS	2:0:1 21% 3	1:2:2 17% 5	**3:2:3** **18%** **8**
Other aspects of the RBGS	2:2:0 29% 4	1:3:0 13% 4	**3:5:0** **18%** **8**
Develop & practise skills	0	1:2:1 13% 4	**1:2:1** **10%** **4**
General outcomes (no statement of content)	0	2:2:1 17% 5	**2:2:1** **11%** **5**

* Denotes multiple responses

Table 6.12 **Content focus of teachers' outcomes for their excursion to the RBGS**

Secondly teachers' statements also indicate a requirement to consider how students will engage with the conceptual component of their response. The outcomes statements made by teachers involved in this research include their requirement for specific ways of

engaging their students with their required content focus. Table 6.18 presents the range of processes expressed by teachers' outcomes. The third consideration for these responses is that of the perspectives of infants, primary and secondary teachers. The ratio of the responses is included in Tables 6.12 and 6.18.

Plants

1. To be able to see *a variety of plants* in their natural environment; To be able to 'touch' and identify *different part of the plants*. (K TUS96)
4. To enjoy their first look at *plants* and to find out *how seeds germinate*. (Yr1 TUS96)
5. Aware of: *how plants grow*, seasons, leisure time – use of the park, *care for plants*, parks. (Yr1 TUS96)
7. To be able to see / identify *different plant types*. To recognise *parts of the plants*. (Yr1 TUS96)
2. The children were able to explain *what a plant is*. The children could show *the parts of a plant*. (Inf TUSII96)
9. Children can identify some foods and plants used by Aboriginal people and are aware (of some) *Australian plants*. (Prim TUS96)
9. The children were able to see and feel first hand *the plants they had been studying*. (K/2/3/6 TUSII96)
10. Students had better understanding of *rainforest plants* and habitat. (K/2/3/6 TUSII96)
17. Children identified *plants that are native to our local area*. Children used this knowledge to establish a native garden at school. (Yr3 TUSII96)
11. The children were able to look at and discuss the varieties of 'cactus' and how succulent plants have adapted to hot, arid environments. (Yr5 TUSII96)
14. Explore the *plant diversity*. Examine the conditions which exist in different environments and study the *adaptive features of plants*. (Yr8 TUS96)
18. Use of microscopes, Observation of *plant types*, Identification of *plant types* (Yr8 TUSII96)
21. Completed the unit of work on *plant classification* quickly and efficiently. (Yr8 TUSII96)
30. Understanding of *classification of plants*. Better understanding of *function and structure of plants*. (Yr8 TUSII96)
22. To allow students to observe the *variety of plants and their adaptations to their environment*. (Yr8 TUSII96)
23. Experience a *wider range of plant species*. The work schedule reinforces classwork. (Yr8 TUSII96)
25. Understanding of *diversity and structure of plants* as included in our topic on plants. (Yr8 TUSII96)
26. Students exposed to a larger *variety of plants* that available at school. (Yr8 TUSII96)
27. Students exposed to *plant diversity and structure*. (Yr8 TUSII96)
19. Girls saw a much more *diverse range of plants*. (Yr10 TUSII96)
20. Students had hand-on experience of a *wide variety of plants from the different groups* – much better variety than would be possible at school and obviously better than slides / film. (Yr10 TUSII96)

Aboriginal people & their use of plants

2. For the children to be able to identify *plants traditionally used by Aborigines* and to state some *traditional uses of plants*. (Yr1 TUS96)
3. For children to have hands on experience about *native plants and their uses*. (Yr2 TUS96)
5. Better awareness of Aboriginal bush foods. (Inf TUSII96)
8. Aboriginal and TS Week. Culmination activities. Learning about & recognising *traditional foods, tools*. (Prim TUS96)
9. Children can identify some *foods and plants used by Aboriginal people* and are aware (of some) Australian plants. (Prim TUS96)
10. Learn how *Aboriginals* (sic) *used* (sic) *plants*, see those *plants*, (Prim TUS96)
11. To experience the gardens for all; To see first hand the types of plants grown by the first settlers; To experience at first hand the *plants used by Aborigines*. (Prim TUS96)
12. For the children to learn some practical knowledge and be exposed to a real look at *bush food*. (Prim TUS96)
13. To be more aware of places to go. Arouse interest in *cultures other than their own*. (Yr3 TUS96)
16. The children had first-hand experience about *Aboriginal use of plants*. (Yr3 TUSII96)
12. Children were shown examples of flora used by local tribes as a food and medicine sources. Poisonous foods were discussed and posters were displayed showing use of foods, tool making etc. (Yr5 TUSII96)
28. Students understood more about traditional Aboriginal culture. (Yr7 TUSII96)

Environments at the RBGS

1. To be able to see a variety of plants *in their natural environment*; To be able to 'touch' and identify different part of the plants. (K TUS96)
6. Observing/ /looking at various living things, using their senses, exploring the *environment*. Rules for gardens, plant life. (Yr1 TUS96)
6. Real close investigation looking at the insects. Seeing *the minibeasts in their natural environment*. (Inf TUSII96)
10. Students had better understanding of rainforest plants and *habitat*. (K/2/3/6 TUSII96)
14. Activities were hands on Children experienced *humidity*. (Yr5 TUSII96)
14. Explore the plant diversity. Examine *the conditions which exist in different environments* and study the adaptive features of plants. (Yr8 TUS96)
22. To allow students to observe the variety of plants and their adaptations to their *environment*. (Yr8 TUSII96)
24. None that had already been achieved in the classroom but again in *the different environment of being at the RBG*. (Yr8 TUSII96)

Other aspects of the RBGS

5. Aware of: how plants grow, seasons, *leisure time – use of the park*, care for plants, parks. (Yr1 TUS96)
6. Observing/ /looking at *various living things*, using their senses, exploring the environment. Rules for gardens, plant life. (Yr1 TUS96)
6. Real close investigation looking at *the insects*. Seeing the minibeasts in their natural environment. (Inf TUSII96)
11. To experience the *gardens for all*; To see first hand *the types of plants grown by the first settlers*; To experience at first hand the plants used by Aborigines. (Prim TUS96)
13. To be more aware of *places to go*. Arouse interest in cultures other than their own. (Yr3 TUS96)
7. Children were able to see how *the Sun Dial* worked and most understood it and related it to analogue time. They also developed estimation and measuring skills. (Yr5 TUSII96)
8. Children were able to see how a *constructed object* threw a shadow allowing time to be measured. Children were able to use a combination of skills to estimate and measure height. (Yr5 TUSII96)
15. We have a very high ESL / non English speaking background so we wanted to make the children aware of some *Australian history*. (Yr6 TUSII96)

Develop & practise skills

1. *To further develop skills of categorising, grouping, labelling; to develop 'learning to look' skills*. (Inf TUSII96)
7. Children were able to see how the Sun Dial worked and most understood it and related it to analogue time. They also developed *estimation and measuring skills*. (Yr5 TUSII96)
8. Children were able to see how a constructed object threw a shadow allowing time to be measured. Children were able to use a *combination of skills* to estimate and measure height. (Yr5 TUSII96)
18. *Use of microscopes*, Observation of plant types, Identification of plant types (Yr8 TUSII96)

No statement of content

3. Children *learned a great deal were able to write / draw / discuss what they had learned that day*. (Inf TUSII96)
4. The children *had increased their knowledge and awareness*. (Inf TUSII96)
13. The children had a *practical hands-on experience* and a *better overall knowledge of the subject*. (Yr5 TUSII96)
14. Activities were *hands on*. Children experienced humidity. (Yr5 TUSII96)
29. A *presentation* for the school library, *discussion* in class. (Yr9 TUSII96)

Table 6.13 **Teachers' responses: Content focus of teachers' outcomes for the excursion to the RBGS**

6.3.1 Content focus

The most obvious statement that can be made from this data is that teachers of all school groups from infants to secondary can state clear statements about what they want to achieve on their excursion. These statements of outcomes for the excursion bear strong resemblance to statements of learning outcomes. The following paragraphs discuss each category of responses.

a. Plants

Approximately one half of the teachers involved in this study have come to the RBGS to achieve outcomes specifically associated with study of plants. Study of the responses indicates that for infants and secondary teachers study of plants is associated with school science.

For primary teachers study of plants is associated with study of environments that can be located in science or social science. Discussion of the data associated with the survey question on teachers reasons for visiting the RBGS revealed that primary teachers can have a multi-disciplinary focus for their excursion and data from their responses about their excursion outcomes lends support to this observation.

The group of outcomes referring to plants demonstrates a range of content that could be used as a 'syllabus' for the content about the study of plants that could be provided by the RBGS. This 'syllabus' is illustrated in Table 6.14.

Teachers have also provided an insight into how this content is to be approached. Table 6.15 arranges teachers' outcome statements into groups of like-statements that then can be arranged into a taxonomy of excursion outcomes. This taxonomy of objectives is organised from sensory awareness → observation /exploration → identification and recognition → increasing understandings and awareness.

Kindergarten - Year Two	Year Three - Year Six	Year Seven - Year Ten
What a plant is First look at plants A variety of plants Parts of a plant How seeds germinate How plants grow. Caring for plants	Australian native plants Local native plants Rainforest plants Succulent plants	Plant groups / plant diversity / plant classification. Plant adaptations. Structure & function of plants.

Table 6.14 **Topic statements on 'Plants' from teachers' outcomes**

These explorations of the results of data about teachers outcomes for their excursion that relate to plants indicate that teachers are able to articulate their requirements for study of plants at the RBGS. Their outcomes are relevant to the resources of the RBGS and to science curriculum documents. Hence it appears that teachers' outcomes are soundly based as to what their students should be able to achieve at their appropriate level.

The level of articulation between the RBGS and schools for plant-related topics may well be due to the identification of links between botanic gardens and primary science stated in the *K-6 Science and Technology Syllabus and Support Document* (Board of Studies 1989). Furthermore the data indicates that there is a clarity of association between the RBGS and study of plants. Teachers recognise the association between the RBGS and plants. Further data from the case studies has revealed that students of all school ages also recognise the association between the RBGS and plants.

The data indicates that teachers at all levels value their students being able to interact with real, living plants. The following quote from a secondary teacher demonstrates his/her recognition of the superiority of seeing the real, living plant.

Kindergarten - Year Two	Year Three - Year Six	Year Seven - Year Ten
At the RBGS students will be able to: See, touch plants and plant parts See a variety of plants Identify different plant types Recognise parts of plants Show the parts of a plant Find out how seeds germinate Explain what a plant is Be aware of how plants grow and how to care for them Enjoy their first look at plants	At the RBGS students will be able to: See and feel plant first hand See and feel plants they have been studying Look at and discuss varieties of cactus plants and their adaptations Identify plants native to our local area Have a better understanding of rainforest plants Be aware of some Australian plants On their return to school students will be able to: Use their understandings to establish a native garden	At the RBGS students will be able to: See a diverse range of plants Have hands on experiences with a wide variety of plants from different groups Experience wider range of plant species Be exposed to a larger variety of plants Be exposed to plant diversity and structure. Use microscopes Observe plant types; variety of plants Observe adaptations of plants Study the adaptive features of plants Explore plant diversity Identify plant types Complete a unit of work on plants Understand diversity and structure of plants Better understand plant classification Better understand structure and function of plants

Table 6.15 **A teachers' syllabus of plant-related outcomes**

"Students had hand-on experience of a *wide variety of plants from the different groups* – much better variety than would be possible at school and obviously better than slides / film." (20.Year10 TUSII96)

Primary and secondary teachers include in statements of outcomes that their students would achieve a 'better understanding' of plants. The data provides little insight into the nature of this understanding. Evidence from Case Study School G provided some insight into the nature of understandings about plants that are expected of Year 10 science students. A different and less cognitively-based insight was provided by AN from School C who required her students to experience the plants and environments at the RBGS to gain a better understanding of a rainforest environment. Clearly case study as a research technique provides a greater opportunity to explore teachers' requirements of their excursion.

A single response from an infants teacher identifies the role of student enjoyment of experiences at the RBGS. As we have seen in the discussion of teachers' reasons for the excursion, teachers associate student enjoyment with the success of their excursion. It appears that student enjoyment of the excursion is an important component of the excursion experience for the teachers involved in this survey.

b. Aboriginal use of plants

More than one quarter of the teachers including one half of the primary teachers involved in these surveys visited the RBGS for experiences associated with Aboriginal use of plants. Table 6.16 orders the content of the outcomes listed in Table 6.13. Results from both these Tables demonstrate that teachers expect the excursion to provide outcomes relating to plants used by Aboriginal people. The outcome statements present an unproblematic view that appears to remove this content from its association with critical issues in Aboriginal Education.

Kindergarten - Year Two	Year Three - Year Six	Year Seven - Year Ten
"plants traditionally used by Aborigines" (2TUS96) "native plants and their uses" (3TUS96) "Aboriginal bush foods" (5TUSII96)	"traditional foods and tools" (8TUS96) "foods and plants used by Aboriginal people" (9TUS96) "how Aboriginals used plants" (10TUS96) "plants used by Aborigines" (11TUS96) "bush food" (12TUS96) "cultures other than their own" (13TUS96) "flora used by local tribes as a food and medicine; poisonous foods." (12TUSII96) "Aboriginal use of plants" (16TUSII96)	"traditional Aboriginal culture" (28TUSII96)

Table 6.16 Topic statements on 'Aboriginal use of plants' from teachers' outcomes

These statements of content demonstrate a range terms that have been identified by Aboriginal educators as misconceptions and inaccuracies (Craven & Rigney 1999, Partington 1998, Craven 1996). The misuse of terminology evident in the outcome statements is described in the following paragraphs.

1. Relegation of Aboriginal culture to the past. Focussing content on traditional uses of plants can imply that Aboriginal people are not part of the present. Use of the past tense also implies that this use of plants happened in the past and does not happen now. An emphasis on traditional Aboriginal culture can be interpreted as a refusal to acknowledge that Aboriginal people are part of our urban community. The data indicates that teachers may prefer to approach Aboriginal studies by providing an anthropological focus to their statements of outcomes. (Newlin & Moran 1999, Craven 1996)

2. Aboriginal culture is conspicuous by its absence. Topics such as 'bush foods' and 'uses of Australian native plants' can be said to ignore sources of information that provide the essential background to these topics i.e. Aboriginal people past and present

in communities across Australia. The data indicates that teachers may prefer to by-pass this heritage of information in their use of the RBGS for information about Australian native plants. (Cavanagh 1999, Craven 1996)

3. Aboriginal people are the same across Australia. Use of terms such as 'Aborigines' and 'Aboriginals' and indeed a preferred term 'Aboriginal people' can infer that there is a homogenous group of Aboriginal people across Australia. Use of the term 'Aboriginal' is particularly offensive to Aboriginal people. (Newlin & Moran 1999, Craven 1996)

It is clear that it would be inappropriate to use these outcomes to derive a 'syllabus' of topics for the RBGS in this topic area. This set of data indicates that education programs offered by the RBGS that focus on Aboriginal people and their use of plants presents a group of problematic issues. While this discussion has identified some of these issues it is clear that further consideration of methods by which the RBGS addresses these issues is of critical concern.

c. Environments at the RBGS

Not quite one fifth of the teachers involved in this survey include statements about environments at the RBGS as a content focus for their excursion.

This group of topic statements from Table 6.17 demonstrates that teachers are concerned with the physical features of and plants and animals associated with the environments at the RBGS. Here, as in the previous topic area teachers have chosen to isolate outcomes relating to environments from any association with relevant environmental issues or concerns for human impact on environments.

The data provides no evidence for content requirements for environmental issues associated with topics such as rainforests and plant diversity yet both the education programs of the RBGS and relevant syllabus documents encourage this aspect of content. Hence it is highly appropriate for teachers to express content requirements for human impact on rainforests of the world or on the diversity of plants. It appears that

teachers involved in this study do not see their excursion as being concerned with these issues.

Kindergarten - Year Two	Year Three - Year Six	Year Seven - Year Ten
"plants in their natural environment" (1TUS96) "exploring the environment" (6TUS96) "minibeasts in their natural environment" (6TUSII96)	"understanding of habitat" (10TUSII96) "experience humidity" (14TUSII96)	"conditions which exist in different environments" (14TUS96) "adaptations to their environment" (22TUSII96) (outcomes achieved) "in the different environment of being at the RBGS" (24TUSII96)

Table 6.17 **Topic statements on 'Environments at the RBGS' from teachers' outcomes**

This survey data does not provide any insight into the use of the RBGS in providing student experiences that are relevant to the concerns of environmental education. Documents from both the school (e.g. *K-6 Science & Technology Syllabus and Support Document* Board of Studies 1989) and from the BCGI (e.g. *Environmental Education in Botanic Gardens* Willison 1994) clearly associate botanic gardens with issues of human impact on environments and the plight of living things. The data indicates that teachers involved in this study do not associate their excursion to the RBGS with outcomes relating to these issues.

A further issue raised in the consideration of this topic is evident in the following quote from an infants teacher.

> "To be able to see a variety of plants in their *natural* environment; To be able to 'touch' and identify different part of the plants." (1. Kindergarten TUS96)

The quote indicates that this teacher associates the environment at the RBGS with a natural environment. Clearly the RBGS is a made environment and part of the urban landscape. The quote indicates potential for misconceptions about the RBGS

representing natural environments. Data from students' excursion experiences has also provided an indication of the potential for environments at the RBGS to be represented as a natural environment.

d. Other aspects of the RBGS

This group of outcomes indicates that infants and primary teachers involved in this study can also use the RBGS as a resource for history and mathematics. The RBGS has an implied historical focus identified in the *K-6 HSIE Units of Work* (Board of Studies 1998). Use of the RBGS as a venue for mathematics is suggested in its program of lessons (RBGS 1995).

Outcomes stating the RBGS can be viewed as one of Sydney's attractions and a location to be visited by students and their families reinforces the view identified in the discussion of the pedagogy teachers have for their excursions. The data suggests that teachers play a part in educating a new generation of visitors to the RBGS.

These outcomes reproduced below clearly demonstrate that the notion of the RBGS as a venue to visit is associated with teachers' statements about the content focus for the excursion.

> "Aware of: how plants grow, seasons, *leisure time – use of the park*, care for plants, parks."
> (5. Year 1 TUS96)
> "To experience the *gardens for all*; To see first hand the types of plants grown by the first settlers; To experience at first hand the plants used by Aborigines."
> (11. Primary TUS96)
> "To be more aware of *places to go*. Arouse interest in cultures other than their own."
> (13. Year 3 TUS96)

The responses confirm that these teachers consider that the RBGS as a venue to visit is a component rather than a single focus for their excursions.

d. Develop and practise skills

One teacher involved in this study stated his/her excursion outcomes solely as an opportunity for his/her students to develop and practise skills. The other three teachers in this group associate skill development with study of content. This survey data suggests that teachers may hold requirements for their students to develop and practice skills however these requirements are associated with the content outcomes for the excursion.

e. No statement of content

One in ten teachers involved in this survey expressed their requirements for the excursion as general outcomes with no specific statement of content requirement. This survey data demonstrates that the majority of teachers relate the outcomes they hold for their excursion to specific rather than to general areas of content.

6.3.2 Process focus

A further step in the consideration of this data is to turn our attention to the context within which teacher have stated their outcomes for this excursion. Statements of educational outcomes emphasise the processes by which teachers approach content and the statements of excursion outcomes of the teachers involved in this study also emphasise processes. Hence the second approach to the responses to this question item presents teachers' outcome statements in the context of their process orientation.

Table 6.15 presents the results of the process of reading and re-reading the responses to gain a sense of the main groups of responses. The table also provides the ratio of infants: primary: secondary teachers' responses. Table 6.16 presents the responses placed in each group.

This data presents four major findings. Firstly that teachers hold expectations about the learning processes their students will use at the RBGS. Secondly these expectations can be grouped into three overlapping categories: sensory-based processes, investigation-based processes and processes that demonstrate student understandings. The data

suggests that these three categories of processes could form a sequence of process outcomes.

Process focus*	Teacher Use Survey 1996 Infants:Primary:Secondary Teacher ratio 7:6:1 n = 14	Teacher Use Survey Term II 1996 Infants:Primary:Secondary Teacher ratio 6:11:13 n = 30	TOTAL Infants:Primary:Secondary Teacher ratio 13:17:14 n = 44
Sensory-based	4:3:0 50% 7	1:8:5 47% 14	**5:11:5** **48%** **21**
Investigation-based	3:0:1 29% 4	1:3:2 17% 5	**4:3:3** **23%** **10**
Demonstrate Understandings	3:2:0 36% 5	2:3:2 23% 7	**5:5:2** **27%** **12**
General (no statement of process)	2:5:0 50% 7	2:3:5 33% 10	**4:8:5** **39%** **17**

*Denotes multiple responses

Table 6.18 **Process focus of teachers' outcomes for their excursion to the RBGS**

Thirdly, practical, sensory-based experiences form the basis of the expectations teachers hold for how their students will learn at the RBGS. Fourthly, for teachers the process of interaction with the environment commences with a content focus bought to the RBGS. There is no evidence of outcomes simply requiring students to have experiences or to look at their surroundings. Teachers involved in these surveys link learning processes with a content focus. The following paragraphs discuss each category of responses.

a. Sensory-based outcomes

More than one half of this category of outcomes (27% of all outcome statements) involves students being able 'to look at' or 'to see'. Included with these 'attending to' outcomes are three other sensory-based outcomes. The focus of this process of attending

Sensory-based outcomes

1. To be able *to see* a variety of plants in their natural environment; To be able *to 'touch'* and identify different part of the plants. (K TUS96)
3. For children to have *hands on experience* about native plants and their uses. (Yr2 TUS96)
6. Observing/*looking at* various living things, *using their senses*, exploring the environment. Rules for gardens, plant life. (Yr1 TUS96)
7. To be able *to see* / identify different plant types. To recognise parts of the plants. (Yr1 TUS96)
6. Real close investigation *looking at* the insects. *Seeing* the minibeasts in their natural environment. (Inf TUSII96)
10. Learn how Aboriginals (sic) used (sic) plants, *see* those plants. (Prim TUS96)
11. To *experience* the gardens for all. To *see first hand* the types of plants grown by the first settlers. To *experience at first hand* the plants used by Aborigines. (Prim TUS96))
12. For the children to learn some practical knowledge and *be exposed to* a real look at bush food. (Prim TUS96)
9. The children were *able to see and feel first hand* the plants they had been studying. (K/2/3/6 TUSII96)
16. The children had *first-hand experience* about Aboriginal use of plants. (Yr3 TUSII96)
7. Children were *able to see* how the Sun Dial worked and most understood it and related it to analogue time. They also developed estimation and measuring skills. (Yr5 TUSII96)
8. Children were *able to see* how a constructed object threw a shadow allowing time to be measured. Children were able to use a combination of skills to estimate and measure height. (Yr5 TUSII96)
11. The children were *able to look at* and discuss the varieties of 'cactus' and how succulent plants have adapted to hot, arid environments. (Yr5 TUSII96)
12. Children *were shown* examples of flora used by local tribes as a food and medicine sources. Poisonous foods were discussed and posters were displayed showing use of foods, tool making etc. (Yr5 TUSII96)
13. The children had a practical *hands-on experience* and a better overall knowledge of the subject. (Yr5 TUSII96)
14. Activities were *hands on* Children *experienced* humidity. (Yr5 TUSII96)
23. *Experience* a wider range of plant species. The work schedule reinforces classwork. (Yr8 TUSII96)
26. Students *exposed to* a larger variety of plants that available at school. (Yr8 TUSII96)
27. Students *exposed to* plant diversity and structure. (Yr8 TUSII96)
19. Girls *saw* a much more diverse range of plants. (Yr10 TUSII96)
20. Students had *hand-on experience* of a wide variety of plants from the different groups – much better variety than would be possible at school and obviously better than slides / film. (Yr10 TUSII96)

Investigation-based outcomes

4. To enjoy their first look at plants and *to find out* how seeds germinate. (Yr1 TUS96))
6. *Observing*/looking at various living things, using their senses, *exploring the environment*. Rules for gardens, plant life. (Yr1 TUS96)
1. *To further develop skills of categorising, grouping, labelling; to develop 'learning to look' skills*. (Inf TUIIS96)
6. Real *close investigation* looking at the insects. Seeing the minibeasts in their natural environment. (Inf TUSII96)
7. Children were able to see how the Sun Dial worked and most understood it and related it to analogue time. They also *developed estimation and measuring skills*. (Yr5 TUSII96)
8. Children were able to see how a constructed object threw a shadow allowing time to be measured. Children were *able to use a combination of skills* to estimate and measure height. (Yr5 TUSII96)
11. The children were *able to look at and discuss* the varieties of 'cactus' and how succulent plants have adapted to hot, arid environments. (Yr5 TUSII96)
14. *Explore* the plant diversity. *Examine* the conditions which exist in different environments and *study* the adaptive features of plants. (Yr8 TUS96)
18. *Use of microscopes*, *Observation* of plant types, Identification of plant types (Yr8 TUSII96)
22. To allow students *to observe* the variety of plants and their adaptations to their environment. (Yr8 TUSII96)

Demonstrate understandings

1. To be able to see a variety of plants in their natural environment; To be able to 'touch' and *identify* different part of the plants. (K TUS96)
2. For the children to be able *to identify* plants traditionally used by Aborigines and *to state* some traditional uses of plants. (Yr1 TUS96)
7. To be able to see / *identify* different plant types. To *recognise* parts of the plants. (Yr1 TUS96)
2. The children were *able to explain* what a plant is. The children *could show* the parts of a plant. (Inf TUSII96)

3. Children learned a great deal *were able to write / draw / discuss* what they had learned that day.(Inf TUSII96)
8. Aboriginal and TS Week. Culmination activities. Learning about & *recognising* traditional foods, tools. (Prim TUS96)
9. Children can *identify* some foods and plants used by Aboriginal people and are aware (of some) Australian plants. (Prim TUS96)
17. Children *identified* plants that are native to our local area. Children *used this knowledge* to establish a native garden at school. (Yr3 TUSII96)
7. Children were able to see how the Sun Dial worked and most understood it *and related it to* analogue time. They also developed estimation and measuring skills. (Yr5 TUSII96)
11. The children were *able to* look at and *discuss* the varieties of 'cactus' and how succulent plants have adapted to hot, arid environments. (Yr5 TUSII96)
18. Use of microscopes, Observation of plant types, *Identification of* plant types (Yr8 TUSII96)
29. A *presentation* for the school library, *discussion* in class. (Yr9 TUSII96)

No statement of process
4. To *enjoy* their first look at plants and to find out how seeds germinate. (Yr1 TUS96))
5. *Aware of*: how plants grow, seasons, leisure time – use of the park, care for plants, parks. (Yr1 TUS96)
4. The children had *increased their knowledge and awareness*. (Inf TUSII96)
5. *Better awareness of* Aboriginal bush foods. (Inf TUSII96)
8. Aboriginal and TS Week. *Culmination activities. Learning about* & recognising traditional foods, tools. (Prim TUS96)
9. Children can identify some foods and plants used by Aboriginal people and are *aware* (of some) Australian plants. (Prim TUS96)
10. *Learn how* Aboriginals (sic) used (sic) plants, see those plants. (Prim TUS96)
12. For the children *to learn* some practical knowledge and be exposed to a real look at bush food. (Prim TUS96)
10. Students had *better understanding of* rainforest plants and habitat. (K/2/3/6 TUSII96)
13. To be *more aware* of places to go. *Arouse interest* in cultures other than their own. (Yr3 TUS96)
13. The children had a practical hands-on experience and a *better overall knowledge* of the subject. (Yr5 TUSII96)
15. We have a very high ESL / non English speaking background so we wanted to make the children *aware of* some Australian history. (Yr6 TUSII96)
28. Students *understood more about* traditional Aboriginal culture. (Yr7 TUSII96)
30. *Understanding of* classification of plants. *Better understanding of* function and structure of plants. (Yr8 TUSII96)
23. Experience a wider range of plant species. The work schedule *reinforces classwork*. (Yr8 TUSII96)
24. None that had already been achieved in the classroom but again in the different environment of being at the RBG. (Yr8 TUSII96)
25. *Understanding of* diversity and structure of plants as included in our topic on plants. (Yr8 TUSII96)

Table 6.19 **Teachers' responses: Process focus of teachers' outcomes for their excursion to the RBGS**

to include plants, in general, specific plants such as cacti, other living things and sundials.

One third of the outcomes in this category (16% of all outcome statements) involves students 'experiencing' plants. Furthermore the responses provide an insight into the nature of these experiences. Close reading of the responses in this sub-group of outcome statements are requirements for either 'hands on' experiences or for 'first hand' experiences. These requirements can be interpreted as being based on practical sensory interaction with selected aspects of environments at the RBGS.

As demonstrated in Table 6.18 approximately one half of teachers' excursion outcomes relate to students having sensory-based experiences at the RBGS. Study of this category of outcomes confirms the link between students using their senses and teachers' requirements for student experiences.

The data suggests that these sensory-based experiences could be the first in a sequence of steps that could define the nature of the learning processes for the excursion experience at the RBGS. It appears that teachers require their students to see or attend to or to experience or to be exposed to specific components of the plants and the environments at the RBGS. This category of outcomes also suggests that students move beyond attending to specific components of the environment to physically interacting with these components.

The data from this teacher survey suggests that teachers express a requirement for their students to 'experience' content i.e. students' experiences form the process component of cognitive outcomes. It is clear that teachers can state a clear content-related purpose for student activity.

This category of outcomes provides an insight into the notion identified in teachers' reasons for their excursion where teachers want 'to provide experiences' or for their students to 'experience' plants. The discussion of this category of excursion outcomes revealed that often the experience teachers require for their students is that they use their senses to physically interact with plants and environments at the RBGS.

This category of outcomes infers that students are able to move through the environment and have close physical access to the focus of their experience however there appears to be no direct mention of the physicality of the experience. It is clear that students are free to move to those aspects of the environment with which they wish to interact and this is a feature that would distinguish this experience from that students have in a classroom.

b. Investigation-based outcomes

This category of investigation-based outcomes can be seen to overlap with the category of sensory-based outcomes however they have been placed in a separate category to demonstrate a more focussed interaction with plants and environments. This group of outcomes also demonstrates a formal association with processes allied with school syllabus documents in science and mathematics.

The data suggests that there is a group of skills associated with the science process of investigating. This group of responses involves students learning to look, observing, examining and using microscopes as well as investigating specific aspects of the environment at the RBGS. There are also three responses relating to the mathematical processes of grouping, estimating and measuring. A further set of outcomes relates to use of research skills to study and to find out.

This category of excursion outcomes also provides a sense of active student interaction with specific features of the RBGS. At this level of experience students are required to engage in a more focussed interaction with features of the RBGS and can be said to imply a further step in a sequence of processes that occur at the RBGS. Students move beyond attending to aspects of the environment and purposefully interact with the environment to discover or to find out.

A single response included below indicates that there is a social aspect to the excursion experience.

> "The children were *able to look at and discuss* the varieties of 'cactus' and how succulent plants have adapted to hot, arid environments."
> (11. Year 5 TUSII96)

The quote indicates that students are able to discuss their perception of the features of plants directly in their gaze. The quote indicates that the excursion provides opportunities for students' experiences to be discussed with friends and perhaps with

their teacher or the botanic gardens educator accompanying the group. Data from students' perceptions of their excursion experience indicates the prevalence of this feature of the learning process.

This response demonstrates a sense of the immediacy of the environment from which students are directing their observations and discussion. There is also a sense that students are surrounded by cactus plants as they would be in the Succulent Garden at the RBGS. These two latter features of this quote provide an indication of the contribution that specific environments at the RBGS can make to the learning process. Teachers' responses to the next survey item further illuminate the contribution made by specific environments to learning at the RBGS.

c. Demonstrate understandings

This category of outcomes presents a range of attributes that teachers can use to identify student learning. Further inspection of this category identifies a number of similar groups. Firstly the outcome that students from Kindergarten to Year 10 can recognise or identify specific content. This content includes plant parts, plants used by Aboriginal people or plants native to an area. It is not clear where this identification process will take place either at the RBGS or at school. The second group of outcomes in this category involves students being able to state, or to explain their understandings to others.

A third group of outcomes involves students being able to discuss their experiences at the RBGS. The requirement or observation that students are able to discuss their experiences infers that the excursion experience has encouraged student interest in the topic. The notion of active student discussion also indicates that the excursion has provided students with a lot to talk about.

A further group of outcomes illustrates the sort of creative activities that engaged students on their return to school. These include writing and drawing as well as making presentations. The quotes also demonstrate the contribution of the excursion experience

with other aspects of a unit of work resulting in students being able to create a garden bed at school. Evidence from the case studies reveals more detail about the impact of the excursion on students and how they demonstrate their understandings of their experiences at the RBGS.

This category of outcomes can be seen to relate to the previous categories and can be said to provide a further step in the learning sequence that has been reflected in this data. Students have attended to, then interact with aspects of the environment. Students then interact with the environment to achieve a purpose. This category of outcome adds the step where students demonstrate that they have incorporated the experience into their own group of experiences.

d. No statements of process

This category of outcomes has statements that do not involve a requirement for processes. The active stem of the outcome statement relates to students achieving understanding or awareness of a range of content areas or for students to learn about or to complete or reinforce classwork. This category of outcomes also includes two outcomes reproduced below that could be grouped as affective outcomes.

> "To *enjoy* their first look at plants and to find out how seeds germinate."
> (4Yr1 TUS96))
> "To be more aware of places to go. *Arouse interest* in cultures other than their own."
> (13. Year3 TUS96)

This data indicates that affective outcomes may not be uppermost in teachers' requirements for their excursion to the RBGS. The discussion of teachers' reasons for their excursion to the RBGS revealed that teachers place importance on their students enjoying the excursion to the RBGS. Data from the case studies has also revealed enjoyment as a feature of an excursion to the RBGS. A similar statement can be made for the place of the excursion in arousing or increasing student interest in a particular topic.

6.3.3 Discussion

Evidence from this data block enables the following conclusions to be proposed about excursions to the RBGS.

1. For classroom teachers visiting the RBGS, the excursion is a learning experience.
2. Teachers are concerned with both what and how their students learn in the RBGS.
3. Teachers associate the RBGS with study of plants.
4. Secondary science teachers use the RBGS as a resource for their students to learn about plants.

1. Data from Table 6.12 demonstrates that teachers' outcome statements have a clear emphasis on specific content. A detailed look at these responses in (Table 6.13) reveals that 41 responses (93%) relate to specific content about plants, Aboriginal use of plants and/or environments at the RBGS. These responses demonstrate that the teachers involved in this research hold a clear content focus for their excursion to the RBGS. The excursion experience is based on cognitive outcomes. Hence these content statements provide clear evidence that teachers view excursion as a cognitive-based learning experience.

2. Excursions to the RBGS link content and process. Teachers expect their students to be actively engaged and involved in practical, sensory-based learning experiences focussed on plants and environments at the RBGS.

3. The excursion outcomes reveal that teachers from Kindergarten to Year 10 associate the RBGS with study of plants. This clarity of association indicates that for school teachers, the RBGS has a single, identifiable focus on plants.

4. The results demonstrate that secondary teachers involved in this research have a specific focus on plants. The school lesson program of the RBGS (RBGS 1995) offers

lessons to secondary teachers in a range of subject areas however it appears that the RBGS attracts science teachers and specifically science teachers who require their students to learn about plants.

The data indicates the following hypotheses can be made about excursions to the RBGS.

1. The importance of and need for students to see and interact with real living plants.

This data suggests that teachers perceive superiority of the opportunity for their students to see the real, living plant over their seeing other representations of plants such as photographs, drawings or videos. This data provides a sense of the processes by which students can learn from being at the place or in the presence of these real living things. The data suggests that students can not only handle and observe the living material they can also discuss this experience with friends and adults accompanying the group.

2. This data indicates that there are distinct learning processes that teachers require at the RBGS. These processes are characterised by students' direct, sensory interaction with specific components of living environments at the RBGS.

3. The data suggest that learning processes at the RBGS can form a sequence of stages illustrated in Figure 6.1. Each stage can be viewed as a level in a taxonomy of learning experiences.

attending to specific components → interacting with specific components to experience and explore → interacting to achieve a purpose → communicating experiences/observations → demonstrating understanding

Figure 6.1 **Learning sequence**

This data reinforces the emerging conceptualisation of a taxonomy of learning experiences that occur on an excursion to a botanic garden. This taxonomy will be

compared with information from the Literature Review and other data from the case studies and presented in the concluding chapter.

4. Student experiences are related to cognitive rather than to affective outcomes. The excursion outcomes provided by teachers involved in this research provide little indication of the nature and relative importance of the affective outcomes they hold for the excursion.

5. A syllabus of cognitive outcomes for excursions relating to the scientific study of plants can be framed for infants, primary and secondary excursions to the RBGS.
Data from excursion outcomes demonstrates that teachers' statements produce a well-articulated group of outcomes for study of plants. This group of outcomes could be used as a basis for a RBGS K-10 'syllabus' for science-based study of plants.

Observations and issues that can be drawn from the data are listed below.

1. The data from this survey item provides us with little insight into how students will use the experiences, skills or understandings from their excursion to the RBGS on their return to school. The issue of the use of the excursion as enrichment or as an essential component of classwork is raised but not illuminated by survey data. Information from the case study schools is able to provide insight into the nature of the relationship between classwork and the excursion to the RBGS.

2. Teachers' outcome statements for Aboriginal use of plants show evidence of misconceptions and misuse of terms associated with the curriculum area of Aboriginal studies.

3. Teachers' outcome statements for environments at the RBGS provide a narrow view of the potential use of the resources of RBGS for environmental education represented in curriculum documents and policy statements for botanic gardens educators.

6.4 Teachers' views of a botanic garden as a resource

This set of data is from teachers' responses to Question Five in the Teacher Use Survey that was posted to the teachers involved in excursions to the RBGS in Term Two of 1996. Teachers were asked "What can/did you achieve at the RBGS that you may not have achieved in your classroom?" There were 30 responses to this question with two respondents referring the reader to their response to Question Three "What objectives/outcomes were achieved as a result of this excursion?" This section of Chapter Six presents and then discusses teachers' responses to this survey item.

It was the intention of this survey item to probe teachers' reflections on reasons for their use of a botanic garden rather than their classroom. Responses have been read and re-read to determine the range of issues covered by the responses. These issues have been studied and a number of headings have been developed. The survey responses were then grouped according to their similarities under each heading. Most survey responses provide a number of reasons hence Table 6.20 provides many more than 30 responses to the survey item. Teachers' responses to this question item are listed in Table 6.21.

As a result of this process the responses to this survey item have been grouped under the following headings:

- Access to resources
- Observing the real thing
- Availability of practical 'hands on' activities
- Unique learning opportunity
- RBGS staff expertise

A further method of approaching the results was to compare the responses from infants, primary and secondary teachers. This comparison was made using a ratio calculated from the numbers of teachers from the particular schools involved in the survey (6 infants teachers: 11 primary: 13 secondary i.e. 6:11:13). This comparison provides a

general indication of the differences between infants, primary and secondary school teachers. These figures in Table 6.20 indicate that notable differences occur between these groups of teachers. Access to the resources of the RBGS and student observation of the real thing is of highest importance to secondary teachers. Secondary teachers also value the availability of practical activities that would otherwise not be available to their students. Primary teachers are more likely to express an interest in the types of learning experiences their students have at the RBGS. These teachers are more likely to seek resources of the RBGS where their students can interact with the real thing. Infants teachers value the opportunity for their students to see the real thing and the practical nature of the experience. They also recognise that the RBGS has resources that are not available to them at school or in the local environment.

Response Category*	**Responses Infants:Primary:Secondary 6:11:13 n = 30**
Access to resources	3:5:8 53% (16)
Observing the real thing	3:4:7 47% (14)
Availability of practical 'hands on' activities	3:3:4 33% (10)
Unique learning experience	1:5:2 27% (8)
RBGS staff expertise	2:4:1 23% (7)

*Denotes multiple responses

Table 6.20 **Teacher responses to survey item 'What can/did you achieve at the Royal Botanic Gardens that you may not have achieved in your classroom?'**

Access to resources

1. It is always good to have an 'expert' explain/support teaching/learning activities; 'hands on'; *access to resources not available at school* (Inf TUSII96)
2. *We were able to see the variety of plants there are* and compare/contrast them. (Inf TUSII96)
6. *Access to the 'mini world'*. Seeing first hand insects and minibeasts interacting. (Inf TUSII96)
7. Seeing how the sun can tell us the time. *We also did an art lesson of the city scape which they could not have done in class*. Also they used maths skills for a 'real' purpose. (Yr5 TUSII96)
8. A great learning environment. *Work with a recognised accurate sundial* to measure time contrasting with analogue and digital time pieces. (Yr5 TUSII96)
12. *I did not have* either the *resources* or the expertise *to teach the children what your teachers were able to teach.* (2/2 Yr5 TUSII96) [Aboriginal people and their use of plants]
13. Seeing the *plants in a rainforest environment.*(Yr5 TUSII96)
17. Expert lecturer, hands-on experiences, wider range of experiences, *better resources*. (Yr3 TUSII96)
18. Direct observation; *plant diversity* (Yr8 TUSII96)
19. Seeing *live specimens* growing – seeing *huge variety*. (Yr10 TUSII96)
20. Students had hands-on experience of a wide variety of plants from the different groups – *much better variety than would be possible at school* and obviously better than slides/film. (Yr10 TUSII96)
21. Students were able to see specimens of various sizes *which we can't necessarily provide at school.* (Yr8 TUSII96)
22. The actual observation of the plants eg *seaweed, mosses, cacti, cycads, ferns etc* (Yr8 TUSII96)
24. Seeing a wide variety of *living specimens of plants from different classification groups and from various geographical locations*. (Yr8 TUSII96)
27. *Large variety of plants* plus expert guide/lecturer. (Yr8 TUSII96)
30. *Plant samples* – particularly during walk through the gardens. (Yr8 TUSII96)

Observing the real thing

2. We were able to see the variety of plants there are and *compare/contrast them*. (Inf TUSII96)
5. More 'hands-on' experiences; *Observing the 'real thing' – trees*. (5 Inf TUSII96)
6. Access to the 'mini world'. *Seeing first hand insects and minibeasts interacting.* (Inf TUSII96)
7. *Seeing how the sun can tell us the time.* We also did an art lesson of the city scape which they could not have done in class. Also they used maths skills for a 'real' purpose. (Yr5 TUSII96)
10. *In class relied on books and pictures. At BG – visual* and 'hands on' (K/2/3/6 TUSII96)
13. *Seeing the plants in a rainforest environment.*(Yr5 TUSII96)
14. *Actually studying the different plants* – experiencing humidity. (Yr5 TUSII96)
18. *Direct observation*; plant diversity (Yr8 TUSII96)
19. *Seeing live specimens growing – seeing huge variety*. (Yr10 TUSII96)
20. Students had hands-on experience of a wide variety of plants from the different groups – much better variety than would be possible at school and *obviously better than slides/film*. (Yr10 TUSII96)
21. *Students were able to see specimens of various sizes* which we can't necessarily provide at school. (Yr8 TUSII96)
22. *The actual observation of the plants* eg seaweed, mosses, cacti, cycads, ferns etc (Yr8 TUSII96)
24. *Seeing a wide variety of living specimens of plants* from different classification groups and from various geographical locations. (Yr 8 TUSII96)
25. *Observe a range of plants* and observe conditions necessary for growth of plant varieties.(Yr8 TUSII96)

Availability of practical 'hands on' activities

1. It is always good to have an 'expert' explain/support teaching/learning activities*; 'hands on'*; access to resources not available at school (Inf TUSII96)
4. *Hands on* (Inf TUSII96)
5. *More 'hands-on' experiences*; Observing the 'real thing' – trees. (Inf TUSII96)
10. In class relied on books and pictures. At BG – visual and *'hands on'* (K/2/3/6. TUSII96)
16. *'Hands on' experience*; staff had knowledge which I didn't. (Yr3 TUSII96)
17. Expert lecturer, *hands-on experiences, wider range of experiences*, better resources. (Yr3 TUSII96
20. *Students had hands-on experience of a wide variety of plants from the different groups* – much better variety than would be possible at school and obviously better than slides/film. (Yr10 TUSII96)

25. Observe a range of plants and *observe conditions necessary for growth of plant varieties.*(Yr8 TUSII96)
26. Again *students exposed to a great variety of plants.* (Yr8 TUSII96)
28. *The hands-on visual identification components* would have been difficult to include in my classroom. (Yr7 TUSII96)

Unique learning experience
3. Hands on experiences from experts in the field – guided tour of the Gardens – *looking at and for specific reasons.* (Inf TUSII96)
7. Seeing how the sun can tell us the time. We also did an art lesson of the city scape which they could not have done in class. *Also they used maths skills for a 'real'* purpose (Yr5 TUSII96)
8. *A great learning environment. Work with a recognised accurate sundial to measure time contrasting with analogue and digital time pieces.* (Yr5 TUSII96)
9. *The children were able to EXPERIENCE a real rainforest setting.*(K/2/3/6 TUSII96)
14. Actually studying the different plants – *experiencing humi*dity. (Yr5 TUSII96)
15. This term (4) we had a lesson given by the FSC teachers at Jibbon Beach to view engravings, a midden, food sources etc. The teachers there thought the classes were very well prepared – *the children had remembered a lot of what you'd said and shown them.* (Yr5 TUSII96)
23. *It's a far more stimulating environment to learn about plants.* (Yr8 TUSII96)
29. *Students were genuinely interested, came back and wrote an evaluation, used the plants and gathered more.* (Yr9 TUSII96)

Expertise of staff
1. *It is always good to have an 'expert' explain/support teaching/learning activities*; 'hands on'; access to resources not available at school (Inf TUSII96)
3. *Hands on experiences from experts in the field – guided tour of the Gardens* – looking at and for specific reasons. (Inf TUSII96)
11. *The expertise and enthusiasm displayed by the teaching staff towards the learning experiences.* Of course being a new teacher (beginning) I am enthusiastic however I don't have the expertise that your staff have! (Yr5 TUSII96)
12. *I did not have* either the resources or *the expertise to teach the children what your teachers were able to teach.* (Yr5 TUSII96)
16. 'Hands on' experience; *staff had knowledge which I didn't.* (Yr3 TUSII96) [Aboriginal people and their use of plants]
17. *Expert lecturer*, hands-on experiences, wider range of experiences, better resources. (Yr3 TUSII96)
27. Large variety of plants plus *expert guide/lecturer.* (Yr8 TUSII96)

Table 6.21 **Categories of responses to survey item 'What can/did you achieve at the RBGS that you may not have achieved in your classroom?'**

6.4.1 Access to resources

It is expected that teachers would include the plants and special environments of the RBGS. Teachers in this group mention specific resources available at the RBGS and these are listed as follows:

- plants; live specimens; wide variety of plants; diversity of plants; plants from different plant groups; plants from different geographical locations
- special environments: rainforest

- special environments: rainforest
- animals: insects
- other resources: sundial
- location of the RBGS.

The data suggests that access to resources is an important feature for secondary teachers. Responses in this group mention that the RBGS has resources that are not available at school or the resources of the RBGS are better than what is available at school. The following examples are typical of the responses in this group.

> "Seeing a wide variety of living specimens of plants from different classification groups and from various geographical locations."
> (24. Year 8 TUSII96)
> "I did not have either the resources or the expertise to teach the children what your teachers were able to teach."
> (12. Year 5 TUSII96)
> "Access to the 'mini world'. Seeing first hand insects and minibeasts interacting."
> (6. Infants TUSII96)

Teachers' responses provide an insight into the features of the living plant resources of the RBGS that they perceive to be most important. For infants, primary and secondary teachers the wide variety of plants growing at the RBGS is an important feature. For secondary science teachers specific examples of taxonomic groups of plants are available at the RBGS. Primary and secondary teachers require plants from specific environments such as rainforest plants. This information provides a strong focus for the living collection of plants found at the RBGS. It appears that school groups value the variety of plants found at the RBGS and specifically plants from a range of taxonomic groups and from specific geographical environments.

6.4.2 Observing the real thing

This survey question has highlighted the importance of students being able to see the real object at the RBGS. Teachers from all school groups value the visual experience of their students being able to see the real, living thing. The data suggests that students learn about these real things using their senses. Furthermore teachers go on to indicate cognitive aspects and advantages of seeing the real thing. Students are able to make observations and are able to compare and contrast on the spot. Learning is immediate.

Another feature expressed in these responses is that teachers value their students seeing the real thing over seeing pictures in books, slides or videos. The following are examples of typical responses in this group.

> "In class relied on books and pictures. At BG – visual and 'hands on'."
> (10. Primary TUSII96)
> "The actual observation of the plants eg seaweed, mosses, cacti, cycads, ferns etc."
> (22. Year 8 TUSII96)

One of the implications for the RBGS itself is that the object of interest is accessible to students. It is clear from these responses that students are able to physically interact with the plant or the sundial or whatever is the focus of attention. This aspect is also a feature of the following group.

6.4.3 Availability of practical 'hands on' activities

Teachers in this group value the practical nature of their students' experiences at the RBGS. The term 'hands on' was frequently mentioned in this group. There are many interpretations of this term but responses provide the sense that the term implies students being involved in practical experiences including physical handling of plants. The term 'hands on' implies the tactile nature of the experience – another sensory aspect of the excursion.

The teacher ratio for this response indicates that the practical, interactive nature of the excursion is valued by all groups of teachers – particularly by infants teachers. The following quotes are typical of the responses in this group.

"*More 'hands-on' experiences*; Observing the 'real thing' – trees."
(5. Infants TUSII96)
"Expert lecturer, *hands-on experiences, wider range of experiences*, better resources."
(17. Year 3 TUSII96)
"*The hands-on visual identification components* would have been difficult to include in my classroom.
(28. Year 7 TUSII96)

Similar to the previous group, this group of responses also indicates that the resources of the RBGS are accessible to students. Further implications of this category include the ideas that resources of the RBGS can be handled and that practical activities are made available to school groups. It appears that these practical experiences are not otherwise available to students.

6.4.4 Unique learning opportunity

This group of responses relates to the type of learning experience that students can have at the RBGS but not in the classroom. Close study of the responses reveals a number of aspects relating to this learning experience:

- using skills for a real purpose
- experiencing environments
- the motivational aspect of the excursion.

Three teachers mention that their students are using the skills learned at school for a real purpose when they are involved in activities at the RBGS. For example:

"Hands on experiences from experts in the field – guided tour of the Gardens – *looking at and for specific reasons.*"
(3. Infants TUSII96)

"Seeing how the sun can tell us the time. We also did an art lesson of the cityscape which they could not have done in class. *Also they used maths skills for a 'real' purpose.*"
(7. Year 5 TUSII96)

Emerging from the data and potentially a very powerful aspect of the experiences students have at the RBGS, is being physically immersed in a special environment. Teachers working on rainforests bring their students to the RBGS to experience the humidity of a rainforest-like environment as demonstrated by the following quotes.

"The children were able to EXPERIENCE a real rainforest setting."
(9. Prim TUSII96)
"Actually studying the different plants – experiencing humidity."
(14. Yr5 TUSII96)

These two responses indicate the sensory nature of student experiences at the RBGS allowing students to 'experience' particular scientific concepts such as humidity. Furthermore it would be difficult for students – particularly primary students to grasp the concept of humidity. Humidity cannot be seen – we cannot see water in the air – but it can be experienced. These responses indicate that the experiences students have on excursion help them to construct personal understandings about selected scientific concepts such as rainforests and humidity.

Four teachers – two primary and two secondary teachers state the motivational aspects of the excursion cannot be matched at school. The excursion to the RBGS interests, stimulates and motivates students as seen in the following quotes.

"This term (4) we had a lesson given by the FSC teachers at Jibbon Beach to view engravings, a midden, food sources etc. The teachers there thought the classes were very well prepared – *the children had remembered a lot of what you'd said and shown them.*"
(15. Year 5 TUSII96)
"*Students were genuinely interested, came back and wrote an evaluation, used the plants and gathered more.*"
(29. Year 9 TUSII96)

The first of these quotes focuses on the memorable nature of the excursion for these Year 5 students. These students had visited the RBGS more than six months before their excursion to Jibbon Beach yet they are able to transfer what they had learned at the RBGS to a new environment. It appears that the excursion experience is memorable for students and that students recall and use in different settings what they have learned at the RBGS.

The second quote focuses on the motivation aspect of the excursion for Year 9 students. It appears that this group of students demonstrated their interest by being actively involved in learning activities on their return to school. This response indicates that these students are able to locate and identify plants they have learned about at the RBGS. It appears that students were able to transfer the knowledge about particular plants gained at the RBGS back to their school environment.

6.4.5 RBGS staff expertise

The responses in this category indicate that infants and primary teachers seek RBGS expertise with science and with Aboriginal studies. This may reflect two issues. Firstly primary teachers typically demonstrate strengths in syllabus areas other than science – put simply primary teachers are not primary teachers because of their love of science. Hence access to an enthusiastic science communicator can provide their students with a range of opportunities including instant answers to student questions and a positive role model for science.

Secondly these teachers mention the lack of information about Aboriginal use of plants and look to the staff at the RBGS to provide this information and experience for their students.

Typical responses in this category include the following.

"It is always good to have an 'expert' explain/support teaching/learning activities; 'hands on'; access to resources not available at school."
(1. Infants TUSII96)
"I did not have either the resources or the expertise to teach the children what your teachers were able to teach."
(12. Year 5 TUSII96)

Responses suggest that input provided by the RBGS staff is a feature of an excursion to the RBGS. Teachers in this survey – particularly infants and primary teachers recognise the specific expertise of Gardens staff. These responses add to the data relating to the role of the RBGS education staff involved with school groups. These teachers describe this role as including the following:

- explainer
- to support teaching/learning activities
- tour guide
- expert lecturer.

Attributes of the RBGS education officer indicated by these responses include:

- knowledge of the RBGS
- enthusiasm for the learning experience
- knowledge of plants
- knowledge of Aboriginal use of plants
- ability to communicate these understandings to students.

6.4.6 Discussion

This data block has illuminated teachers' perceptions of the importance of their students learning being sited at the RBGS. Teachers' responses provide a sense of the educational features of the RBGS that relate directly to teachers' requirements. Teachers' responses reveal the following four requirements of the living plant collection at a botanic garden.

1. Plant displays that are relevant to school groups include thematic plantings from distinct habitats such as rainforest and arid areas. The physical environments associated with these plant displays provide a well-defined area to focus student exploration and observations.

2. A botanic garden grows a wide variety of living plants that are not otherwise available in the local environment of the student. For secondary science students this variety of plants is required to include displays of land plants other than flowering plants – these groups include cone-bearing plants, ferns and bryophytes.

3. The collections of plants displayed at a botanic garden needs to be physically accessible to students and to be able to withstand handling by large numbers of school students.

4. The physical environments created at a botanic garden should provide students with a sense of being immersed in a unique space. A wide range of healthy, spectacular and unusual plants occupies this space.

This survey item provides further illumination of teachers' requirements of the botanic garden educator. Teachers' responses demonstrate that they require content expertise beyond that of a normal primary or secondary classroom teacher. Teachers also require the botanic garden educator to demonstrate enthusiasm for the excursion experience and familiarity with places and activities at the garden that will support student learning.

Teachers' responses highlight the practical nature of the experiences their students' have at the RBGS. There is a clear association between these practical experiences and students increasing their understandings of plants and environments at a botanic garden. Teachers at all levels are prepared to take their students beyond the classroom and school to the environment of a botanic garden to provide the opportunity for these practical activities with the plant collections displayed at a botanic garden.

6.5 Teachers' criteria for evaluation of the excursion – the 'worthwhile' excursion

One of the significant themes that has emerged from the teacher survey data is the notion of the 'worthwhile' excursion. A group of 14 responses from the written surveys conducted in 1996 were able to provide a profile, based on these teachers' perceptions, of a worthwhile excursion. The sample included five teachers of infants classes, seven primary teachers and two secondary science teachers. These teachers had stated that they thought their excursion to the RBGS was a 'worthwhile' experience and the complete survey response from each teacher was studied to see if there were commonalties between the responses. These commonalties could then be used to build up a description of a worthwhile excursion.

Study of the data indicated that there were significant commonalities between the responses. All responses shared a number of features that are explored in the following sections:

- excursion is part of a teaching sequence in a specific unit of class work
- excursion as a memorable experience
- RBGS as a resource for learning
- RBGS as a real context for learning
- interaction between students and RBGS
- immediacy of the learning environment
- excursion is an enjoyable experience
- a busy full day

6.5.1 Part of a teaching sequence in a specific unit of class work

All 14 teachers involved in this sample stated the unit of work that brought their class to the RBGS. Four of the five infants teachers were doing a science and technology-based unit with the fifth teacher doing Aboriginal studies. Of the primary teachers, six were doing the HSIE-based Aboriginal Studies and one teacher was doing a science and

technology-based unit. Both secondary teachers were science teachers doing a science-based unit on plants. The excursion was embedded in the classwork for this unit and served a specific role in the sequence of learning activities the teacher had planned for their students.

Many of these teachers could describe where the excursion fit as part of their unit. The following quotes demonstrate how these teachers have placed the excursion.

> "Good timing. We have 2 more weeks on this unit so I should help consolidate what we learnt."
> (11. q5 Primary TUS96)
> "Completed the unit of work on plant classification quickly and efficiently."
> (21. q3 Year 8 TUSII96)

For the majority of these teachers it was clear that the excursion was embedded into their teaching sequence for the unit. The excursion experience was to be used to consolidate and extend classroom learning. Students would learn specific content and have specific practical experiences that would assist them in their classwork. Students' experiences on the excursion would be used in classwork after the excursion.

> "After theory and research lessons, the excursion was the practical lesson used to culminate the unit by giving children knowledge and skills to design and make."
> (17. q4 Year 3TUSII96)

Teachers anticipated that their students would have practical experiences and access to resources and expertise that could not be duplicated in their classrooms at school.

> "I did not have either the resources or the expertise to teach the children what your teachers were able to teach."
> (12. q5 Year 5 TUSII96)

Specific content and practical experiences are uppermost in these teachers' minds. Teachers expressed clear observations about what their students had learnt and experienced while on the excursion. The following responses from an infants teacher demonstrates that learning outcomes are often expressed in terms of the observable behaviours that students have when they return to the classroom after the excursion.

> "The children were able to explain what a plant is. The children could show the parts of a plant." (q3) and
> "They had so much to report when they came back and were using the correct terms." (q5)
> (2. Infants TUSII96)

Clearly these young students can demonstrate what they have learned on their excursion. In their explanations and identifications the students have adopted the scientific language modelled by the RBGS.

6.5.2 The excursion as a memorable experience

Another point of commonality for this group of teachers is their observation of the impact that the excursion has on their students. Many teachers stated that the excursion was a special experience and a highlight for their students. The following quote demonstrates both the notion of the excursion as a highlight and the allied concept that the excursion is a memorable event in the school calendar. The quote contains the teachers' recollections of the day (q1) and her response about how the excursion fit into her existing program (q4).

> "Highly professional staff with a real dedication to their work. A highly informative programme *which our students still talk about.*" (q1)
> "It was actually a 'focal' point to which we could refer." (q4)
> (16. Year 3 TUSII96)

The persistence and clarity of students' memories of this excursion surprise many teachers included in this sample. The following quote was made by a primary teacher

who had brought a group of ESL students to the RBGS with the general outcome of increasing their awareness of Australian history. The excursion was one of a number of trips for these students serving to broaden their contact with the Australian environment.

> "This term (4) we had a lesson given by the FSC teachers at Jibbon Beach to view engravings, a midden, food sources etc. The teachers there thought the classes were very well prepared – the children had remembered a lot of what you'd said and shown them."
> (15. q5 Year5 TUSII96)

This quote provides further evidence for the nature of learning on an excursion to a botanic garden. The excursion to the RBGS provides experiences for students that form part of their more permanently held learning memory.

6.5.3 RBGS as a resource for learning

The RBGS provides a wealth of input for visiting students. Teachers select from this rich resource those experiences and specific information that will complement classwork with their students. The RBGS is used as a resource in the following ways:

- seeing the real thing
- source of information
- source of practical activities.

a. Seeing the 'real thing'

Uppermost in teachers' minds is that their students will see the 'real thing' at a botanic garden. These teachers want to focus students' attention on specific plants/animals and/or environments, relating this experience to classwork and the unit of work being studied.

> "Seeing first hand insects and minibeasts interacting."
> (6. q5 Infants TUSII96)

"Students were able to see specimens of various sizes which we can't necessarily provide at school."
(24. q4 Year 8 TUSII96)

The data also suggests that teachers highly value the opportunity for their students to see for real what they had previously seen as pictures, slides or video.

b. Source of information

The RBGS can be used as a source of information for the teacher and his/her students. Schools access information from a range of sources at the RBGS and these include the plants and plant displays themselves, RBGS staff and printed signs and brochures available at the RBGS.

The following quote is a Year 5 teacher's learning outcomes for the excursion (q2) and her comment about what she could achieve at the RBGS that she may not have in her classroom(q5). This teacher has specific expectations about what information her students will access while they are on this excursion. The majority of responses have equally as specific outcomes for the excursion.

"My class was studying Aboriginal culture and I wanted them to find out what local vegetation would have been utilised by Sydney based tribes." (q2)
"I did not have either the resources or the expertise to teach the children what your teachers were able to teach." (q5)
(12. Year5 TUSII96)

Furthermore it is clear that she was not able to provide this information for her students at school. Many responses similar to this imply that such information may not be readily available to schools and hence the RBGS is providing a unique source of specific information for school students.

c. Source of practical activities

Many respondents state that the RBGS provides the practical component that is essential to complete the specific unit of classwork. Both secondary science teachers are found in this group. Their responses indicate that students complete the practical work set for their unit of work on plants at the RBGS.

> "Completed the unit of work on plant classification quickly and efficiently. (q3)
> Students were able to see specimens of various sizes which we can't necessarily provide at school." (q4)
> (21. Year8 TUSII96)
> "It provides a practical on work done in class."
> (23. q4 Year 8 TUSII96)

Hence teachers state that they use the RBGS as a resource to enrich and extend the learning experiences of their students. Their students have a special opportunity to see at first hand specific resources, have immediate access to specific expertise and information and practical activities that are relevant to the unit of work they are studying at school.

6.5.4 RBGS as a real context for learning

Teachers from this sample were also interested in the RBGS being a part of the wider community. The Gardens are part of the real world beyond the classroom where students' work on a particular topic can take on relevance and meaning. Teachers involved in this sample indicated that they use the RBGS as a real context within which students can translate their understandings and skills from the classroom to a real practical situation.

> "The excursion reflected in a very practical way what I had been teaching my class on minibeatsts."(q1) and

"...most of the minibeasts that were discussed and investigated on the excursion we had looked closely in class." (q4)
(6. Infants TUSII96)

This quote demonstrates that these students have had the opportunity to transfer their understandings about bugs and beasties from the classroom to the RBGS. At the RBGS the students are searching for the animals that they have learned about at school.

Furthermore the understandings and skills learned in this real context can be transferred back to the classroom to inform class projects and activities. The following quote describes the situation where students have transferred the horticultural skills learned at the RBGS to their school situation. The children have visited a venue where garden making is a profession. The children have spoken with horticulturalists about making gardens and have not only translated these skills to the school environment they have synthesised their understandings to create their own garden.

"Children identified plants that are native to our local area. Children used this knowledge to establish a native garden at school. (q3) and
After theory and research lessons, the excursion was the practical lesson used to culminate the unit by giving children knowledge and skills to design and make." (q4)
(17. Year3 TUSII96)

This teacher went on the make the following final comment about the excursion.

"One of the most pertinent excursions we've had closely aligned with the Science & Technology curriculum."
(17. q6 Year 3 TUSII96)

The RBGS is a real context for science and scientific work. Gardens staff model and communicate their understandings with visiting students of all ages. Students can see the relevance of specific information and classwork becomes more meaningful. The

following quote indicates that even for an infants class the visit to the RBGS has made an impact on their familiarity with science and the language of science.

> "They (children) had so much to report when they came back and *were using the correct terms*."
> (2. q6 Infants TUSII96)

6.5.5 Interaction between students and RBGS

These teachers expect and value direct, practical interaction between their students and the resources of the RBGS. The term 'hands on' seems to be used by the teachers involved in this sample as a term synonymous with their students being involved in practical activities and also being able to handle resources and materials.

> "Children enjoyed the hands on experiences of holding dilly bags, clapping sticks, womeras etc."
> (12. q5 Year5 TUSII96)
> "Enjoyable! Informative! The lesson was pertinent to our unit. I liked the hands-on approach." (2. q1 Infants TUSII96)

Students interact with the RBGS by using their senses. Students' experiences can be tactile as demonstrated in the following quote from a Kindergarten teacher.

> "To be able to see a variety of plants in their natural environment; to be able to 'touch' and identify different part of the plants."
> (1. q2 Kindergarten TUS96)

A further component of the sensory nature of the experience is the idea of experiencing a particular environment. Teachers using the Tropical Centre comment that their students are able to 'experience' humidity. There is a sense of being surrounded by a tactile experience.

6.5.6 The immediacy of the learning environment

Teachers comment on their students being able to learn on the spot. Students can observe and discuss particular features of the RBGS while being directly at that feature. There is instant access to feedback either by using students' own observations or by obtaining feedback from RBGS staff accompanying the group. It seems that information that is accurate and relevant to the students is also immediate and inexhaustible. Again we encounter the notion of being immersed in or surrounded by a learning environment.

> "We were able to see the variety of plants there are and compare/contrast them."
> (2. q5 InfantsTUSII96)

This quote also indicates that students move beyond observations to making generalisations about plants. This infants class is using the resources of the RBGS to build their concept of plants. They are looking for similarities and difference between plants. They are observing for a purpose. The teacher of this very young class is directing and focusing her students' observations.

The following quote also demonstrates this sense of the immediacy of the learning experience.

> "To see first hand the types of plants grown by the first settlers.
> To experience at first hand the plants used by Aborigines."
> (11. q2 Primary TUS96)

This teacher is also focussing and directing her students' observations and experiences. These students will be working at specific sites at the RBGS for specific purposes. These students are not at the RBGS as tourists. It is obvious that they are at the RBGS to be exposed to specific experiences that are coherent and that relate directly to work being done at school. These students are at the RBGS to learn.

6.5.7 The excursion as an enjoyable experience

It is a common feature of these responses that teachers and students both enjoy the day. It is apparent that teachers and their students have an enjoyable day and that the groups find learning an enjoyable experience. Teachers find that their students are excited and motivated by the excursion. The following quotes are the recollections of the two secondary teachers about their excursion to the RBGS and demonstrate that even adolescents respond favourably to the learning situation at the RBGS. The third quote is from a Year 5 teacher and provides an image of a relaxed and hassle-free excursion.

> "The girls working with interest on the material provided."
> (21. q1 Year 8 TUSII96)
> "Casual. The presenters were well prepared and the plant 'lab' was enjoyed by our students."
> (23. q1 Year 8 TUSII96)
> "An enjoyable day, in a beautiful setting where the children, parents and I were made welcome and received valuable information."
> (12. q1 Year 5 TUSII96)

6.5.8 The busy full day

It appears that this group of teachers makes full use of their excursion day. The majority of responses leave the reader with the impression that the day was very busy. The following quote is a Year 6 teacher's recollection of the day (q1) and her comments about how her groups used the RBGS after the lesson (q6).

> "A lot of input for the students, very much hands on in the classroom and on the walk." (q1)
> "Yes – looked at the First Farm section of the gardens – tried to imagine what life was like both for the first white settlers and Aborigines. Compared food eaten then and now." (q6)
> (15. Year6 TUSII96)

6.5.9 Discussion

This presentation and discussion of teachers' conceptualisation of a 'worthwhile' excursion has provided a summary and overview of classroom teachers' perceptions of

an excursion to the RBGS. The most significant feature shared by all the responses was the use of the excursion as an educational tool. These teachers had strong expectation that their students would learn from the excursion and that learning would take place while students were on excursion. The excursion formed part of the lesson sequence for a particular unit of classwork. The excursion would provide opportunities that were not available at school. These opportunities included being able to see the 'real thing', have 'hands on' experiences and access to resources and specific expertise. Students would have an opportunity to understand that they could learn in places other than their school classroom.

Teachers stated that their students returned to class demonstrating observable learning behaviours. The excursion was a critical component of classwork providing a rich reservoir of memorable experiences to which the teacher and students could refer. The teacher's view of the excursion was that they were moving their students' learning environment from the classroom to the RBGS for the day. For these teachers the excursion was not primarily a respite from school or an extra-curricula activity. Nor was the excursion an isolated event in the school calendar. It was tightly tied to current classwork and would provide unique learning experiences for their students.

Chapter Seven **GUIDING PRINCIPLES**

Guiding principles address the issue of using the resources of a botanic garden to the best educational advantage for learners, specifically students visiting a botanic garden on a school excursion. As a product of this research they are written to inform rather than to dictate the practice of botanic garden educators. This set of principles has been derived from research of a wide range of participants involved in school excursions to botanic gardens. The research has included practising educators in four botanic gardens on Australia's east coast as well as the teachers and school students associated with the case studies and surveys described in Chapters Four, Five and Six.

The guiding principles were derived from data associated with the RBGS and may be seen to apply exclusively to the RBGS. Validation of this set of guiding principles was sought from a reference group of twelve educators from botanic gardens in Australia and from overseas to determine the extent to which the principles applied to practice in botanic gardens in Australian and to gardens in Britain, Europe and America. The principles were piloted and then emailed to 28 botanic garden educators in Australia, Britain, Europe and America, twelve replied by return email.

Table 7.1 presents responses to the question about the degree to which the principles are appropriate to the school programs in their particular botanic garden. A response of 'a' represents 'very much so', 'b' represents 'in part' and 'c' represents a response of 'not appropriate'. Comments from the reference groups are included with the following discussion of each of the eleven guiding principles.

The primary sources for this data are:

- In-depth interviews with Education Officers in botanic gardens and field study centres on the east coast of Australia.
- Email responses from a reference group of twelve botanic garden educators in Australia and from overseas botanic gardens.

	Relevant	Plant focus	Big picture	Accuracy	Using real plants	Personal communi cation	Sensory	Prior understan dings	Learning styles	Fun	Best practice
Pilot Australia	a	a	a	a	a	a	a	a	a	a	a
1 A Britain	a	a	c	b	a	a	a	a	a	a	a
1B Mexico	a	a	a	a	a	a	a	a	a	a	a
1C Belgium	a	a	a	a	a	a	a	a	a	a	a
1D Britain	b	b	b	b	b	b	b	b	b	b	b
2E USA	a	a	a	a	a	a	a	a	a	a	a
2F France	b	a	a	b	a	b	a	a	a	a	a
2G Australia	a	a	b	a	b	a	a	a	a	a	a
2H Australia	a	a	a	a	a	a	a	a	a	a	a
2I Australia	a	a	a	a	a	b	a	b	b	a	a
2J Australia	a	a	a	a	a	a	a	a	a	a	a
2K Australia	a	b	a	b	a	a	a	a	a	a	a

Table 7.1 **Reference Group responses to survey item: 'To what degree do you believe these are appropriate guiding principles for school programmes in your botanic garden?'**

- Written responses to surveys from classroom teachers and their students involved with activity sessions at the RBGS.
- In-depth semi-structured interviews conducted with classroom teachers and their students after their visit to the RBGS.

The following chapter presents and discusses each guiding principle and includes comments from the reference group of botanic garden educators.

7.1 For school groups the messages, resources and learning situations encountered at a botanic garden must be relevant to the curriculum, teachers, students and the environment of schools.

The overriding issue for both botanic gardens educators and classroom teachers involved in this research is the relevance of the school programs in botanic gardens to school curricula. The overwhelming nature of the responses from classroom teachers involved in this research places curriculum relevance as a priority in preparing school programs at the RBGS. Based on the evidence from classroom teachers involved in this research, teachers visit a botanic garden because they perceive that the experience is relevant to their class work with their students. Botanic garden educators expressed equal concern.

> "I'm not driving this (lesson content) she (the teacher) must have a syllabus-based, program-based agenda.....Teachers have expectation and they are able to verbalise those in curriculum terms.... So we are keeping up with new syllabus documents. It's fundamental to our process."
> Interview. BG3, BG2. October 1998.

> "In all our lessons teachers are looking for practical, hands on work to meet their curriculum needs – I don't think they would come to a lesson that wasn't curriculum based."
> Interview BGE1, BG4 March 1999.

The classroom teacher is the key element in the excursion. It is their decision to bring their students on excursion, it is their choice of activities and topic that provides the

framework for the activities at the RBGS. An important finding of this research is that teachers hold a clear expectation that their students will learn on their excursion to the RBGS. The data from both the case studies and teacher surveys provides a strong sense that teachers have moved the site of their students' learning from the classroom to the RBGS for the day.

This research has also revealed that students also hold expectations for learning on their excursion. The learning expectations of both teachers and students co-incides most clearly when these expectation relate to study of plants. The findings of this thesis demonstrate that students across their years of schooling can and do focus on plants and environments at the RBGS and these aspects of the excursion form their long-term recollections of the event.

Removing students from the physical environment of the school and allowing them to learn in a different place can help to make schooling more relevant to students.

> "School yards don't have those magical places that are memorable to those students. Their schoolyard is so familiar to them. They do something in the schoolyard – I don't think it makes as big an impact as something that's perhaps larger scale, just different being on excursion."
> Interview. BGE1, BG4. March 1999.

> "One of the things I think we should aim for whenever we do a lesson is to provide something they can't do at school."
> Interview. BGE2, BG4. March 1999.

This research has revealed that the physical environment at the school may not contain plants. Indeed classroom teachers state that a purpose of their visit is for their students to experience expanses of lawn and green space.

> The students have "never seen grass before.... For those children how a plant works is completely irrelevant. Their rolling on the grass is the experience of the day."
> Interview. BGE3, BG2. October 1998.

There are many administrative components of the school environment that impact on an excursion to a botanic garden. The most obvious of these are safety aspects of an excursion and the time constraint. Botanic gardens appear to offer a familiar environment for teachers and students.

> "It's more structured than going to an open space or a natural area and safety is a big thing. They've (botanic gardens) got proper paths to walk along, they've got access to first aid .... There's not that big element of unknown. If you get teachers that come here – who've never been to the botanic gardens – even though the botanic gardens in unknown to them – overall it doesn't offer that sense of the unknown. Like going to a state forest or a reserve would do. That's part of the safety thing – lack of stress on the teacher's part."
> Interview. BGE2, BG4. March 1999.

School groups have a limited amount of time to interact with the botanic gardens. For the RBGS school groups spend up to four hours at the Gardens. Schools involved in this study spend up to two hours of this time with education staff.

> "I've got an agenda. I want these kids to get as much out of the day as possible."
> Interview. BGE3, BG2. October 1998.

> "The groups are here for an hour and a half so it seems a pity to waste that time on things they could do elsewhere."
> Interview. BGE2, BG4. March 1999.

> "You are able to see here 5 different communities in the space of 90 minutes."
> Interview. BGE1, BG4. March 1999.

It is evident from the three previous quotes from botanic gardens educators that they are well aware of maximising the educational opportunities for school groups on an excursion to a botanic garden. As Table 7.1 demonstrates ten of the twelve members of the reference group agree with this principle. Two representatives from Europe commented that the botanic garden has its own messages that are important.

> "The message we give to the school groups could be different than the official school programs. For example, we make particularly (sic) education about plants threatened by

extinction. We speak about conservation with primary school, even if this theme is not study (sic) before the secondary school."
Email survey. 2F. January 2003.

"BGs have their own agenda like plant conservation and a fascination of how plants function and adapt to different environments. And we should try to mix these with the information we offer. Groups often set out to find information on this or that subject ... but what we should always try to add specific info as well, to touch other areas and other subjects, not only those that a group expects to find. This being said, I believe we should always start by addressing the issue the group is interested in but to try to take a little further."
Email survey. 1C. August 2002.

7.2 Botanic gardens have an identifiable and unique focus on plants. Teaching and learning strategies selected by botanic garden educators should promote understanding of, interaction with and awareness of plants and their importance in our world.

A major contribution of this research is the revelation of the clarity of focus on plants. Even the youngest students involved in this research recognise that they have come to the RBGS to see, to study or in some way to learn about its plants. The power of such a simple association is a critical factor for botanic gardens to recognise, use and to maintain as a primary focus for education programs.

"They're handling a flower with a really unusual exotic shape which they wouldn't see otherwise and they actually look at it and appreciate it. So it is teaching appreciation of plants."
Interview. BGE1, BG4. March 1999.

The twelve members of the reference group agreed with this principle with one respondent – an Australian commenting that a botanic garden can offer much more than study of plants.

"Plants and thematic garden displays are objects or interpretive hooks used to explore much wider environmental and cultural themes other than just plants."
Email survey. 2K. January 2003.

Evidence from this thesis suggests that the focus of an excursion to the RBGS can extend beyond plants and environments and move to exploring cultural views of plants and their uses. In this situation data from this thesis suggests that the content and pedagogical focus of the excursion are less distinct that when the focus is on plants and environments. Teachers do not express clear, well-articulated learning outcomes and their students may not be able to identify the learning purpose for their excursion.

As discussed in the Literature Review, botanic gardens are concerned with focussing public concern on plant conservation and behaviour that promotes a sustainable lifestyle. Evidence from this thesis demonstrates that teachers do not often choose to explore these themes at the RBGS even though they are apparent in school syllabus documents and in the lesson programme offered to schools be the RBGS.

7.3 Underlying education programmes for school groups visiting a botanic garden should be a 'big picture' concept that is relevant to that programme and its participants.

'Big' picture messages provide an underlying theme for a particular educational activity. While the main focus is obviously about plants there would be one or two further 'big' ideas underlying the purpose of the visit. Discussions with education professionals about their work revealed that 'big' ideas were uppermost in their responses about the value of their work. It seems that 'big' ideas underpin each session with school students.

> "You show the kids the plants – but you talk about the animals and when they see how relevant the plant is then they are slipped into their next phase of understanding – is that the plants exist but the animals can't exist without the plants."
> Interview BGE3, BG2. October 1998.

The 'big' ideas encountered during this research have been mostly content based however there is no reason to exclude or ignore skills-based and attitude-based 'big' ideas. This research has indicated that a critical factor in the excursion event is the

short time spent in this educationally rich environment hence the need for educators to refine and focus educational activities.

Research conducted by Falk & Dierking (2000, 1997) as well as this study of student recollections of their excursion reveals that there is some recollection of very general ideas. At the RBGS students' recollections relate to the wide range of plants and to plant adaptations and are relevant to the learning outcomes required by classroom teachers. The 'syllabus' of plant-related outcomes presented in Chapter Six is a starting point for articulating the major plant-related 'big ideas' that may underpin these sessions with students.

Study of the responses from Table 7.1 reveals that one response in this category display a 'c'. Unfortunately there is no reason provided for this opinion that the guiding principle is not relevant to the school program in this botanic garden. However the remainder of the responses are positive.

> "Given that we only have students for a very brief time on excursions compared to their teachers I think we are very much after a high impact, motivational input that paints the broader brushstroke of the 'big picture' story in the hope that this generates momentum for further learning in the classroom. Hopefully we are also looked upon as an educative resource for the teachers because of our more specialist knowledge in relation to plants, culture and environment. Look at 2 or 3 key ideas in our programs and hope these messages leave with the students."
> Email survey. 2K. January 2003.

7.4 A tradition of authority is associated with the scientific and horticultural knowledge base of botanic gardens. Teaching and learning strategies should communicate concepts and skills that are scientifically accurate.

The scientific and horticultural staff of a botanic garden would be recognised as world experts in their particular area of work. A botanic garden would see also themselves as examples of excellence in horticultural practices. Where botanic gardens have scientific staff they are world experts on plant taxonomy and conservation of plants. The authority of a botanic garden would relate to the accuracy of the information it

provides to a range of groups about plant-related issues. Scientific publications from the RBGS include a four volume series on the plants of New South Wales; two scientific journals relating to the taxonomy (*Telopea*) and ecology (*Cunninghamia*) of plants. RBGS scientific staff also provide expertise for a number of governmental and community groups.

There are many unique features learning environments in scientific institutions such as those found in botanic gardens and museums. Firstly there are real scientists working in these places and these people are content specialists. Secondly education staff who are aware of the expertise within their institution can access this source of information. Education staff generally have some knowledge of the content areas – enough to frame useful questions and then be able to interpret the scientific response so that it is accessible to a particular audience or target group. In many cases it is appropriate to utilise the communication skills of education staff to simplify and deliver the scientific and horticultural messages of a botanic garden.

> "...we need to capture hearts as well as minds, so some artistic license needs to come into programs that for example use the arts as a vehicle for learning. Our language should be at an appropriate level and style so that it does not become too jargonistic and clutter and alienate student learning."
> Email survey. 2K. January 2003

Community recognition of the tradition of authority of a botanic garden has an impact on education programs. Teachers and students hold expectations about their access to information and expertise held by a botanic garden and furthermore this research has demonstrated that students and teachers appreciate access to the expertise of botanic gardens staff.

Inspection of Table 7.1 reveals that this principle is least highly regarded by the reference group. Indeed the following quote reveals a highly negative response to the notion of scientific accuracy.

> "I am least concerned with this item. I do not think that the public perception of information provided by botanic gardens is accurate. I do think that the horticulturalists

and botanists associated with Botanic Gardens may perceive their own assumptions as being accurate. We have to admit that we do NOT know everything about plants, and that we are still finding that many of our ideas need changing. We have to be open to change, to accept new findings, or even old ideas that may have some merit."
Email survey. Pilot. July 2002.

Issues of scientific accuracy and world-recognised expertise can signal a theory of education where knowledge is a body of information that is to be transferred from the botanic garden to its visitors (Hein 1998). Hein's model for developing an educational stance for a museum illustrated in the Literature Review suggests that such an education theory supports a didactic pedagogical approach.

"We take this further because of the herbarium and our huge data bases as well as conservation and research activities. We include the scientific/research issues in our meet and greet and in the Intro to the Gardens activity – we have pre-determined the main messages that are to be delivered."
Email survey. 2I. January 2003.

The tone of the above quote suggests that visitors involved in these activities may be expected to receive the information about this botanic garden 'delivered' as an intact message. Research of the learning situation in scientific institutions (e.g. Falk & Dierking 2000) and evidence from this thesis suggests that this expectation most probably would not be realised. Further consideration is required to balance the scientific principle of accuracy with the 'learning principle' of visitors constructing their own understandings. The following quote demonstrates a possible way of viewing the situation.

"It's important to show to the children that Science is not only boring and stiff, and that it's possible to have a good scientific process also with fun, curiosity and surprise."
Email survey. 2F. January 2002.

7.5 In a botanic garden living plants, plant displays, special environments and landscapes can be used to demonstrate clearly, unambiguously and spectacularly particular understandings, skills or values. Teaching and learning strategies should allow every student to observe and interact with living plants, displays and environments at the botanic gardens.

The powerful characteristic of the resources available in a botanic garden is that they are real. Students and teachers are confronted with the size, shape, colours, odour, texture and presence of a living organism.

The contribution of this research is to alert botanic garden educators to the use of research to identify the plants and places in the garden that are memorable for students. This research also demonstrates the persistence of students' memories about plants they have seen and observed at the RBGS. It appears that the impact of plants on students from both primary and secondary schools has been under-estimated by both classroom teachers and botanic garden educators. Other research (Tunnicliffe & Johnson 2000) demonstrates that children readily discuss plants at a botanic garden.

A botanic garden has plants that are familiar to students (eg eucalypts, vegetables) as well as those plants that they wouldn't normally see (eg the Wollemi Pine, Saguaro Cactus).

> "We have got things that they're not going to get. They're going to have more impact because they're bigger and more special to the botanic garden than in their own school yard. So they remember it better."
> Interview. BGE1, BG4. March 1999.

Plants can be selected because the education staff are familiar with the collection of plants and those aspects of the collection that are relevant to school education programs. This requirement also needs to be balanced with considerations of the resources available to maintain robust collections of plants that can withstand these physical requirements.

"I do not know of this principle could be possible with each visitor. It is very important to involve first hand experiences but always under your control or could be terrible impact to your plants in the Garden."
Email survey. 1B. August 2002.

The range and type of resources available to use in a botanic garden are continually changing with the season and the weather. One particular plant or garden bed may be particularly useful for a certain activity one week but come back a week later (even a day later) and the relevance has gone. The unique feature of a botanic garden as an educational resource is that it is continually changing.

"That's a good activity to do in winter when you don't have as much happening in the lagoon – and there's not much in flower. In summer you've got a lot of animals visiting the migratory ones or the ones passing through. Winter when it's very quiet you may not even get a wood duck or a black duck. They're all somewhere else."
Interview. BGE2, BG4. March 1999.

There needs to be plenty of material for students to handle and observe. Plants resources at a botanic garden are renewable and there is often a huge amount of plant material available for students to use.

"Where kids can actually handle the bits of plants. They can handle them, they can rub the leaves – they can get their hands dirty."
Interview. BGE2, BG4. March 1999.

7.6 Teaching and learning strategies should support and encourage personal communication and interaction between botanic garden's staff and students.

Botanic garden educators identify talking with students and interacting at a personal level as an important factor in the success of school programs. Personal communication is direct, flexible and can be pitched at a level appropriate for the visiting students. The educator has instant feedback on the success or otherwise of the event.

"Every kid is reachable – if you can tap in. Listening to their conversation, watching for their body language when you are talking about things.
Interview. BGE3 BG2. October 1998.

The implication of this situation is that education staff need to be flexible. They require a wide range of activities based on a wide range of resources at hand to enable them to respond to student interest and understandings. The activities themselves need to be flexible. They can be made more complex according to the interest and ability of the students.

"Other groups some of them who aren't used to working outdoors – you can't do anything with them as a group they're just not going to respond as a group. So you just have to send them off in little groups and give each adult instructions."
Interview. BGE2 BG4. March 1999.

"I was running out of time at the end and I thought I shouldn't do the food web game – that can take 25 minutes to do it properly. But I thought they would respond to it – and they did – they loved it."
Interview. BGE2. March 1999.

This research has demonstrated the memorable nature of the session experienced by students visiting the RBGS. The botanic garden educator selects locations, specific plants and a range of activities to cater for the needs of the visiting school group. A further feature of this research is that the botanic garden educator is not generally part of students' recollections of the day. Responses from the reference group support this principle with attention being drawn to the amount of staff time devoted to face-to-face interaction with visiting school groups.

"Most definitely good communication is good learning. For this to happen a high level of face-to-face program delivery is required. While we are continually looking to improve this aspect of our service it is a challenge to meet the demand for direct teaching services that can then engage garden learners with BG staff."
Email survey. 2K. January 2003.

7.7 Teaching and learning strategies should emphasise practical involvement and first hand experiences. Activities based on the sensory experiences of looking, touching, smelling, listening and tasting are fundamental learning experiences for students visiting a botanic garden.

This research has identified the persistence of students' recollections of sensory experiences they have had at the RBGS. Learning from these experiences has been described by Dewey in his conception of learning, yet it is the results of this research that endorse this view as fundamental to explaining the nature of learning in a botanic garden.

> "We teach them to stop and look a little bit closer and one of the things they go away with might not be concrete knowledge it might be the ability to stop and look a bit closer. We don't do it casually – we actually say to them we want you to observe things .... Really pointing it out – you've got to have your 'scientist' eyes and your 'scientist' ears to listen."
> Interview. BGE1, BG4. March 1999.

As Table 7.1 demonstrates, this principal is on of three receiving the highest level of endorsement from botanic garden educators.

7.8 Teaching and learning strategies should take into account the student's prior understandings about, interest in and experience with plants and the environment.

Research of learning described in the Literature Review indicates that people learn best when their personal understandings are linked to their prior learning experience. These understandings can be sought and developed when learners are at the botanic garden as demonstrated in the following quotes from the reference group.

> "Explainers sus out where the students are at within the first few minutes and they wing it from there. If teachers provide appropriate responses on the booking sheet we can get closer to the mark."
> Email survey. 2I. January 2003.

"Essential in some way to determine the starting point for learning programs. Usually done in discussion with the teachers prior to visit and through questioning on arrival."
Email survey. 2K. January 2003.

It appears that botanic garden educators are able to gain some insights into their visiting students using two techniques: by discussions held at the start of a session and from information provided by the classroom teacher before the excursion.

Choice of messages, resources and activities by the education professional relate to their immediate relevance to the world of the student. Hence information, plants and other resources and activities used during sessions involve elements that are familiar to students.

Research of student conversations in botanic gardens (Tunnicliffe & Johnson 2000) suggests that the garden seems to be a familiar place for students. Furthermore secondary teachers involved in this research have commented on their perception (often to their surprise) that their students find the excursion to the RBGS interesting and enjoyable. It appears that further research can provide an insight into students' prior understandings of the concepts they may encounter at the RBGS such as plants, plant conservation, biodiversity, recycling etc.

7.9 Education programmes at a botanic garden recognise that people learn in a variety of ways hence a variety of teaching and learning strategies should be incorporated into education programs for school students.

This research has revealed that students have a wide range of responses to their visit to the RBGS. Research of learning indicates that people learn best when there are many ways of receiving information and experiences. Data from Table 7.1 demonstrates that botanic garden educators strongly endorse this principle.

"We need to recognise there are many different preferred learning styles (Gardner's multiple intelligences) that our visitors bring and programs need to be inclusive of this. We

run a diverse set of programs that vary the style and approach to learning. They include sensory based activities wherever possible."
Email survey. 2K. January 2003.

7.10 Education programmes should recognise that effective learning in botanic gardens is fun and enjoyable.

Almost without exception botanic garden educators interviewed for this research emphasised that visiting school groups should have fun while they are at the excursion venue.

"If students can find something they enjoy – an interest will develop. It doesn't have to be here and now it can be later on."
Interview. BGE2, BG4. March 1999.

This principle was endorsed by the reference group with an addition of the notion of the experience being challenging.

"In Mexico the understanding of interpretation is very new, sometimes we are still talking about environmental education, but the principles we apply are the same but with a different name. But it is important to remember that effective learning has to be fun and provocative!"
Email survey. 1B. August 2002.

7.11 Education programmes at botanic gardens should model contemporary best practice in relevant areas of educational endeavour. Environmental education and science education are two key areas of relevance to school education programmes in botanic gardens.

This research has revealed an underlying commitment to the educational worth of the school excursion to a botanic garden on the part of both the visiting classroom teacher and the botanic garden educator. Furthermore investigation of the nature of student recollections about the event justify this commitment. Considering teachers' preferences for a 'worthwhile' excursion, they form professional opinions about their

excursion to the RBGS. It is precisely this opinion that results in teachers bringing other teachers to the RBGS and the subsequent rise in visitation. The following quote provides an insight into the professional outlook of a botanic garden educator.

> "It is important for BG education to keep in touch with the most up to date developments of our core business – learning. BGs need to be strongly involved with local education departments to ensure they are up to speed with the latest curriculum developments and approaches to learning. Our teaching and learning methodology needs to be at the cutting edge of current best practice in the wider schools system. This challenge is made easier in situations like my own where the education officer is seconded from the Education Department. This provides ready made professional development networks, curriculum support and teacher networks."
> Email survey. 2K. January 2003.

The positive response to this principle from the reference group endorses the links between botanic garden education and both science education and environmental education.

7.12 Summary

This chapter presents a set of guiding principles to inform the practice of botanic garden educators working with school groups visiting a botanic garden for a school excursion. The principles have been drawn from the case study and survey data presented in this thesis and from in-depth interviews held with botanic garden educators working in three botanic gardens on Australia's east coast.

The set of guiding principles have been reviewed and endorsed by a wider group of botanic garden educators from Australia, Britain, Europe and America. This indicates that the findings of this thesis can be applied to botanic gardens in other parts of Australia and the world.

The set of endorsed guiding principles represents a response to the third research question posed in the Introduction to this thesis and, more importantly, a practical outcome of this research. Incorporation of these principles into existing programmes

will further refine them into a set of useful strategies for botanic gardens educators. To this end the strategies can be grouped as follows.

School Education Programmes in Botanic Gardens

1. For school groups the messages, resources and activities encountered at a botanic garden must be relevant to the curriculum, teachers, students and the environment of schools.

2. Education programmes at a botanic garden should model contemporary best practice in relevant areas of educational endeavour. Environmental education and science education are two key areas of relevance to school education programmes in botanic gardens.

3. Underlying education programmes for school groups visiting a botanic garden should be a 'big picture' concept that is relevant to that programme and its participants.

Botanic Gardens as Learning Environments

1. In a botanic garden living plants, plant displays, special environments and landscapes can be used to demonstrate clearly, unambiguously and spectacularly particular understandings, skills or values. Teaching and learning strategies should allow every student to handle, observe and interact with living plants, displays and environments at the botanic garden.

2. Botanic gardens have an identifiable and unique focus on plants. Teaching and learning strategies selected by botanic gardens educators should promote understanding of, interaction with and awareness of plants and their importance in our world.

3. A tradition of authority is associated with the scientific and horticultural knowledge base of botanic gardens. Teaching and learning strategies should communicate concepts and skills that are scientifically accurate.

4. Teaching and learning strategies should support and encourage personal communication and interaction between botanic garden staff and students.

Teaching in a Botanic Garden

1. Teaching and learning strategies should emphasise practical involvement and first hand experiences. Activities based on the sensory experiences of looking, touching, smelling, listening and tasting are fundamental learning experiences for students visiting a botanic garden.

2. Teaching and learning activities should take into account the student's prior understandings about and interest in plants and the environment.

3. Education programmes at a botanic garden recognise that people learn in a variety of ways hence a variety of teaching and learning strategies should be incorporated into education programmes for school students.

4. Education programmes should recognise that effective learning in a botanic garden is fun and enjoyable.



Plate 7 **We smelled flowers. (School E 1996)**

Chapter Eight CONCLUSION

8.1 Introduction

This chapter brings together the major findings of this research to draw conclusions about the first two research questions asked of the work, to consider the limitations of the study and to make recommendations for further research. The first two sections of this chapter respond to the following research questions

1. What is the nature of the excursion experience of school students and their teachers at a botanic garden and how do these experiences relate to other researched excursion experiences?
2. What is the nature of the learning experience of students at a botanic garden and how does this learning relate to wider understandings of learning?

8.2 Nature of the excursion experience for students and teachers

It was the intention of this thesis to explore and record the excursion experiences of school students and their classroom teachers. The methodological approach adopted for this process was designed to allow the widest possible range of responses to questions that probed responses to and recollections of the excursion event. The process of data analysis allowed themes to emerge from the data and these themes are presented in the following sections of this concluding chapter.

The methodological approach adopted by this research has proved to be a powerful tool to uncover the excursion experiences of students and teachers and has resulted in a base-line set of data about these excursion experiences. Further research can use this thesis as a point of comparison and also as a fertile ground for areas of further study.

8.2.1 Major findings of research of students' excursion experiences

This section of the thesis draws together information from the case studies about the nature of students' recollections about their excursion to the RBGS. Analysis of students' recollections of their excursion to the RBGS provides an insight into those experiences that form students' memories of the event.

The methodological approach of this thesis has utilised two techniques of inquiry to explore the excursion experiences of school students visiting the RBGS. Students have been interviewed before and after their excursion. Students have also been asked to respond to a written survey. The open-ended nature of the inquiry has allowed various themes to emerge from this data and these themes and their significance to defining the nature of the excursion experience for school students is discussed in the following sections.

a. Students' long-term recollections are linked to their teachers' learning outcomes for the excursion

There is overwhelming evidence in students' responses that their recollections are linked to their teachers' learning expectations for the excursion. Study of the case study and survey data about the nature of teachers' outcomes for the excursion reveals that teachers hold both cognitive outcomes and preferences for specific learning processes. Evidence from the data indicates that these outcomes relate to a current unit of classwork and that teachers hold little if any expectations that their students will have long-term recollections relating to their outcomes. In considering students' memorable experiences it could be determined if students' recollections were associated with the outcomes their teachers hold for the excursion.

Data from the case studies reveals that both the short-term and longer-term recollections of students are linked to teachers' learning outcomes for the excursion. Short-term recollections can be seen to relate to teachers' cognitive outcomes for the excursion. There is evidence that students recall specific factual detail relating to the learning outcomes for the excursion. There is also evidence that this factual recall is often incorrect.

This association of longer-term recollections with learning outcomes indicates that there is a second tier to the learning experiences that occur in a botanic garden. These long-term recollections are embedded in students' experiences of the day and are associated with plants, places and other memories of having an enjoyable experience especially with friends. These recollections are evidence of students' building experiences they have had at the RBGS into their schemes of understandings – particularly understandings about plants. This thesis terms this kind of learning 'scheme-building learning'.

Identification of scheme-building learning is a major outcome of this thesis. This finding provides an explanation for teachers' intuitive belief that excursions are rich learning experiences for their students and result in learning that goes beyond the cognitive gain that can be tested immediately after the event. An excursion to a botanic garden results in long-term, scheme-building learning about plants.

b. The formal aspects of the excursion form the major part of students' recollections

It is clear from the discussions of case study data that students' recollections are largely associated with the formal aspects of the excursion to the RBGS. This is an unexpected yet clear and positive observation that can be made from the case study data. It could be expected that students' memories of the excursion would include comments about the myriad factors that would form part of this special event. Indeed there was little expectation of students' recollection of any aspect associated with the formal aspects of the excursion to the RBGS.

The data has been searched to find possible reasons for such a clear yet unexpected result. Evidence from the case studies suggests that students are trained from an early age to recognise that learning can happen out of the classroom and that excursions are part of classwork. It could be said that TQ, the classroom teacher from School E, was training her young students to focus on these formal aspects of the excursion and to associate the excursion with the topic of current classwork. Year Ten students from School G understood that the purpose of their excursion was to complete a unit of science work.

One could consider that students may be reporting or writing down comments that they consider is the 'right' thing to say or 'correct' responses to a researcher from the Royal Botanic Gardens Sydney. This situation is certainly a possible feature of methodologies focussing on school students. However, in the light of the consistency of the findings across the range of school groups and the range of research strategies this thesis holds that students' responses can be said to reliably reflect their personal opinions.

The findings of this thesis have demonstrated that the focus of students' recollections of their excursion is the formal session conducted at the RBGS. The nature of these recollections can be influenced by the classroom teacher and the bg educator. The classroom teacher selects the focus for the formal session and the bg educator, in consultation with the classroom teacher selects activities, locations and plant displays that form the detail of the session.

c. Plants are memorable features of the excursion

It was expected that plants could form part of students' recollections about their excursion to the RBGS. However the frequency of these recollections as well as the recollection of specific plants up to one year after the excursion clearly indicates that plants are a feature of students' recollections. This finding clearly demonstrates that plants can be of interest to students and furthermore botanic gardens are effective venues for capturing and focussing student attention on plants.

It is a reasonable assumption that students will remember plants after an excursion to a botanical garden. This research suggests that not only do plants have a place in the long-term memories of school students, plants are memorable for students. This section of the research considers those aspects of the plants at the RBGS that are memorable for students.

Students respond to the visual impact of the large numbers of plants and to the wide variety of plants growing in garden displays. Students appear to retain a visual memory of the plant displays at the RBGS. The very low incidence of recollections about the aesthetics of the plant displays at the RBGS indicates that it is simply the

general impact of seeing large numbers of plants that remains as a memorable feature of the excursion for school students.

The most popular group of plants evident in this research is cactus plants. Students of all ages have mentioned these plants in their recollections of the day. Cactus plants appear to be memorable because of their armory of spines and because of their unusual shape. Cactus plants are simply very different from other plants.

Students also have recollections of specific plants. Furthermore, the data indicates that where students have mentioned specific plants, they are generally those plants related to the topic or theme of the formal part of the excursion. For example infants students from School E remembered specific plants associated with their topic of the senses. Students from School B mention a group of specific plants associated with their theme of rare and threatened plants. Students from School A recall specific plants associated with their rainforest theme. Students from School G have recalled cycads, ferns and smelly seaweed as part of their work on plant diversity and adaptation.

Students also mention carnivorous plants and a range of 'personality' trees. The recollections of students from School B provide some insight into the specific trees that are recollected by students as well as some insight into reasons for the recollection. This group of students provides a range of reasons for recollections of specific plants at the RBGS rather than providing one reason. Specific trees can be remembered because of

- their unusual name (eg Dragon's Blood Tree)
- their unusual shape (eg Bottle Tree)
- activities associated with the tree (eg the Wishing Tree).

This data clearly indicates that the classroom teachers' selection of topic and the plants selected by the RBG educator have influenced students' recollections. Further research can provide information about the 'personality' trees in the RBGS and in other botanic gardens. Further research will also reveal the reasons for the charismatic nature of these plants.

d. Place is a memorable aspect of students' experiences

Data from the case studies indicates that two specific locations at the RBGS are recalled by students who have visited them during their excursion. These locations are the Tropical Centre and the Succulent Garden. The clarity and persistence of these memories indicate that 'place' forms a critical component of the excursion experience for students.

A visit to the Tropical Centre forms a major part of students' recollections of their excursion. The impact of this glasshouse complex is most evident in the responses from students from School C where seven months after their excursion to the RBGS to study rainforests almost all students recall visiting the Tropical Centre.

Data from the case studies demonstrates that the physical structure of the glasshouses with a pyramid and long arc-shaped glasshouse housing two separate rooms, its misting system and waterfalls appear to be the most memorable aspects of this complex. Students also have long-term sensory recollections of the heat and humidity of the Tropical Centre. The massed plant displays of the complex are a memorable feature for all students visiting the Tropical Centre while older students from Year Six to Year Eleven can recall specific plants growing there. Primary and secondary student recalled general groups of plants such as epiphytes and vines as well as the common names of plants such as Venus Fly Trap and bromelliad.

Students' memories of the Tropical Centre can be used to create links between their experience at the RBGS and further classwork. Evidence from Schools C, A, J & G suggests that students associate the Tropical Centre with rainforests and with the hot, humid conditions of rainforests. Teachers are able to link students' recollections of the heat and humidity of the Tropical Centre with the heat and humidity of a tropical rainforest.

There is evidence of possible misconceptions associated with linking study of rainforests with the Tropical Centre. Firstly students may consider that all rainforests are hot and humid when temperate rainforests such as those of Tasmania do not have

this physical feature. Secondly the Tropical Centre is not a natural environment it is a collection of plants that grow in tropical environments. It lacks a wide range of 'real' rainforest features such as the animals and their noises and the darkness of the environment at ground level. However teachers from Schools C & A indicate that this experience provides a basis from which their students can build their understandings of a rainforest environment.

The Succulent Garden is a popular location for all students involved in this research and it is the display of cactus plants that forms the reason for student recollection of this location. The Succulent Garden is a focus for students' recollections and data from Schools C, B, J & G demonstrates that students link their observations of cactus plants in the Succulent Garden with a desert environment. Hence, as in the case of the Tropical Centre, bg educators can use the location as a basis for memorable experiences and also to create links between students' experiences at the RBGS and their classwork. In the case of the Succulent Garden, students will be focussed on the plants, hence there are two clear avenues for possible class study. Firstly teachers can make connections between features of desert environments and students' experiences of the Succulent Garden and secondly students' recollections of cactus plants will link to study of adaptations of plants from desert areas.

The data indicates that there is potential for creating or reinforcing misconceptions about desert environments. Students' may consider that all the plants in the Succulent Gardens are cactus plants – rather than a wide range of plants from desert environments around the world. Hence students' experiences in the Succulent Garden may lead them to consider that all desert environments contain cactus plants.

This research reveals that specific locations at the RBGS form long-lasting memories of excursions to the RBGS. This evidence indicates that, depending on the focus of the excursion, bg educators may select these special areas for the impact they generate in school students. Provided these locations are relevant to the theme required by the school group, these locations can be used to create memorable experiences that can be linked to classwork.

This research suggests that these findings relating to specific places at the RBGS may well apply to other botanic gardens that have glasshouse complexes and displays of cactus plants. The research also suggests that individual botanic gardens could conduct their own study of students to determine their view of memorable locations at their venue. Providing these locations are relevant to the needs of a particular school group, then these places can be used as locations for specific learning experiences.

e. Practical activities form part of students' recollections of their excursion

Case study data demonstrates that all students involved in this research remember both specific activities and aspects of activities. This research has revealed that teachers require their students to be involved in practical, sensory-based activities with plants and environments at the RBGS. Evidence from student recollections presented in the case studies demonstrates that these kinds of learning processes are memorable for students.

Data from the case studies reveals that the youngest students recall sensory information seven months after the event. This situation is repeated throughout the case studies involving long-term recall of the excursion experience. This finding is an unexpected feature of the research. There was no expectation for students to recall sensory experiences such as looking at plants or feeling hot or the smell of a eucalypt leaf or the sound of bats.

Associated with this sensory aspect is student mentioning of specific activities that involve using the senses. These activities include students from School A recollections of being blindfolded or using hand lenses. Infants students from School E recall activities that focussed on finding colours or smelling or touching.

Clearly these findings hold implications for the teaching strategies that bg educators would select for school groups. The findings confirm and endorse the use of 'sensory awareness' activities with students across the full range of school groups involved in this research. These findings also indicate that RBG educators can influence students' recollections through their choice of activities.

f. Social aspects form part of students' recollections of their excursion

The data in this thesis indicates that social aspects of the excursion are an important feature of the event. An underlying feature of students' recollections about their excursion to the RBGS is the presence of a group of students. For infants students and for Year 10 girls the notion that the student is part of a group appears to be an important feature of the recollection. Students from School E couch their recollections by using 'we' rather than the personal pronoun 'I'. Approximately one half of the Year Three students from School C use a similar sentence structure. The use of 'we' drops off for students in Year Six and completely disappears for Year Eight students.

There is a complete return to consideration of the social group when we turn to the data from Year Ten students from School G. These students suggest that presence of their friends is a critical element in their recollections of the excursion. Furthermore Year Eleven students suggest that their memories associated with their friends are used to recall the cognitive details required by their teachers in classwork.

g. Recollections of informal aspects of the excursion

Students' recollections also include other aspects that are associated with the excursion. The three main categories of responses are those relating to the animals at the RBGS, to the physicality of the day and to having lunch.

Every group of students involved in this research mentions the animals at the RBGS. Students recall birds, bats, spiders, tadpoles and caterpillars they encounter at the RBGS. The interesting aspect of these results is that the incidence of students' recollections about animals are minimal compared with their recollections of plants. This feature of the data provides further indication of the impact of the plants at a botanic garden.

An underlying component of students' responses is the sense of the physical nature of the experience. Students frequently mention walking or going to. There is a sense

of movement and being on a walk. This finding indicates that there is a psychomotor aspect to the excursion experience at the RBGS.

A small number of responses recall lunch as part of their memories of the day. The experience of having lunch in the RBGS surrounded by green lawns and close to the busy harbour could be expected to form a memorable aspect of the day. However it is not a major focus of students' recollections of the event.

h. Aspects of the excursion that do not form part of students' recollections

Study of the data from each case study reveals that the following aspects of the excursion have received scant attention from students.

i. Situations of 'teacher talk'

There are very few responses from students that can be linked to 'teacher talk' during the lessons at the RBGS. Furthermore there are few responses about any adults that accompany the group. This feature of the responses indicates that the role of the bg educator is associated with facilitating students' experiences by selection of activities and resources rather than conducting 'lecture-type' situations. It is highly appropriate that the focus of the excursion for students is concerned with practical activities with plants and locations at the RBGS.

ii. Experiences outside the RBGS

There is little evidence of students recalling aspects of their journey to or from the RBGS. Students' responses focus entirely on the experiences at the RBGS. This is another unexpected feature of the data. Students' recollections are not concerned with trip details.

iii. Negative aspects of the day

There is very little indication from this data that students have had negative experiences on their excursion. For a number of schools involved in this research (Schools B, A & J) the weather on the day was extremely hot. The physical discomfort of the day receives scant attention from the students. There may well

have been other negative features of the day however these are not apparent in students' responses.

h. Summary and implications of findings

A critical finding of this research is the close association between students' memories of the excursion and the formal aspects of the event. The data clearly demonstrates commonalities between teachers' expectations for the excursion and students' recollections of the experience. The areas of commonality include close correspondence between students' recollections and both teachers' cognitive outcomes for the excursion and their expectations for specific types of learning processes.

This finding has enabled identification of two tiers of learning that occur as a result of an excursion to the RBGS. Firstly there is evidence for short-term cognitive gain – learning that is anticipated by the classroom teacher and forms part of a teaching sequence for a particular unit of classwork. The second tier of learning has been termed 'scheme-building' learning and relates to learning experiences that contribute to students' personal understandings of the world.

Comparisons across the case studies reveal that students' recollections are influenced by their classroom teachers and by the botanic garden educator. The classroom teacher selects the specific cognitive focus and preference for learning processes for the excursion while the bg educator selects the specific activities, locations and resources including plants for these activities. It is interesting to consider that students' recollections of the excursion can be influenced by a range of factors almost totally within the control of the classroom teacher and the botanic garden educator.

The findings illustrate that plants are a memorable feature of the excursion to the RBGS a situation that would be unique to a botanic garden. The data demonstrates that students of all ages associate their excursion to the RBGS with study of plants.

There are no other excursion venues that specifically focus on plants and this feature alone illustrates the success of a botanic garden as a resource for school students from infants to secondary school to further their understandings of plants.

The findings of this research demonstrate that practical activities particularly sensory experiences form part of students' long term recall of their excursion to the RBGS. Students' recollections about specific activities and locations indicate the immediacy of the environment at the RBGS. Specific aspects of the environment are within students' grasp and can be physically accessed, touched and handled. Environments can be moved through and interacted with. There is also evidence that specific details of these environments engage students' attention. These features of the results underline the relevance of interactive, sensory-based activities as fundamental teaching strategies for students of all ages visiting the RBGS.

8.2.2 Major findings of research of teachers' excursion experiences

This section of the conclusions draws together information from the case studies and teacher surveys to present the major findings of this thesis concerning teachers' excursion experiences. As for the students involved in this research, the methodological approach has allowed themes to emerge from the data rather than be imposed on the research situation. One of the strongest themes emerging from the data is the teachers' view of the excursion as a learning experience and this will be discussed in the next section of this chapter focussing on the nature of learning in a botanic garden. The other themes are explored as major findings of this thesis and are discussed in the following section.

a. Excursion is linked to classwork

A clear finding of this research is the teacher's identification of close links between the excursion and classwork. Teachers visit the RBGS because it is relevant to their classwork. The data demonstrates that the majority of teachers involved in this research expect that the excursion is related to school syllabus requirements. The tangible interpretation of syllabus documents by infants, primary and secondary teachers is their teaching program that is presented to students as discrete units of classwork.

The data indicates that teachers – particularly infants and primary teachers, respond to the procedures adopted by the RBGS to identify links between its resources and school syllabus documents. Furthermore classroom teachers take advantage of these procedures to establish links between RBGS education programs and their individual teaching program. The data indicates that teachers use the advertised links between RBGS programs and school syllabus documents as a basis for selection of the excursion topic. A second group of RBGS procedures requests information from teachers about their individual teaching program to seek written and verbal confirmation of the links between the session at the RBGS and their classwork at school.

The data from this research demonstrates that teachers can also hold a range of interpretations about the relationship of the excursion to school curriculum. These expectations relate to the broad role of the school in socialisation and enculturation of students. Excursions can be viewed as opportunities to inspire and motivate students. Excursions can also be viewed as visits that familiarise students with the cultural environment of the wider community. The following summarises the range of relationships of the excursion to classwork revealed in this thesis.

i. Excursion is part of a teaching program for a unit of work

This view of the excursion is characterised by those teachers that have embedded the excursion in classwork for a particular unit of work. It is the view expressed by the majority of primary school teachers involved in this study. The data suggests that the class group on excursion to the RBGS is involved in the study of a particular unit of work – for example Rainforests. The class teacher views the excursion as an essential part of students' experiences for this unit of work. Characteristically there is classwork leading up to the excursion generally consisting of some form of research of the rainforest environment. The excursion provides a wide range of experiences that are used for classwork after the excursion.

This model for the excursion experience where the excursion is embedded in classwork is evident in research of school visits to museums (e.g. Orion et al 1997,

Grieef 1999, Griffin 1999) indeed these researchers consider that this is the preferred model within which schools should approach their excursions.

Those teachers that view the excursion as part of their unit of work demonstrate a range of strategies to incorporate the excursion into their classwork. The data demonstrates that teachers may use the excursion as an introduction to or in the early stages of a unit of work. The rationale for early placement of the excursion in the unit of work can be to provide a pool of experiences to which students may refer in subsequent classwork. For example AK perceived that her students from School C had little experience of a rainforest environment, the group visited the Tropical Centre at the RBGS to provide her students with some understanding of the physical conditions in a rainforest. She was able to draw on these experiences in subsequent classwork. A second rationale for early placement of the excursion was to provide interest and motivation for a unit of work on plants. The Teacher Use Survey 1996 illuminates a situation where young infants students had visited the RBGS to plant seeds as one of the first lessons in a unit of classwork on growing plants.

Other teachers have visited the RBGS mid-way through their unit of work. In this situation teachers may require their students to find out particular information that is relevant to their unit of work. For example the Teacher Use Survey of Term Two 1996 demonstrates a situation where students were required to find out how local Aboriginal people use plants. This information was relevant to their unit of work on Aboriginal people of the Sydney area. Another rationale was to provide practical experiences that complemented the unit of classwork. An example of this strategy was found in the same survey data where students visited the RBGS for practical experience in creating garden beds.

A number of teachers provide a rationale for visiting the RBGS towards the end of their unit of classwork. These teachers use the excursion to consolidate and reinforce classwork in a particular topic. Often these groups may have studied a particular environment such as a rainforest of a desert and visit the RBGS to see and experience what they have been studying in class – what they have seen as pictures in a books or on a video screen. In a similar situation some teachers have reported using the excursion as a culmination activity for a unit of work. One of the teachers using this

strategy (Teacher Use Survey 1996) commented that she was using the excursion as a self-evaluation strategy to see what her students had learned during a particular unit of work.

The data suggests that teachers expect that the excursion experiences of their students will be relevant to classwork. Teachers expect their students to be able to make links between their classwork and their experience at the RBGS. Teachers anticipate that the excursion experience will be meaningful for their students and will reinforce classwork. The data indicates that teachers expect their students to perceive that what they learn in the classroom can be transferred to situations outside school.

The data suggests that on return to the classroom, students are expected to recall and utilise their excursion experiences for the short term of their unit of classwork. For example primary students use their recollections of the excursion for creative and factual writing on their return to school. Infants and primary teachers appear to hold little expectations for the long-term recall of the excursion by their students. The data suggests that secondary students could be expected to recall details of plant structure and physical environments some years after the excursion. This expectation for secondary students relates to the following view of an excursion as a stand-alone experience.

ii. Excursion is a stand-alone experience

This view of the excursion places the excursion experience within a framework of desirable fieldwork experiences for students. The data from the case studies suggests that secondary science teachers appear to view the excursion to the RBGS as an extension of classwork about plants. These teachers use the excursion as an opportunity for their students to learn in the field, outside the science laboratory. The excursion extends students' understandings of and experience with plants.

The perception of this approach to excursion as fieldwork can hold that there is a unique set of understandings, skills, attitudes and values associated with fieldwork. Indeed the excursion itself could be viewed as a whole unit of work with minimal

classwork required before and after the event. The excursion is perceived as a day to focus on science work uninterrupted by the normal school routine.

Other researchers such as Lai (1999a) describe fieldwork in geography as a stand alone experience. Lai comments that the special experiences gained while students are involved in fieldwork appear not to be incorporated into classwork. They are an isolated group of experiences that may fulfill syllabus requirements as part of the study of geography.

Teachers involved in this type of excursion demonstrated two approaches to the sequence of lessons that would introduce and/or follow-up on the excursion. Firstly some teachers – often those teachers with lower ability students, used the excursion as a motivational factor to introduce their students to study of plants. There was no introductory lesson at school and the excursion itself was the first session for the unit of work. Other teachers introduced their students to the unit before the excursion, requiring their students to have a grasp of concepts and scientific terminology before the visit to the RBGS. In both cases follow up work in the classroom consolidated the broad concepts encountered in the excursion.

The data from this research suggests that the perception of the excursion as a unit of work in secondary science teaching may be an efficient and effective means for students to extend their understanding of plants. Indeed it appears that students are trained from their earliest days at school to consider that learning can take place in environments other that their school classroom. Case study data indicates that both primary and secondary students do consider that they are on excursions to learn in a different environment. Furthermore it could be stated that as students approach senior secondary schooling they are expected to achieve a significant set of syllabus requirements while they are on an excursion.

The results of this thesis demonstrate a need for closer investigation of the relationship that the 'stand alone' excursion has to both curriculum and to school classwork. This thesis argues that the excursion as a unit of classwork for secondary students is a logical extension of primary school grounding in learning outside the classroom. Secondary students can achieve a significant amount of syllabus-related

outcomes when they are able to focus on a clearly defined group of experiences in a venue such as a botanic garden.

iii. The excursion as a venue visit

There is some indication in the data that both primary and secondary teachers view the excursion as a way of exposing their students to a range of venues that are perceived as relevant to 'enculturation' of their students. The data suggests that teachers perceive that the RBGS is part of Sydney's cultural landscape both from an historic and scientific perspective. The data from this thesis suggests that teachers may be involved in a venue visit to the RBGS.

Other research (e.g. Griffin 1999) suggests that other venues in Sydney may be considered as an essential venue for students to visit as part of their school experiences. Indeed some data from this thesis suggests that teachers consider that their students may not otherwise have the opportunity to visit these cultural venues and that these visits would be considered an essential component of a student's school experiences.

It could be suggested that teachers visiting a cultural venue with their students may not have embedded the visit into their classwork. Indeed the purpose of the excursion may simply be for students to see and experience this new environment. The data in this research does not illuminate the relationship of this interpretation of the excursion to classwork, nor the relative importance of this factor in the choices teachers make about excursion venues. However this research has identified this interpretation of the excursion as have other researchers. It seems clear that such a visit would be desirable for any excursion venue and that this type of visit would require the venue to appreciate that they are fostering the next generation of venue visitors.

iv. The excursion as a break in routine

Data from both primary and secondary teachers suggests that the excursion can be perceived as a break in the routine of school. Indeed some secondary schools indicate that it is 'routine to break the routine' with excursions placed in the school calendar

at the beginning of the school year. It is apparent in some data from primary teachers that they would consider that it is essential for their students to have a break from the classroom at least once a term. Other considerations of relevance to classwork are secondary to the purpose of this excursion to re-kindle interest and motivation in their students.

Data from this research provides little insight into how the excursion is used by those teachers visiting a venue as an enculturation experience for their students or as a break in school routine. However it could be said that these experiences may not be tied to classwork yet they may fulfil an important role in the total school curriculum.

b. The excursion will involve practical experiences and contact with real living plants and environments

The data indicates that teachers expect that their students will be actively involved in practical experiences while they are on excursion to the RBGS. These practical experiences include sensory interaction with plants and environments. The data indicates that infants, primary and secondary teachers all expect their students to have tactile, visual experiences with plants and plant displays. The data indicates that teachers link these practical experiences with an increase in students' cognitive understandings of plants and environments.

The data from this research indicates that infants, primary and secondary teachers are concerned that their students have close contact with real living things at the RBGS. The data demonstrates that teachers hold that seeing the 'real thing' is a superior learning experience for their students. Teachers recognise that students expand their understandings of plants by being surrounded by the rich plant collections of the RBGS.

c. The RBGS is a learning environment

The data from this thesis presents a range of expectations that teachers hold for the RBGS as the venue for their excursion and these expectations relate to the role of the bg educator, the plant collections of the RBGS and their accessibility to students, the geographical location of the RBGS.

i. The role of the botanic garden educator

The data presents a range of teachers' expectations for the botanic garden educator conducting the formal session at the RBGS. The data suggests that the botanic garden educator can take on a range of roles as follows:

- a professional educator
- a source of information
- a tour guide

As a professional educator, the botanic garden educator's performance is critically assessed by visiting teachers in three main areas. Firstly the botanic garden educator is expected to have an understanding of syllabus documents that are relevant to the session. The data indicates that teachers anticipate that the botanic garden educator understands and will deliver what is required by the teacher involved with the session. The botanic garden educator is expected to work with a class of up to 30 school students, their teacher, visiting parents and other adults accompanying the group.

Secondly teachers of all age groups anticipate that the botanic garden educator will be able to communicate and interact with their students. The data suggests that these groups range from Kindergarten to Year 12 students from a range of cultural backgrounds and with differing physical and emotional capacities. Teachers anticipate that the botanic garden educator will be positive towards their students and will be able to motivate, interest and engage students during their session at the RBGS.

Thirdly teachers expect that the botanic garden educator can facilitate student interaction with relevant plants and environments at the RBGS. The data suggests that teachers anticipate that the botanic garden educator will employ student-centred, practical activities that engage students with the living plants and the environments at the RBGS.

The botanic garden educator is expected to provide specialist information to school groups. In this capacity botanic garden educators may be required to provide a lecture or be able to respond immediately to students' questions. The information provided by the botanic garden educator is expected to be accurate and accessible to students of all ages. The data suggests that infants and primary teachers in particular value the ability of the botanic garden educator to model scientific understanding and enthusiasm for science and for the environment.

As a tour guide the botanic garden educator is expected to know the garden and those parts of the collection that are relevant to a particular school group. Teachers anticipate that botanic garden educators can lead the group to the plants and locations at the RBGS that are accessible and safe for groups of students.

ii. The plant collections and environments at the RBGS fulfil needs of schools

As expected, the data from this research reveals that teachers visit the RBGS because of its collection of plants. Teachers at all school levels recognise that the plant collections of the RBGS are unique and of a high standard. The plants and environments of the RBGS represent the structure, variety and human aspects of plant life. Access to real, living plants that demonstrate observable features is seen by teachers as being able to engage, inspire and motivate their students.

The data indicates that the plants and plant displays of the RBGS can be used for educational purposes as they relate to curriculum needs and can encourage both access and the physical attention of groups of school students.

iii. The RBGS is accessible and close to other venues

The data demonstrates that teachers consider a range of administrative issues when they make decisions about the venue for their excursion. For the teachers involved in this research the RBGS is an accessible venue – the RBGS is close to public transport and a reasonable distance to travel for a day's excursion. Data from teachers involved in this research reveals that teachers may visit more than one venue during the day and the RBGS could be one of two or even three locations visited by the school group.

iv. The RBGS is a green space of peace and tranquility

The data suggests that teachers recognise that the RBGS is a place to experience space and tranquility. This consideration leads onto considerations of teachers' view of the affective nature of the excursion to the RBGS.

d. Considerations of affect

The affective nature of excursions to the RBGS is apparent in the data however affect plays a small role in teachers' considerations of the excursion. Clearly data from this research indicates that teachers expect their students to enjoy the excursion to the RBGS. The excursion involves a motivational element for students were teachers anticipate that the interesting, enjoyable nature of the excursion experience will result in their students being more receptive to learning and, especially in the case of secondary students, be more receptive to learning about plants.

The data reveals the importance for teachers from inner city schools for their students to experience the space and tranquility of the RBGS. For some teachers this sense of space contributes to a relaxed way for students (and their teachers) to approach the excursion experience. The data also suggests that teachers perceive the excursion as a means for students to learn appropriate behaviour to adopt when they visit a venue like the RBGS.

The data indicates that teachers value the opportunity provided by the excursion to interact with their students in a more positive and informal way. Away from the intense, time-poor environment of school, students and their teachers may have the opportunity to experience each other's company on an informal basis. This experience may provide an opportunity for teachers to build more positive relationships with their students.

e. Summary and implications of findings

Teachers view their excursion to the RBGS as a learning experience. The data from this research indicates that teachers hold a range of expectations about the sorts of experiences that their students will have while on excursion to the RBGS. It appears

that these experiences are to result in the achievement of cognitive-based outcomes that are relevant to a specific unit of classwork. Furthermore student experiences are related more to the achievement of cognitive rather than affective outcomes.

One of the clearest findings of this thesis is that the majority of school excursions to the RBGS are linked to classwork. Furthermore the excursion for infants, primary and secondary schools relates directly to syllabus-based work in schools.

The data from this thesis suggests that teachers can hold a wide range of interpretations about the role of their excursion and its relationship to school curriculum. It is clear that there is more than one preferred model with which schools and excursion venues including botanic gardens can view the school excursion. While most schools demonstrate that the excursion is embedded in current classwork the data suggests that there are three other views for excursions. Evidence from the thesis suggests that excursions can also be viewed as stand alone experiences, venue visits or a break in routine. Each of these four views of excursions has their own appropriate pedagogical approach from both the school and from the venue.

The data indicates that teachers build students' skills in learning how to learn beyond the classroom. Teachers involved in this research hold that their students can learn in a variety of surroundings. The cognitive load for students on excursions increases from components of units of work to whole units of work as the students move from primary into secondary school. Students are expected to be able to focus their attention on learning experiences in a diverse and novel environment.

The data indicates that teachers hold a range of pedagogical uses for their excursion. Teachers demonstrate professional judgements about the placement of the excursion within their teaching programmes for a unit of work. The data does not provide the opportunity to evaluate the effectiveness or otherwise of these decisions however it is clear that arguments can be made for a variety of approaches to the placement of an excursion within a unit of work.

This discussion clearly indicates that teachers perceive that the RBGS is an environment for learning. The overall impression left after consideration of the data

provided by teachers is that they have moved the site of learning from their classroom to the RBGS for the day. The next section of this chapter reveals the nature of the learning that can take place at the RBGS.

8.3 Nature of learning at the RBGS

The second research question required an exploration and interrogation of the expectations of teachers and the experiences of their students on excursion to a botanic garden to facilitate the generation of hypotheses about the nature of learning that may happen in such a place during such an event. The case-study approach of this thesis has provided a means of study of the place of an excursion within the curriculum processes and milieu of the classroom and school. The methodology allowed exploration of students' longer-term memories of the excursion experience and the relationship of these recollections to the learning outcomes required by the classroom teacher. Generative techniques applied to analysis of data have allowed themes to emerge from the data. These themes are discussed below. The views of learning revealed in this thesis needed to be articulated with the wider views of learning – especially learning that may occur in venues beyond the classroom this relationship will be presented in the next section. The educational stance for a botanic garden incorporating theories of knowledge, learning and teaching will then be posed.

8.3.1 Learning at a botanic garden is 'two-tiered'

Comparison of data from across the study has resulted in identification and articulation of the two-tiered learning that has been found to occur in a botanic garden. The first tier of learning is identified as relating to cognitive gain where specific cognitive outcomes expressed by the classroom teacher form the basis of the excursion. The second tier of learning relates to the scheme-building learning that occurs when students are physically engaged in activities that form part of a teaching sequence in a relevant unit of classwork. This latter type of learning is evident in students' long term recollections of the excursion and appears to contribute to students' construction of their own personal understandings about the world.

This research has also shown that there is certainly a place for measurable, often short-term learning associated with cognitive gain. Indeed the highly structured approach to the excursion demonstrated by School G reinforces the use of the venue in learning for cognitive gain. Furthermore the research by Vasala et al (2001) reported in the Literature Review demonstrates that such highly structured excursions result in measurable cognitive outcomes for students involved in such programmes. This requirement for student learning of specific content appears to peak in the latter stages of secondary schooling. Case study data and research of this requirement for cognitive gain demonstrates that this type of learning involves the following:

- expression of measurable cognitive outcomes for the excursion
- specific activities conducted at specific locations in specific time frames
- consistency of delivery of these activities
- worksheets to record students responses to these activities
- activities that involve recording of correct responses and accurate detail
- evaluation of cognitive outcomes
- students' accurate short-term recollection of factual detail.
- the excursion is an enjoyable and motivational event for students.

The second type of learning found in this research has been termed scheme-building learning and is closely associated with the type of learning articulated by Dewey. This type of learning involves student physical interaction with the plants and environments at a botanic garden as part of a teaching sequence in a particular unit of classwork. Evidence of this type of learning includes the following

- students' long term recollections are associated with the learning outcomes set by the classroom teacher
- students have opportunities to physically interact with specific components of the living collection of plants in specific locations
- students have opportunities to discuss and share their experiences with other students and adults with the group
- the excursion is an enjoyable and motivational event where students actively participate and demonstrate enthusiasm with their interactions

- opportunities for students to select and direct their experiences and make their own record of the event
- activities include times to reflect on student experiences and create the need for further experience.

Clearly the methodological approach of this thesis has provided a source of evidence for the type of 'deep' learning that was thought to happen on an excursion to a venue like a botanic garden. Intuitively teachers have always known that there is more to the event than models that articulate learning as cognitive gain have indicated. This thesis has provided a window into a means of researching the nature of scheme-building learning that may take place in a venue beyond the classroom.

8.3.2 Learning at a botanic garden is concerned with what, how and where

Data from survey and case studies clearly demonstrates that learning at the RBGS is concerned with three aspects: learning has a content focus, it involves specific learning processes and is situated in the physical environment of the RBGS. Put in a simpler way – learning at the RBGS is concerned with what, how and where.

a. Learning at a botanic garden is content focused – the 'what'

Plants are the focus for cognitive understandings at the RBGS. This research has uncovered a clear association between a botanic garden and study of plants that is recognised by even the youngest of participants involved in this study. A botanic garden can be described as a single focus venue. This clarity of focus and close, recognisable association with plants places botanic gardens in a unique position to educate about, with and for plants. There are no other educational venues that focus visitor expectations and experiences explicitly and solely on plants.

In cases where teachers' learning expectations are about plants this clarity of focus translates into a close correspondence between teachers' cognitive expectations for the excursions and both students' longer-term recollections of the experience and students' understandings of the purpose for their excursion to the RBGS.

Classroom teachers and botanic garden educators involved in this study agree that the conceptual focus for school excursions from any age group targets 'big ideas' rather than a 'litany of facts'. The 'big ideas' associated with scientific study of plants can be organised into a 'syllabus' of conceptual understandings about plants that can be explored on an excursion to the RBGS. This syllabus is illustrated in Table 6.15.

It appears that teachers' well articulated conceptual understandings are confined to scientific study of plants and environments. However once the focus of the discussion moves from teachers' requirements for learning at the RBGS to requirements outlined in NSW school syllabus documents and to the RBGS' own requirements for the educational focus of the RBGS it appears that a much broader range of learning possibilities exists.

NSW syllabus documents in both the broad learning areas of Science and Technology and Human Society and Its Environment refer to the RBGS as a site for both Aboriginal education and environmental education. Discussion in the Literature Review referred to the educational role of botanic gardens in plant conservation and in addressing the needs of indigenous communities. An understanding of Aboriginal use of plants involves exploration of the perspective of a different cultural group. Meaning is socially negotiated and relates to communicated understandings rather than to 'objective' factual information. This research indicates that the RBGS may not be seen by school teachers as a site for exploration of socially constructed views of the world. Further research is required to articulate a 'syllabus' of outcomes that are relevant to exploration by school students of cross-cultural views of plants and environments.

The fundamental and characteristic outcome of environmental education programs is a socially critical, action orientated citizenry (Huckle 1985). For school groups environmental education involves students being personally involved in programs that improve the environment (Gough 1987). In terms of Habermas, environmental education could be said to involve both 'socially negotiated' and 'emancipatory' understandings which result in personal attitudinal and behavioural change. This research demonstrates that the RBGS may be used by school teachers as a model of

'good' environmental managers and for sources of information about the environment and sustainable lifestyles. However it appears that further research is required to realise the education potential of the RBGS in mobilising social change towards a more sustainable community.

b. Learning at a botanic garden is about learning processes – the 'how'

Exploration of the findings of this thesis reveals that learning at the RBGS is based on focussed interaction with plants and environments. Data from students and teachers involved in this research reveals features of these interactive learning processes. Learning processes at the RBGS involve sensory interaction with specific plants and environments. The processes involve students being able to move to attend to these components and being able to discuss their experiences of these components with their friends, teachers and other adults. Students are personally engaged with their learning and it forms a memorable and enjoyable feature of the excursion.

i. Taxonomy of learning experiences at a botanic garden

Data from the case studies and teacher surveys provides an insight into a variety of learning outcomes. Furthermore once identified these outcomes are often grouped to form learning sequences. Generalisation of these learning sequences forms the basis of a taxonomy of learning experiences at a botanic garden which is illustrated in Table 8.1.

The learning experiences illustrated in this table are the culmination of study of teachers' and students' discussion of their learning processes on their excursion and comparison of this data with the experience taxonomies of Steinaker & Bell (1979) and Lai (1999b) included in the Literature Review.

Close inspection of this table reveals that the learning experience are ranked in a sequence with each learning experience becoming more complex that the one before it.

Learning experience	Previous experience	Activity
Attending to specific aspects of environments	Determination of purpose of inquiry/exploration. Location of site Practice of sensory awareness skills	Exploration and discussion of environment, recognising familiar components of environment Selection of specific objects for further study Reflection by sharing experiences & linking with experiences in other environments, appreciation and enjoyment
Interaction with specific aspects of environments	Attending to specific aspects of environment for specific purposes. Location of site Practice of sensory awareness skills	Sensory interaction with selected object, physical handling of object, discussions and comparison of selected objects. Reflection by shared discussion and comparison of objects, linking with previous understandings appreciation and enjoyment
Making observations	Attending to and / or interacting with specific aspects of environments for a specific purpose Location of site Practice of sensory awareness skills	Focussing on and observing specific aspects of the object Measuring, estimating, drawing, recording information Reflection by discussion and comparing observations, presenting findings
Gaining a wider perspective	Focussed engagement with object, environment or experience	Grouping, classifying, seeking similarities and differences, familiarisation with place Reflection on processes and linking with previous experiences
Demonstrating understanding	Focussed engagement with object, environment or experience Record of engagement and of reflection on engagement	Transferring new experiences to other environments, artistic response to experience, reporting, presenting, modelling Reflection by comparison with previous level of understanding, evaluation
Developing environmental values and appreciation	Focussed engagement with object, environment or experience	Familiarisation with place Surveying, debating Reflection on the aesthetic qualities of environment, comparison of personal values and those of others

Table 8.1 **Taxonomy of learning experiences at a botanic garden**

This increasing progressions from sensory awareness activities through observation and inquiry to increasing and demonstrating understanding to developing attitudes and values is a feature of the Chicago Model for Learning in a Botanic Garden

discussed in the Literature Review. Each learning experience involves a number of consistent features:

- links with a previous learning experience
- contains a cycle of action and reflection
- involves students' physical interaction with the environment.

The learning experiences relate more closely to the taxonomy of learning experiences proposed by Lai (1999b). His work is based on the learning experiences of secondary geography students rather than to the range of subject matter that may be encountered in a botanic garden. Both taxonomies involve a progression of students moving through an environment to physical, then cognitive and affective engagement with surroundings. Both taxonomies involve considerations of appropriate techniques for reflection. The six learning experiences from Table 8.1 are described in the following section.

Attending to specific aspects of environments

In a botanic garden students are immersed in a new and complex environment and they may need to develop skills of noticing or looking for detail in such a location. A fundamental learning experience particularly for younger students may well be to develop observation skills and simply use their senses to explore this environment. This learning experience involves student selecting and focussing their attention onto a specific aspect of a plant or of an environment in a selected location. Students often make connections with similar objects found at home or at school. There is a sense of freedom and enjoyment with students being able to move through and around a space as part of this selection process and discussing their experiences with their friends.

There is some evidence from the case study and survey data that teachers spend some time exploring particular environments while they are visiting the RBGS. There is evidence from the case study data that these explorations do result in students' long term recollections of specific plants and places at the RBGS. This thesis contends that these experiences can be viewed as a learning experience if students' recollections are linked to the learning outcomes required by the classroom teacher.

Interaction with specific aspects of environments

Students use their senses to interact with the plant or other feature that is the focus of their attention. Students are able to handle and touch this feature as well as discuss their activity with their friends and adults accompanying the group. This learning experience flows from students' explorations of specific environments and involves closer physical contact and observation of detail. Often during this activity teachers or students themselves can pose questions that prompt further inspection of detail. There is a sense of student excitement and sharing of findings with an increase in quieter moments of absorbed attention. This is also an opportunity for links to be created between the new environment and those that have formed part of students' previous experiences.

Making observations

This learning experience moves beyond the primary experiences of the previous learning experiences. Students are now investigating their environment. They record detail, estimate and measure components of this environment. This is a science-based component of learning at the RBGS and involves students making observations of selected components of the environment. The 'science sense' of this component involves students in noticing and recording specific detail as accurately as possible.

Data from the case studies and teacher surveys reveals the popularity of this type of learning experience at all levels of schooling. It appears that teachers utilise worksheets as a means of directing and recording students' observations. This learning experience has the potential to involve the full range of the investigation process i.e. hypothesising, making observations, testing observations, reforming hypotheses, making conclusions. However there is little evidence in the data that this process continues beyond making observations. Further research of the place of the excursion in a teaching programme that focuses on student investigation would reveal the extent to which the investigation process can be conducted on a day's excursion to a botanic garden.

Gaining a wider perspective

A consequence of student engagement with particular aspects of their excursion event is the opportunity to broaden their perspectives in a wide range of areas. The data from this thesis indicates that learning experiences in science-focussed excursions can bring students into contact with a wide range of plants, for example. This learning experience involves students becoming aware of the similarities and differences between the plants at the RBGS and the plants they have experienced in other places. Another opportunity for students to gain a wider perspective is as a result of their interaction with indigenous educators. There is little evidence of this type of learning experience yet this opportunity is available for teachers at the RBGS.

It appears that the simple act of embarking on an excursion to a botanic garden would broaden students' perspectives and indeed there is evidence that teachers view this aspect of an excursion as a valid reason for the event. This thesis takes the view that this experience may be considered a learning experience if it forms part of the learning outcomes for the excursion and such focussed outcomes form part of students' recollections of the event.

Demonstrating understanding

Another consequence of students being engaged in focussed activities with plants and environments in a botanic garden is for them to have the learning experience of being able to demonstrate their understanding. This can involve students in transferring their new experiences to other environments and in particular to further classwork activites back at school. The data from the thesis suggests that students are able to identify plants, use their experience to discuss different environments and make presentations. Data also suggests that students can be involved in creative activities that involve an artistic response to their experiences at the RBGS.

In cases where the excursion is required to meet specific cognitive-based learning outcomes, students' understanding of these requirements may be evaluated by testing or by being incorporated into further learning activities in classwork. Evidence from this thesis suggests that students are able to use their recollections of the excursion in

situations where they discuss and explain their observations. However there is data that strongly suggests that students' may draw factually incorrect inferences or conclusions from their experiences.

The results of this thesis indicate that the excursion to a botanic garden provides students with a unique opportunity to construct their own understandings of plants. Activities that encourage time to engage with and observe plants in particular environments result in vivid, long-term memories. Further research is required to investigate the nature of these knowledge schemes and also to the possibility of extending the range of subject matter that could be the focus of student knowledge schemes.

Developing environmental values and appreciation

A consequence of students' focussed interaction with objects, environments or other experiences at a botanic garden, students may be involved in articulating their opinions about aspects of their experiences. A process of clarifying personal attitudes and values can be extended to explore the attitudes and values held by others. This type of learning experience may result in students changing their own views or being influential in changing the views of others.

There is some evidence in the data that this type of learning experience forms part of an excursion to a botanic garden, however the data sheds little light on the presentation and articulation of this learning experience. Further research is required to investigate the nature and application of this type of learning experience. It would appear that the requirement of environmental education for an active, informed citizenry could be met by providing learning experiences where students are able to identify and articulate their personal opinions and those of others.

c. The learning environment at the RBGS – the where

If educating about, with and for plants is the educational role of a botanic garden, then there is no other venue on the planet where this process will occur with such certainty as in a botanic garden. Data from this research indicates that the RBGS presents a unique environment and set of resources within and with which students

learn. The most focussed and clearly articulated area for student learning in a botanic garden is that relating to plants. This fact places a botanic garden as a highly successful educational institution.

The clear impression created by the data presented in this thesis is that teachers are moving the site of learning from their classroom to the RBGS for the day. Students are immersed in an environment where thematic plant displays and made environments are created specifically for educational purposes. The educationally focussed displays of plants at the RBGS are perceived by teachers to be relevant to school curriculum and also to the students who visit and interact with them.

Features of the environment at the RBGS that are perceived to promote learning involve use of real, living plants that are immediately accessible to students. The environment is composed of real, living things that can be linked directly to learning in other environments and from books, pictures or videos. Students can interact with the real object of their studies.

8.3.3 Comparisons with other models for learning in botanic gardens and other museums

Definitions of learning that are relevant to this research of the nature of learning in a botanic garden need to address subject matter, processes of learning and the physical context for learning. There is evidence of these aspects in the Chicago Model for Learning in a Botanic Garden. While this model would benefit from further elucidation it presents a continuum of learning processes that commences with sensory awareness activities and moves to 'knowledge'. The taxonomy of learning experiences presented in this thesis links with this aspect of the Chicago Model and contains and describes such a continuum of learning experiences.

The second aspect of the Chicago Model presents a requirement for learning that engages the learner, involves transfer of understandings and application to action. This presentation of learning outcomes relates to the action-oriented focus of environmental education. While botanic gardens see themselves as providing learning experiences that are relevant to this domain, it appears from this research

that the requirement of school groups relate more to scientific understandings about plants and environments.

The third aspect of the Chicago Model presents special conditions of learning in the context of a museum. Many of these features – but not all have been located in this research. The data presents evidence for four of the Chicago Model's 'special conditions' of learning – immediate response, socially interactive, multi-sensory and enjoyable experience. It appears that the 'special conditions' of voluntary, intrinsically motivated and self-directed nature of the museum learning experience apply more to the experiences of the general museum visitor.

This latter part of the discussion of the special conditions of learning in a museum relates to Falk & Dierking's conceptualisation of this kind of learning as 'free-choice' learning (Falk & Dierking 2000). Evidence from this thesis reveals that students as visitors to a botanic garden play no part in the decision-making process that makes the choice to visit the RBGS. This is a fundamental difference between school groups and the general museum visitor. Teachers' expectations for specific learning outcomes to be achieved on an excursion require a content focus for a model of learning that is devised to inform learning in a botanic garden for school students.

This thesis has major findings concerning the nature of learning in a botanic garden. These findings will inform the practice of educators at the RBGS and in other botanic gardens. It also appears that these findings have the real potential to inform conceptualisation of the nature of learning and education practice in other museums and outdoor learning environments visited by school groups such as zoos and environment education centres.

8.3.4 The educational stance for a botanic garden

This research has provided an opportunity to propose an 'educational stance' espoused by Hein (1998) and discussed in the Literature Review. Hein requires consideration of a theory of knowledge, a theory of learning and a theory of teaching. In framing the educational stance for a botanic garden the researcher is profoundly aware that ventures into the field of educational philosophy extend beyond the scope

of this thesis. This thesis adopts the position that considered conclusions about the nature of knowledge require a life-time of philosophical research and debate. This thesis can only report the philosophical positions located in the writings of those scholars whose work most closely approximates the researched nature of a specific educational milieu.

a. Theory of knowledge

The area of education theory that informs the practice of education in a botanic garden is found in the work of John Dewey. This thesis provides strong evidence to support its claim that the theoretical underpinning that informs the nature of learning in a botanic garden lies in the Deweyan tradition of learning and experience. The theory of knowledge supported by this thesis is the epistemological position of the pragmatists that knowledge is located in the interaction between the learner and his physical and social environment.

b. Theory of learning

The case studies and surveys discussed in this thesis reveal teachers' requirements for their students to experience plants and environments at a botanic garden. In this context learning in a botanic garden is primarily concerned with deepening and broadening students' understandings of plants and environments beyond the classroom. For Dewey, experiences can be termed learning experiences when there is evidence of continuity, interaction and enjoyment (Dewey 1967/1938).

Evidence from the case studies reveals that the excursion to the botanic garden is continuous with the teaching sequence in a unit of classwork. Students' memories of the event reveal a strong link with the learning requirements of their class teacher. The nature of these memories reveals a rich store of learning experiences indicating that scheme-building learning has occurred on the excursion. The clearest evidence for the presence of scheme-building learning is the clarity of students' mental images of ecological plantings particularly the arid plants found in the Succulent Garden at the RBGS and the rainforest plant collection in the Tropical Centre. Both these environments are closely linked with various topics and themes in classwork back at

school. Evidence from both the case studies and surveys reveals that teachers often use these clear, persistent memories in classwork some years after the excursion.

Data from many sources in this research highlights the importance and relevance of student interaction with the plants and environments in a botanic garden. Students identify this physical association as one of the features of learning in a botanic garden. Teachers actively seek the opportunity for students' direct access to resources that are provided at a botanic garden. There is little doubt that Dewey's requirement for enjoyment is met by the reported experiences of students and their teachers on their excursion to a botanic garden.

In the Deweyan sense this type of learning can be termed scheme-building learning. The longevity of students' recollections about these learning experiences clearly indicates that students can achieve deep, personalised conceptual understandings as a result of an excursion to a botanic garden.

c. Theory of teaching

A powerful and unique contribution made by this Deweyan perspective is its application to teaching practice. This approach embraces subject matter and provides a rich heuristic for professional selection of pedagogical approaches appropriate to a range of content areas. This is a powerful and recurring theme throughout this thesis. Discussion in the Literature Review presented the work of curriculum theorists such as Grundy (1987) and Pearson & Smith (1985) in applying the philosophical work of Habermas to the subject matter contained in curriculum areas. Their work can be viewed as a framework that links appropriate pedagogy to each of Habermas' three areas of human interest.

Subject matter located at the RBGS is identified by the RBGS itself and by the wider global community of botanic gardens and has been discussed in the Literature Review. Subject matter located at the RBGS has also been identified by school syllabus documents and has been discussed in Chapter Six and in the previous section of this concluding chapter. It is apparent that areas of subject matter at a botanic garden can be organised into a framework. This framework, termed the SMP

Framework (Subject Matter Pedagogy Framework), is presented in Table 8.2. The SMP Framework associates subject matter located in botanic gardens with Habermas' areas of human interest. The table then identifies appropriate pedagogical approaches to the subject matter.

Habermas' human interests	**Subject matter**	**Pedagogy**
Technical – knowledge based on empirical investigation and governed by technical rules. Characterised by empirical-analytic sciences.	Plants: plant identification, plant diversity, plant adaptation; horticulture; insect and bird study.	Promote conceptual understanding: physical interaction with plants, techniques promoting specific focus and recall of information. Teacher as expert.
Practical knowledge – social knowledge; negotiated norms and meanings. Characterised by historical-hermeneutic disciplines.	Aboriginal peoples and their use of plants. Other cultural groups and their use of plants.	Promote understanding of another point of view: interaction with members of particular cultural community. Teacher as facilitator.
Emancipatory – critical self awareness; ability to assess and change behaviour. Located in critical social sciences including environmental education.	Environmental education; plant conservation; sustainable horticulture.	Promote personal involvement in environmental problem-solving; promote attitudinal and behavioural change. Teacher reflects and challenges participants.

Table 8.2 **The Subject Matter/Pedagogy (SMP) Framework. An application of Habermas' areas of human interests to organisation of subject matter and pedagogy in a botanic garden.**

Data from this thesis illuminates the area of technical understandings of plants however further work is required to identify and assess the appropriateness of pedagogical approaches to the practical and emancipatory areas of subject matter. Evidence from the teacher survey suggests that teachers can identify and articulate approaches to content and pedagogy associated with learning about plants. However this clarity and familarity is not evident in their considerations of cultural views of

the world other than their own or of the issues involved in plant conservation and sustainable living.

It appears that this model for organising subject matter and pedagogy presents a practical means to identify the range of content and pedagogical approaches associated with botanic gardens and the wider group of museums. The Literature Review identifies the need for consideration of the place of subject matter and its associated pedagogy in research of education and learning in botanic gardens and other museums. This thesis presents this organising framework and invites its application to other educational institutions.

8.3.5 Summary and implication of findings

This thesis provides a model for learning in a botanic garden that incorporates the following:

- 'Two-tier' learning: identification of two types of learning that occurs in a botanic garden - learning for cognitive gain and learning to develop 'scheme-building' understandings.
- The SMP Framework: a framework for conceptualising subject matter and a related pedaogoy
- Taxonomy of Learning Experiences in a Botanic Garden

This thesis describes learning at a botanic garden as two-tiered. Learning can be viewed as learning for cognitive gain and as scheme-building learning. The former type of learning is evident particularly in secondary schools where the school excursion is tightly structured to achieve specific cognitive-based learning outcomes. Scheme-building learning is evident where students have long-term recollections of learning experiences that contribute to their personal schemes of understandings about the world.

The SMP Framework provides a means of conceptualising subject matter encountered in a botanic garden and linking this with appropriate pedagogical

approaches. The framework can be applied to the subject matter of other learning environments within and beyond the school classroom.

The Taxonomy of Learning Experiences at a Botanic Garden articulates learning experiences that offer a continuum for learning that may result in increased awareness and understandings of the environment and also the attitudinal and behavioural change required of the educational role of a botanic garden.

The final comment about the nature of learning is left to John Dewey whose work has made profound, practical 'sense' and inspired and informed this research.

> "The basic question concerns the nature of education with no qualifying adjectives prefixed. What we want and need is education pure and simple, and we shall make surer and faster progress when we devote ourselves to finding out just what education is and what conditions have to be satisfied in order that education may be a reality and not a name or a slogan." (p91 Dewey 1967/1938)

8.4 Limitations of the study

The following aspects of the thesis need to be considered as imposing limitations on the work and need to be identified.

- Limited amount of time spent interacting with students and teachers

The busy and often frantic pace of schools and schooling is a factor that limited the amount of time that could be spent with teachers and their students. In consideration of this factor written surveys were kept to one page for both teachers and students and a close eye was spent on the time taken for interviews with both teachers and students. Limited time coupled with changes in school staff also resulted in teachers involved in the research being unable to comment on the write-up of findings. The time taken from school work and from precious break time is valued by this research and every attempt has been made to maximise the efficient use of this scare resource.

- Site of study is limited to the RBGS

The RBGS is a highly specialised and unique learning environment and many aspects of this research are relevant specifically to this site. However, study of the results of this thesis indicates that many aspects are also relevant to and have been endorsed by educators in other botanic gardens. Furthermore there are aspects of this thesis that are highly relevant to educators in other museums and outdoor learning environments.

- Personal interest and capabilities of the researcher.

This study is research of professional practice of the researcher who can be often working in isolation and somewhat reliant on interpreting research that is relevant to other, mainstream education providers. This thesis is a means of entry into a wider arena of dialogue with groups of botanic garden educators and with professionals from the wider scene of museum education and schools and universities.

8.5 Areas for further research

This thesis has provided a basis and a point of comparison for further research especially in the area of education in botanic gardens. It is evident from suggestions for further research made throughout the work that this research appears to have created more areas for further consideration than it has explained. However, at this point the study has dispelled any doubts about the effectiveness of the school excursion experience to the RBGS and to botanic gardens around the world with similar school education programmes. The following are suggested areas for further research.

- Application of case study methodology to explore the nature of the learning experience particularly in other outdoor venues such as environmental education centres and zoos. This methodological approach allows for investigation of scheme-building learning as well as learning for cognitive gain.
- Application of the SMP Framework to subject matter and pedagogical approaches in other educational institutions – particularly in museums. These cultural institutions present a wide range of subject matter to their visitors and it is apparent that this range of content is not homogenous. It is also apparent that

the subject matter of museums can be located within the SMP Framework assisting education professionals to design programmes utilising appropriate pedagogical tools.

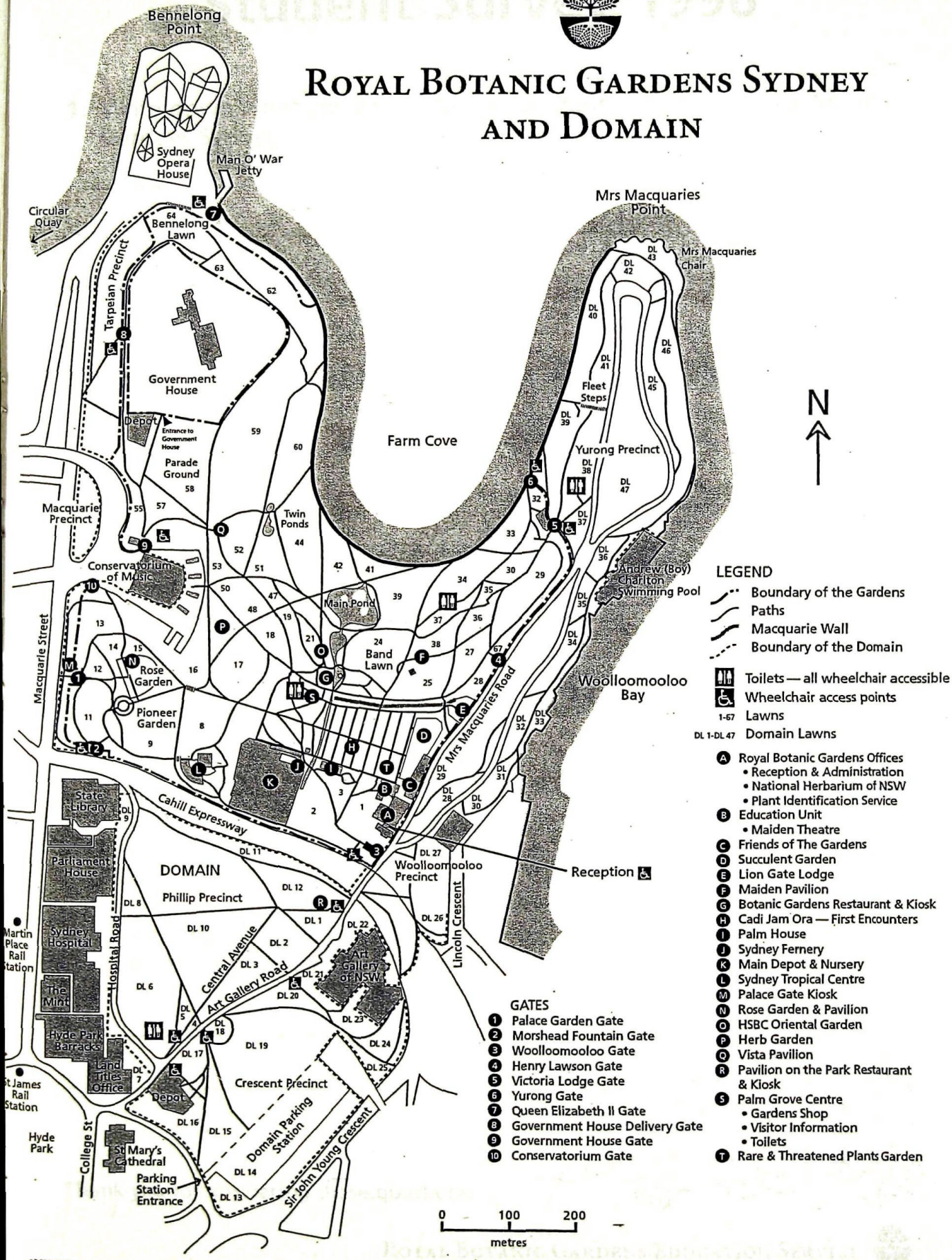
- Design, implementation and evaluation of education programmes focussing on pedagogical approaches that promote personal and community behavioural change associated with education for sustainability.
- Application of the set of Guiding Principles for school education programmes in botanic gardens. This set of principles is a starting point for professional development of current and future botanic garden educators. There is an obvious need to subject the principles to the rigorous scrutiny provided by their implementation and use by professional educators in botanic gardens.

In conclusion

This thesis has provided a valued opportunity to explore and interrogate education practice in a botanic garden. The research presents a theoretical framework for such practice and provides a communication tool to promote dialogue between professional educators operating in botanic gardens, schools, universities and other communities of learning.

This work represents the considered experience of a thirty-year career in teaching, half of which has been located as an educator in one of the world's most beautiful gardens. It is hoped that this work will assist and inform the practice of future generations of educators in botanic gardens especially in their priviledged role of direct, personal interaction with the youngest of visitors to this unique and captivating place. This work is presented with the sincere and deeply held belief that botanic gardens are unique environments for educating the people of this world about plants and their critical importance to all life entrusted to our custodianship.

Royal Botanic Gardens Sydney and Domain



LEGEND

- Boundary of the Gardens
- Paths
- Macquarie Wall
- Boundary of the Domain
- Toilets — all wheelchair accessible
- Wheelchair access points
- 1-67 Lawns
- DL 1-DL 47 Domain Lawns

- A Royal Botanic Gardens Offices
  - Reception & Administration
  - National Herbarium of NSW
  - Plant Identification Service
- B Education Unit
  - Maiden Theatre
- C Friends of The Gardens
- D Succulent Garden
- E Lion Gate Lodge
- F Maiden Pavilion
- G Botanic Gardens Restaurant & Kiosk
- H Cadi Jam Ora — First Encounters
- I Palm House
- J Sydney Fernery
- K Main Depot & Nursery
- L Sydney Tropical Centre
- M Palace Gate Kiosk
- N Rose Garden & Pavilion
- O HSBC Oriental Garden
- P Herb Garden
- Q Vista Pavilion
- R Pavilion on the Park Restaurant & Kiosk
- S Palm Grove Centre
  - Gardens Shop
  - Visitor Information
  - Toilets
- T Rare & Threatened Plants Garden

GATES

1. Palace Garden Gate
2. Morshead Fountain Gate
3. Woolloomooloo Gate
4. Henry Lawson Gate
5. Victoria Lodge Gate
6. Yurong Gate
7. Queen Elizabeth II Gate
8. Government House Delivery Gate
9. Government House Gate
10. Conservatorium Gate

10,000 12/01

Student Survey 1996

1. Write down what you remember about your visit to the Royal Botanic Gardens Sydney.

_____

_____

_____

_____

2. What did you enjoy doing the most at the Gardens? Why?

_____

_____

3. Was there anything you didn't enjoy?

_____

_____

4. What do you remember learning about at the Gardens?

_____

_____

5. What is your favourite part of the Royal Botanic Gardens?

_____

_____



Thank you for answering these questions.

Student Visitor Survey 1996

Please take a little time to answer the following questions about your school excursion to the Royal Botanic Gardens.

1. Write down what you remember about your visit to the Royal Botanic Gardens Sydney. Use the back of the sheet if you wish.

2. What did you enjoy doing the most at the Gardens? Why?

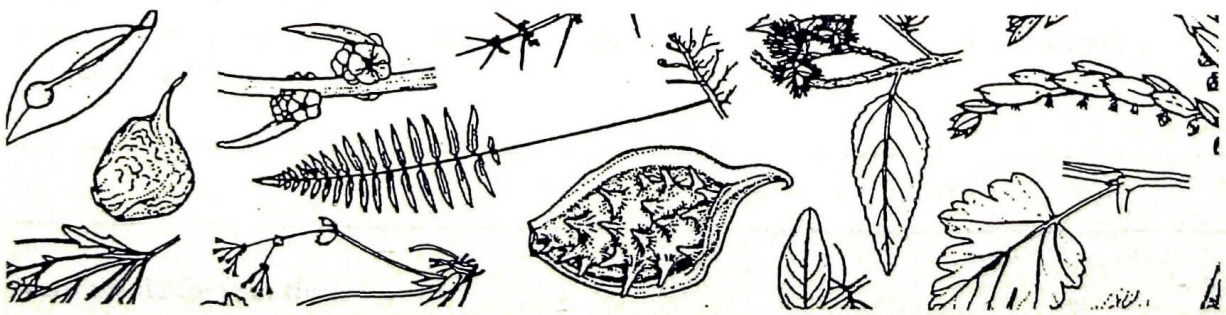
3. Was there anything you didn't like? Please explain.

4. What do you think you went to the Gardens to learn about?

5. What do you remember learning at the Gardens?

6. How is learning at the Gardens different from learning at school?

Many thanks for your time.



Teacher Use Survey

Please take a small amount of time to answer the following questions about your excursion to the Royal Botanic Gardens. Your answers will help us plan better for your needs. Feel free to use the back of the sheet for further thoughts. Thank you for your time.

1. What are your immediate recollections of your excursion to the Royal Botanic Gardens Sydney?

2. Why did you choose to bring your students to the Royal Botanic Gardens?

3. What objectives/outcomes were achieved as a result of this excursion?

4. How did this excursion fit in with your existing teaching program?

5. What can/did you achieve at the Royal Botanic Gardens that you may not have achieved in your classroom?

6. Apart from using the education officer for a lesson did you use the Gardens as a teaching resource in any other way?

Many thanks for your time.

Student Survey 1997

Over the past years your school - [illegible] - has earned the reputation as one of the best school groups on excursion to the Royal Botanic Gardens Sydney. We are very interested in your thoughts about the Gardens and about your excursion.

1. What do you think is the purpose of your excursion to the RBG? Explain.

.....

.....

2. What would be the three most important things e.g. ideas/facts/information that you have learned today?

.....

.....

3. What did you enjoy doing most at the RBG?

.....

4. Was there anything you did not enjoy? Explain.

.....

5. As a day in your school life how would you rate today. Please circle your response.

a. enjoyment? none low medium high
more than at school? Yes / No

b. learning about plants? none low medium high
more than at school? Yes / No

c. boredom? none low medium high
more than at school? Yes / No

d. hard work? none low medium high
more than at school? Yes / No

6. Other comments? Please use the back of this sheet for other comments you may have about the Gardens and your excursion. Thank you for your time.

Teacher Survey 1997

..... enjoys a reputation at the Royal Botanic Gardens as effective users of the Gardens as an educational resource. Please take a few moments to answer the following questions about your school excursion.

1. What is the purpose of your excursion to the RBG? Explain.

.....

.....

2. What would be the three most important things (eg ideas/facts/concepts) you would like your students to learn today?

.....

.....

3. Why did you and your colleagues choose to bring your students to the RBG?

.....

.....

4. How do students learn best in the RBG?

.....

.....

5. What do you value about the excursion to the RBG?

.....

.....

6. Apart from using education staff for lessons today, did you use the Gardens as a teaching resource in any other way?

.....

.....

7. Other comments? Please use the other side and thanks for your time.

[redacted] High School

Student Survey 1997

The Royal Botanic Gardens is interested in your thoughts about your excursion today. Please answer the following questions about the day.

1. What have you enjoyed most about the day?

learning about the different sorts of plants and the rainforest section

2. Is there anything you haven't enjoyed? Explain.

Yes, the day was too rushed we should have longer time at each stop and maybe went into more detail about the plants

3. As a day in your school life how would you rate today. Please circle your response.

a. enjoyment? none low (medium) high
more than at school? (Yes) / No

b. learning about plants? none low medium (high)
more than at school? (Yes) / No

c. boredom? none (low) medium high
more than at school? Yes / (No)

d. hard work? (none) low medium high
more than at school? Yes / (No)

4. What do you remember learning here today?

algae, conifers, cycads, rainforest

5. Compared to learning science in the classroom at school, is learning different here at the Royal Botanic Gardens? Please explain.

Yes as it is more practical and hands on
We have to observe, touch etc instead of just reading information

6. Other comments? Please use the reverse side.
Many thanks for your time. It was a good day, I had fun.
The gardens are good

[redacted]

Teacher Survey 1997

The Year 10 science excursion at the Royal Botanic Gardens is a long-standing tradition for us here in the Education Section. We look forward to the day and without fail, even in the heaviest Spring rain, enjoy the experience. This year the Gardens is keen to find out more about the excursion as an example of highly successful use of the resource. We would value your comments and answers to the following questions.

1. What do you expect your students to learn at the Royal Botanic Gardens?

.....

.....

2. How do you see this differing from what your students would learn in your classroom?

.....

.....

3. What (if anything) do you enjoy about the day?

.....

.....

4. How do you prepare your students for the excursion?

.....

.....

5. How do students learn best in the Royal Botanic Gardens?

.....

.....

6. How do you use this excursion experience in your class work?

.....

.....

7. Other comments? Please use the reverse side.

Many thanks for your time.

Teacher Use Survey 1996

CLASS _____

Your thoughts and experiences are important to us. Please take time to complete the following questions and return to the Education Unit today or fax them to us on 9251 4403. Your answers will help us plan better for your needs.

1. Why did you choose to bring your students to the Royal Botanic Gardens?

_____

_____

2. What objectives/outcomes did you have for this excursion?

_____

_____

3. Has this excursion achieved these objectives/outcomes? Explain please.

_____

_____

4. Apart from today's lesson by the education officer how else did you use the Gardens as a teaching resource?

_____

_____

5. How does the lesson by the Education Officers 'fit' in with your teaching unit at school e.g. what pre/post excursion activities would / did you use etc?

_____

_____

6. Please add further comments on the back of this sheet about your/your students' experiences here at the Royal Botanic Gardens. Any thoughts you might have would be appreciated.

_____

_____

Many thanks for your time.

ROYAL BOTANIC GARDENS EDUCATION SERVICE

Teacher Use Survey Term II 1996

Please take a small amount of time to answer the following questions about your excursion to the Royal Botanic Gardens. Your answers will help us plan better for your needs. Feel free to use the back of the sheet for further thoughts. Thank you for your time.

1. What are your immediate recollections of your excursion to the Royal Botanic Gardens Sydney?

2. Why did you choose to bring your students to the Royal Botanic Gardens?

3. What objectives/outcomes were achieved as a result of this excursion?

4. How did this excursion fit in with your existing teaching program?

5. What can/did you achieve at the Royal Botanic Gardens that you may not have achieved in your classroom?

6. Apart from using the education officer for a lesson did you use the Gardens as a teaching resource in any other way?

Many thanks for your time.

Appendix 3 **Codes for student responses to survey items**

L	Formal aspects of the excursion; RBGS lesson activities		
L*	Specific information about formal aspects		
L^E	Exploring;	L^O	Observation/investigation; L^M Learning from experience
O	Informal aspects of the excursion		
O*	Specific information about informal aspects		
C	Conceptual		
F	Factual		
S	Sensory experience		
S*	Specific information about the experience		
S^E	Looking, looking at, seeing;	SK	see what you are learning about
S^F	Texture, feeling, touching, tasting;	S^T	Temperature/environmental conditions: hot, humid
S^B	Sensory awareness activity: blindfolded, looking through mag glass		
P	Plants		
P*	Specific information about plants		
P^R	Rainforest, rainforest plants	P^D	Plants from arid areas
T	Specific tree in RBGS		
B	Places at the RBGS		
B*	Specific information about the place		
B^G	Tropical Centre, pyramid, arc etc	B^D	Succulent Garden, desert
B^R	Resources of the RBGS	B^L	learning environment
K	Surrounded by plants; access to the real thing		
K^R	real plants/environments	K^B	not video or book
Y	Interactive; hands on		
G	Relevant		
Q	Access to expertise		
M	Interesting		
U	School work; school subjects		
X	Conservation; environmental issue		
A	Animals		
A*	Specific information about animals		
I	Incident happening on the day		
I^G	Incident happening at the RBGS		
I^A	Incident happening in the lesson		
D	Trip details		
W	Walking around	W*	Relaxed
H	Weather		
J	Litter		
F	It was fun; enjoyable		
N	Nil response		
Z	Boring		

Appendix 4.1 **School C Student responses to survey item 'Write down what you remember about your visit to the Royal Botanic Gardens Sydney'**

L A I^a I remember the glass house and the desert and how I fell on a cactus and the tadpoles in
P^d T the water.
B $^{G\ C*}$

L* S I^{a*} When we went into the rainforest bit and it was so hot and then it started to get cooler.
P^{rd} T* When we went into the desert and my friend Rixon got cactus spikes in her hand.
B* ^{C*} W

L A I^a I remember when we were in the glasshouse and at the desert where all the cactuses
P^d T where everyone liked the desert where the spiders were and a lot of people got pricked.
B $^{G\ C*}$ W

L S I^g I remember going into the glasshouse, seeing the wedding, desert and the smell of the
P^d T* eucalyptus tree.
B $^{G\ C}$

L* S I remember the glasshouse it was very interesting the hotness when you go higher up and
P P^d the pyramid with all the plants and the desert.
B $^{G*\ C}$

L* S I remember the glasshouse and all of the plants. I liked how the temperature got hotter
P P^d when you went higher it got hotter. When we went into the desert and saw(?)
B $^{G*\ C}$ W

L*S D I remember the glass pyramid and the desert and the play after. I also remember the furry
P*P^d leaves and the tropical plants.
B $^{G\ C}$

P^d T Going to the desert and seeing cacti.
B ^{C*}

L I^g D When we went into the glasshouse. Walking down the road and seeing the wedding.
B ^{G} W

L* S I remember when we went into the pyramid and it was really hot.
B ^{G*} W

L* S The huge glasshouse and how we went inside and the temperature got hotter and
B ^{G*} W then the water came down and felt nice.

L* S I remember when we went into the RBG and we went into the pyramid where all the
P* beautiful plants were and in one part of the pyramid was hot and the other side was misty
B ^{G*} W and cool.

L* S We went into the pyramid and higher you got the hotter you got.
B ^{G*} W

L* D P^{r} B^{G} W	We got off the bus there and we went into a rainforest then we went into the glass house.
L* S D P* B^{G}*	I remember the walk seeing all the different types of plants and the glasshouse and it temperature.
L* A P B G*	I remember going into the glasshouse and seeing all the plants I remember in the pyramid when I got in there it was very tall. I also remembered seeing the little tadpoles.
L A P^{d} B^{GC}	I remember the glasshouse and the botanical desert and the spiders and spider webs

Appendix 4.2 **School C Student responses to survey item 'What do you remember learning at the RBGS?'**

L P^{R} C^{PR}	what a rainforest is like
L P^{R} S C^{PRS}	what it feels like in a rainforest
L P^{RD} C^{PRD}	about rainforests and the desert
L P C^{P}	the different plants
L P C^{P}	I remember learning about the different trees and plants
L P C^{PR}	all different plants and vines
L P F^{PR}	I learned about the vines that grow very fast
L P S F^{P}	I learned that some leaves smelt like lemons
L B S^{T} F^{BS}	*I learned that in the glasshouse it is all different temperatures but they're all hot*
L P S^{T} C^{PS}	All the different plants and temperatures
L P S^{T} C^{PS}	learning about humidity and plants
L P^{R} S^{T} F^{S}	I learned that in the rainforest when you get higher the temperature gets higher
L S^{T} F^{S}	the humidity it goes higher
L B^{G} F^{B}	I learned about the pyramid
L A F^{B}	I remember when you told us there are frogs in dark ponds
O P S^{F} F^{S}	don't touch a cactus with spikes
Z	Nothing

Appendix 4.3 **School C Student responses to survey item 'What did you enjoy doing the most at the Gardens? Why?'**

L B^G P	I enjoyed the glass house because I was able to see all the different kind of plants.
L B^G P S^T	I liked the glass house because of the plants and the tempere.
L B^G S^T	Going in the Glass house. Because it was icsiting (exciting?) and getting hoter and hoter.
L B^G S^T	Going into the hlass house because you could feel the temperature as you went higher.
L B^G S^T	I enjoyed going to the pyramid and why I liked it is because of the different temperatures.
L B^G S^T	Going in the glasshouse because as we went up it got hoter.
L B^G S	I enjoyed the glass pyramid, because it felt good in the misty part.
L B^G P	The glass house because I like the planes (plants?)
O B^D P^C	Going into the dessert and seeing the Alovira Catus.
O B^D P^C	I liked going to the desert and seeing all the cactus.
O B^D	going to the desurt
O B^D P^C	I enjoyed the desert because when you put your finger 2cm away from the cactus the cactus atomaticly put a prickly in your garden (?)
L W A	I in joyed when we had a tour around the place and the grasshopper it jumped verry high.
L M P^R	I thought the gardens were very instering and tropical.
L O F	Walking. Because I thought it was fun.
L A	I liked sitting down under the tree and talking about the posoms.
O W P	After lunch we went on a walk and I saw a three that had colaful leves

Appendix 4.4 **School G Student responses to survey item 'Was there anything about the day that you did not enjoy?'**

E	I liked everything
E	Everything was fun and I enjoyed it alot
E	No 3
E	No!!! 2
E	No way
E	Nothing
E	No! I liked it all.
E	No everything was great
E	No I liked everything.
E	No there wasent enthing I didn't injoy
A	I didn't like filling out sheets
A	Getting a headake.
A	I did'nt enjoy the walk outside the botanical gardens.
N	Nil response 1

A: aspect of the day not enjoyed by students
E: day enjoyed by students
N: nil response

Appendix 4.5 **School B Student responses to survey item 'Write down what you remember about your visit to the Royal Botanic Gardens Sydney'**

L* DW SE P*	I remember walking around the Gardens and being taught many things about the plant for example the reason a certain plant is in the Gardens. I remember looking at slides telling you about other Botanical Gardens and so on.
L* P*	I remember learning about tree from different country sent here because there aren't many left in that country so we grow them and send the seeds to that country.
L* D BC P T	I remember the dragon blood tree, the bottle tree and the cactus display.
L* P* T*	I remember much about the Dragon's blood Tree, and how it cam from the Canireai Islands and that they want to regrow them, and there are about 15 left and it called a dragon's blood tree because if you cut it it's red like blood.
L* D B BC P T	I remember the dragon's blood tree, the cacti garden, the wishing tree, the bottle tree, the boarders of the Gardens and the little classroom.
L* D B* P T IG	I remember the wall near the water that took 30 years to build. The wedding with living statues. And the dragons blood tree.
L P F	It was a nice day. I lurnt a loot about plants and the seanre.
L SE BS P	I remember about the plants I saw and the view I saw on the hill.
L* SE P*	I saw some flowers and trees from other country.
L B P	All the trees and the wall.
O* DW P T*	I remember the wishing tree and how you had to walk around it three times.
L* D P T	The wishing tree, tall trees, the red blood dragon tree.
P T* B*	I remember there was a wishing tree in the middle of the gardens.
L O* D B* BC P T*	I remember we went to the wishing tree and wished. That we went in the cati(sic) Garden. We drew pictures of the harbour of Sydney.
O D B P T*	I remember that we went to the wish tree. I remember that we did some scejing (Sketching) on the ... some of the tree.

L* BC P T*	I remember the bottle tree. It had something like a you-know-what and it looked like a woman dancing. I liked the cactus garden too.
B* S* D F P	I liked when we were walking through the garden it was shady and quiet and the breeze of the trees.
B* S* P F	Very hot very beautiful, have lots of flowers.
L* O* D SE P	I remember sketching the city line with the tree and looking at unusual trees. Seeing the wishing. Learning about plants.
O* B	I remember sitting on a rock sketching the Harbour Bridge.
L O* D B P*	The drawing of the landscape. Touring the cactus.
B P A	The wishing satue(sic) and the flowers, birds and trees.
L O* DW B BC P* T	I remember the cactus area, wishing at the Wishing Tree and the walk around the Gardens.
L D BC P T	The cactus despla. the botl tree. The dragons blod tree.
	Nil response

Appendix 4.6 **School B Student responses to survey item 'What did you enjoy doing the most at the Gardens? Why?'**

L O* P	Wishing tree, because all your wishes came true, and the bottle tree.
L O P^D F	Wishing statue and the cactus because there fun
L P^D	The cactuses, I liked the shape and protecion of those plants.
L P^D	The cactus desplay because it was different.
L $B^D P^D$	I liked the cactus display because some of the cactus made interesting shapes.
L O P M	I liked all the different sorts of trees because they were interesting.
L O P S M	Seeing all the tree because it was interesting to see all the different kinds of trees
L O S P	Looking at the plants and eating my lunch.
L O W P B^D M	Walking all over the Gardens and the cati Garden. Because they were very interesting than when dad took my brother and I to.
L O B^G K	I enjoyed going in the rainforest type of spot. I liked because it was as if I was really there.
L O W P S	I enjoyed walking around in all the shade of the trees on the path. And all the great trees because I think it was nice and cosy.
L O W S B	Walking around and enjoying looking at the gardens.
L O W S P	Walking around because it was nice to see all the different kinds of trees.
L O W B	Walking around the garden.
L* W P	I enjoyed the walk the most because I was interested in learning about the endangered species of plants.
L* O W P	I enjoyed the tour and the wishing tree and learning and reading all about the names of the plants.
O* B R^F	I liked to sit on the hill and sketch the Oprah House and Harbour Bridge. I just like it.
O* P S	I enjoyed sitting down and drawing the buildings and trees which was nice and cool.

O*	I liked sketching It was a good experience for us.
L O* W B S	I enjoyed drawing, and walking near the bay because drawing is fun and we drew in a cool spot and walking near the bay because it was a cool breeze.
O* B S	I liked sketching because it was nice and cool and there were beautiful surroundings.
O*	Sketching because I'm really like art.
O* S	I enjoy the most is drawing under the shed (shade)
O* S	Sceching was my favourite part because it was shady quiet and comftebil.
L* P F	I enjoy wacing the vedio on our tree's all over the world. I like it because it was fun.

Appendix 4.7 **School B Student responses to survey item 'Was there anything you didn't like? Please explain.'**

E x2	Nothing (2)
E	No. I like all of it. It was a good day.
E	I like everything it was good.
E	There wasn't anything bad in gardens because it really all was good.
E S^T	There wasn't really anything I didn't like about the Gardens apart that it was a hot day but you can't control that.
E S^T	Nothing Except the heat it was unbearable.
A S^T	I didn't like the hot weather because it I can't stand being too hot and sweaty
A S^T	Yes, there was it was too hot that day.
A S^T	The hot weather I didn't like becaue it was too hot.
A S^T	I didn't like the hot weather because I really hate being too hot and sweaty.
A S^T	I didn't like the weather because it was too hot sticky and humid.
A W S^T	Walking because I got hot and tired.
A O*	I did not like the sketching because I found it boring.
A D	I wanted to see the pyramids, it was a pity we didn't.
A D	Yes, that we did not got to go in the glass houses which are the best part in the Gardens.
A J	I didn't like the place where we ate lunch because it was a bit dirty
A J	I didn't like the places that were littered.
A J	I didn't like in the water around the wall all the rubbish and pollution.
A J	Rubbish near the wall.
A J	The plusher (pollution) outsied the gardens
A J	The berty (dirty) worter
AJ	I didn't like the rubbish around the water. I think people should get together and do something about it. It makes the gardens ugly.
AJ	I didn't like how the people were jogging on the grass because it wrecks it.
Z	Everything – boring

Appendix 4.8 **School B Student responses to survey item 'What do you think you went to the Gardens to learn about?'**

L P	I think the Botantic(sic) Gardens were to learn about endangered plants.
L	I think we went to the gardens to learn about the Environment, also because we were studing on the environment
L P	I think we went to the Gardens to learn about the environment and endangered plants.
L P	We were studing nature at the time so probably to learn about the plants.
P	I think we went to the Gardens to learn about plants.
P	We went to the Gardens to learn about plants.
P	plants
P	plants and trees
P	tree and other things
P	I went to learn about all the different and strange plants.
P	To learn about trees and wildlife.
P	We went to the garden to learn about tree's plant and all sote of thing.
P	I think we went to the gardens to learn about all the different types or(sic) trees and the history
P	All the different plants and trees and were they came from.
P	We went to learn about the way plants grow and so we can know more about the way they work.
L	The trees and the environment.
L	plants and the environment
L	trees, plants and the environment
P	to learn about plants and its habitat.
P	I think we learnt about plants and their habitat.
P F	I think I went for learning about plants and habitats, for having fun and also to know who's occupations were in each part of the Gardens.
L	We went to garden to learn about danger trees and other things about trees.
L	I think we went to learn about the environment and Australia safe.
P	I think we went to the Gardens to learn about the affect the trees have on us.
*	Nature

Appendix 4.9 **School B Student responses to survey item 'What do you remember learning at the Gardens?'**

L F^{T}	I remember learning about the Dragons Blood tree.
L F^{T}	I remembered learning about the Dragon's Blood Tree
L F^{T}	I remember that we tolk (sic) about the red dangen (sic) tree.
L F^{T}	about the red dragon blod tree
L F^{T}*	I remember learning about the dragon blood tree and it has red sap just like blood.
L F^{T*}	I remember the dragon blood tree and there was sap that looked like blood there is only 15 left.
L F^{T*}	about the dragon blood tree that came from the Canery islands
L F^{BT*}	That the coves wall took 30 years to build. There were only 15 Dragon blood trees in the wild.
L F^{BT}	I remember learning about the dragon's blood tree how the road was built through the Gardens.
L F^{T*}	abuot the dragons blod tree and haw pepeol cep seds. (how people keep seeds)
L F^{BT}	learning that the bay wall took 30 years to build there was only 15 Dragons blood trees left.
L F^{BTP}	I remember learning about the rainforests, Dragon's Blood Tree, the Borders and plants.
L F^{G}	I remember learning that all the plants were put in a database.
L F^{P}	I can remember learning about all the names of the plant oltho (sic) I can't think of them now.
L C^{P}	I remember learning about the endangered species, the origins of plants
L C^{G}	How they help dangered (sic) plants and trees.
L C^{P}	About native and foreign plant and their habitat.
L C^{P}	I remember learning about tree and how old trees are
L C^{P}	We learned about keeping Australia growing and all about plants, trees and the environment
L C	Trees, wildlife and endangered spicies (sic)
L C	About the environment and trees.
O C	Nature and trees.
O C	trees and nature
O C	about trees
O F	About the things in and out of the gardens how to scetch (sic) better.

Appendix 4.10 **School B Student responses to survey item 'How is learning at the RBGS different to learning at school?'**

K P	You can get a close up of plants.
K^R P	Learning at the Gardens can show us what the plants look like.
S P	If we learn at the garden you can see the plant but at school you can't see the plants.
S	Learning in the gardens is different because you could see them.
S^K P	In the gardens you actully can see the trees.
S^K	Well it's different because we actually saw the things we learned.
S^K Q	We are actually looking at what we are learning about and we are being taught by experts
K^R P Q	It's different from learning from school because they've got the actull plants more information.
S P F	It is different because you could see the plant but at school you can't it is also more enjoyable.
K S^K	Because your actually there when your teach us so we know what you talking about
S P	Because you can see and feel the trees and objects
S K	You get to see tutch and thay ar all around you
P U	Learning at the Gardens is learning about plants school is learning much other things and the school has sport things.
P U	At the gardens you learn about plants and trees and at school you learn subjects
W* S	Learning at the gardens is different because it is calm, quiet and cool.
W S	I like learning at the garden is better because we to walk arounde and see thing
F P K	Learning at the Gardens is different and more enjoyable because you have a lot of trees around you which you don't have at school.
P	At school your in a classroom we haven't got big shady trees and models of the trees.
B	Because you are not in a hot room and you can be in different places in the Gardens.
B U	It is different because it is out in the open and because different kinds of things are learnt.
F	I like the gardens most than school
F	It is fun
F	Yes because school can get boring so it was a good break.
U	learning at the Gardens is beter than school because no maths.
B U	fresh Air, no MATH!!!

Appendix 4.11 **School A Student responses to survey item 'Write down what you remember about your visit to the Royal Botanic Gardens Sydney.'**

L* S^{e}*A*D D^{W} When we went to the RBG, it started to rain. Of course this didn't stop
P* P^{R}* T so we started out. First of all we went and saw a coffee tree on which was a big
B*BG* bug. Then we went and walk(sic) through a forest of tall trees which were full of bats hanging upside from the branches of the trees. They made a very loud noise. We walked on through the forest and saw many amazing trees. We then made our way to the glass house centre where we learnt about the different rainforest and where they grow. We then went through the Australian native rainforest glasshouse and through to the 'around the world section of the glasshouse.

L* I remember the tobbaco(sic) plants and the coffee plants on the way to the glass
P^{R}* T pyramids filled with lucious green rainforest plants and flowers. I remember the
BG* driptips and buttress roots.

L* AD I remembered almost the whole trip, I remembered the Arc and the pyramid place
P and when we were looking for animals and plants on the sheet.
BG

L* AD We talked in a classroom and saw animal skin(?) and talked about the
P^{R} rainforest. We saw a rainforest like place in a glasshouse.
B BG*

L* D We talked in a classroom about why we were there and went in hothouses.
B BG

L* S^{f}* F I remember, we talked about where and what is a rainforest, the place where
B you and your partner has to feel, hear, and it was fun.

L* S* D We came and we talked about rainforests. We then went to the rainforest
P^{R}* pyramid. We looked at smells, sights and hearing.
BG* There were lots of weird plants like epiphytes.

L DW There was a lot of plants. We went into a rainforest ark(sic). We ate lunch and
P* walked back.
BG

L A* I remember the hot house, and the mini rainforest and the bats and spiders and the
P^{R} cockatoos eating some fruit
B BG

L* A* I remember a lot about our excursion. I remember the huge caterpillar on the leaf,
P^{R}* the drip-tips, the rainforest pyramids and most of the things in them.
BG*

L S^{T} F It was a lot of fun. There were a lot of different plants and in the arc and pyramid
P* it was very interesting and that it was very hot in there.
B G*

L* A* The pyramid that had plants from all over the world from various rainforests, the
P* P^{R} arc with the native Australian plants. The ibises with their long sharp beaks and
of
BG* course the friendly people that showed us around.

L* S^{E} D^{W} I remember walking around the Garden looking at the pond plants, having a
P* walk in the Triangular Greenhouse.
B BG*

L* The thing I remember most is the rainforest greenhouses because of all the
P* different plants and the fact that that was what we went to see.
BG*

L* S^{TE} I remember the moist conditions in the rainforest house and seeing many plants.
P
BG*

L D^{W} We went into the ark(sic) and the pyramid and walked around to see some trees
P and plants.
BG

L I remember all the plants in the arc and Australian pyrimid(sic).
P
BG*

L S^{T} I remember that the pyramid was very, very hot!
BG*

L The primid(sic) and I remember the water coming out.
BG*

L F I remember the arc and the pyramid and that it was lots of fun.
BG

L I remember about going into the green house and when it started misting.
BG*

L I remember going into the arc and pyramid.
BG

L D I remember going to the ark(sic) and lunchtime.
BG

L We went to the arc, pryamid and the duck pond.
B BG

L The ark(sic), pyramid.
BG

L S^{E}A I remember going into the pyramid and seeing the bats.
BG

L* S^{B} I remember the pyramid and the arc the(sic) were both really nice and how I was
BG* blindfolded.

L* S^{BF} D^{W} I remember going into the pyramid and arch(sic) as well as touching the
P* plants blindfolded and walking in the forest.
B BG

L* S^{BE} A I remember going through a hot house, going around blindfolded and seeing
BG bats.

L* S^{*EB} A* Going to the hot houses. Seeing and hearing and smelling the bats. Being
P* blindfolded. A plant that smelt like sweat.
BG

L* S^{TBE} I remember the humid plant house where all the plants where, I remember going
P P^{R*} around blindfolded and then guiding Rachel while she was blind-folded. Looking
BG* at the trees and the big butrice(sic) roots.

L* We went in 3 rainforest under a glass pryimid(sic)
P^{R}*
BG*

L* I remember that we went to 3 different rainforest environments.
P^{R}*

L* S^{E} We went to an enclosed rainforest place and saw lots of plants.
P*P^{R}
BG*

L* S^{E} I remember going into all the different rooms of all the different types of
P^{R} P* rainforest. I also remember looking at all the plants.
BG*

L* A* Rainforest plants, Arc Pyrimid(sic), bats, birds
P^{R}
BG

L* I remember I learn(sic) about lots of plants and going to the pyramid.
P*
BG

L D^{W} Walking around and in the green houses.
BG

L D^{W} Walking through the gardens and going into the Pyramid and the Arc.
B BG

L* I remember the brimilliaids (sic), and the pyrimid(sic)
P^{R}*
BG

L A I remember the bats the pyramid, the arc and that little light up thing.
BG*

L* S^{*B} A I remember the bats squeeking in the trees, I remember being blind-folded and
P^{R} smelling something smelly and trying to guess if a certain tree was a rainforest tree.

L S^{FB} A There was a lot of bats. There was a place where we were blindfolded and had
B* to touch things.

L* S^{B} A I remembered that there were a lot of bats, and the place where we blind folded
B* our partners and lead them around.

L* S^{B} A* I remember the bats hanging upside down, being blindfolded, and guessing if
P^{R} trees are rainforest trees or not.

L* S^{B} I remembered being blindfolded and being in the canopy, understory and ground
P^{R}* levels

L* S^{B} I remember being blindfolded in the Arc and I remember the mist.
BG*

L* S^{B} D I remember when it was raining on the way. We also went into the Australian
P^{R}* rainforests and got blindfolded.
B

L* S^{FE} DD^{W} It was raining and we went on a walk a(sic) we had parteners (sic) and they
P* had to lead us through and we had to feel plants and we got a magnified(sic) glass and we got to look.

L* S^{FE}* A* When I went there I felt some soft leave(sic) and some vines and also I saw
P* P^{R} beautiful flowers and heard birds whistling.

L* S^{BE} P	We filled a sheet, we were blindfolded, and we looked at plants.
L* S^{B} D BG	The sheets. The blindfold thing, the triangle. The bus trip.
L* A*	I remember we had to go and dig for animals.
L* S^{T} D P^{R}*	I remember the carniviore(sic) plants and the hot weather.
S^{E} P*	I saw some different plants where I have never seen before
L* S^{E} P^{R}	I remember going and looking at the rainforest trees and plants.
L* S^{E} P* P^{R}*	I remember seeing all different plants and buttress roots.
L* S^{E} P* P^{R}*	I remember seeing all the buttress roots and all the different kinds of plants.
L* A* P* P^{R}*	I remembered the podgy caterpillars, cat-tails, gromeliades(sic), fern, stilt roots, drip-tip leaves, bats, trees, flowers and Kathy (staff).
L* S^{E} P^{R}*	Our guide's specialty isn't rainforests so she only knew as much as us (or a little bit more) I already knew a lot of the things she told. It was interesting still cause I hadn't seen what they really looked like. I was amazed by the amount of water collected by them.
L* P^{R}* B	The plants in the tropical rainforest, trees with buttress roots.
A P	I remember the plant and the bat
S^{E} P	I remember that we saw cool plants
L* S^{E}	Looking through the magnifying glass.
P*	I remembered the lovely plants and trees growing around the RBG
B* D	I remember how close the Gardens were to the harbour and city and also a burst water main formed a small river.
D D^{W} P* B*	I remember the huge trees that you could run around at lunch and play lunch and long walking paths
S^{T}	I remember it being very hot and sticky and quite boring
N	Nil response (2)

Appendix 4.12 **School A Student responses to survey item 'What do you remember learning at the Gardens?'**

S^{T}	How humid and wet it was
S^{T}	I remember learning that it is very moist and as the higher you get it gets hotter.
S^{T}	That it is very humid.
P B S^{T}	About all the plants and its hotter in the Pyramid that the Arc.
P^{R*} S^{TR}	I remember that in a Australian rainforest it gets hotter the higher you go.
P^{R*} S^{TR}	I remember where most of the rainforest are, and it is very humid.
$P^{*R}P^{R*}$ S^{TR}	I remember learning about epiphytes and how humid it is in the rainforests
P* S^{T}	That it was very hot and there were exotic plants
P^{R}* S^{TR}	At the Gardens I remember learning about the temperature of different types of rainforests.
P*	I remembered that there are many species of plants and flower. Also, we learnt some names of the plants.
P^{*R}	Names of lots of plants in rainforests
P*	I remember learning some names of plants.
P*	I remember learning about all the different plants and what they were called
P*	I remember learning all the different kinds of plants.
P	I learn lots of plants
P A	Some different kinds of plants and animals
P*	I remember learning about plants and what they do to survive and that sort of thing.
P^{*R}	Driptips & butress roots & epiphytes.
B P^{*R}	The Gardens are better than I thought and that we learnt a lot about epiphytes.
P^{*R}	About all the flowers eg ephiphytes.
B P^{*R}	How they put bark and a vine around a pipe so the vine doesn't strangle the tree.
P^{R}*	That all rainforest tree's leaves have drip tips and the hoop pine is an emergent of Australian rainforests.
P^{*R}	The bramilliad holds water
P*	I learnt that a plant holds water

P*^{R}	Why the drip tips have drip tips, why the bramilliaids have so much water.
P*^{R} P^{R}	I remember learning about driptips and the amount of rainfall in a tropical rainforest.
P*^{R}	I remember about the tea and tabaco plants, drip tips, air plants fig trees and how the fruit are on the stems of the plant instead of the tips.
P*^{R}	The different types of plants eg epephite, driptips and ()
P*^{R} P^{R}	I remember learning about drip-tips and lots of rainforest plants.
P*^{R}	What I rember is the ephites that grow on trees and stranglers that grow on trees and killes it slowly.
X P^{R}	At the botanical gardens I remember learning that it can be dangerous clearing rainforests for farms because of the rainfall.
X P^{R}	I rember learning that trying to make a farm in the rainforest can be dangerous.
P^{R}*	I remember learning that plants in the rainforest have to have big leaves. Some rainforest plants are small.
P*	That shorter trees have big leaves.
P*	I remember learning that taller trees have smaller leaves.
P^{R}*	That most rainforest plants have big leaves.
P* P^{R}*	I remember learning about different types of leaves and where the different rainforest grow.
P*^{R}	That the epiphtes store water. And also the pitcher plants.
P*^{R}	I remember learning that vines wind around trees so they can get more sunlight.
P*	Different plants adapt to different conditions and that there is a such thing as insect eating plants.
P^{R}*	Which trees are rainforest trees or not.
P^{R}*	I remember learning about the different types of plants in the rainforest and the huge buttress roots of the tree.
P*P*^{R}	The names of the plants and why trees have buttrice roots and what colour the plants are.
P*^{R}	I remember learning about buttress roots and why they are at the bottom of different trees.
P* P^{R}*	The different plants and different types of rainforest around the world
P^{R}*	Many things about rainforests and rainforest plants.
P^{R}*	How do the plants grow in the rainforest sometimes they grow really funny.
X A P^{R}*	How many trees being chopped down and animals in the rainforest.
P*	Trees can grow to 65m

P*	I remember learning the new spiecies (sic) of plants
P*	That plants grow on trees and different types of plants
P*P*^{R}	Plants that grows on each other and vines.
P*	About the trees, shrubs, leaves and the shapes of leaves.
P*	I remember learning about different plants and how they grow.
P*	The plants and how they live.
P*	Were different plant and were they live.
P^{R}	I remember learning about the rainforest. (q4)
P^{R}	About rainforests (q4)
P A	I remember learning about plants and insects.
A	What kind of bug you find in leaf litter.
P A	I remember learning about all the plants and animals
P	I remember learning a bit about plants.
A	Learning about the habitats of animals
A P^{R}	What animal in the rainforest.
X	That you should look after the environment
A	Yeah! We saw all of these disguting bugs.
Z	Not much.
Z	(3 Nil responses)

Appendix 4.13 **School A Student responses to survey item 'How is learning at the RBGS different to learning at school?'**

S^E	You can absorb the information by listening and you can visualise it as well however at school you can't visualise the information as much.
S^F Y	Learning at the gardens is different because you can feel and experience for yourself.
S^E	At the Gardens it is more visual learning than oral learning.
F Y	It is more fun and you learn in a more interesting way.
F S^F	It is more fun and get to touch things.
Y	Learning at the Gardens is interactive.
W Y	Well for starters it's outside and it's interactive.
Y	Because you get to be more involved.
S^F W K	You can feel the air and see things first hand.
S^E K	We actually get to see the things we learn about.
S^E K	You actually get to see what your learning about.
S^E K	At the gardens you get to see what you are working on.
S^{EF} K	You actually get to see the plants. And touch them.
S^{EF} K	You can see and touch it in real life.
S^{EF} K	You can see, hear and feel the rainforest.
S^E K	We can see what we are studying in real life.
S^E K	You can see the real plants and study them closer.
S^E K	You can see all the plants better.
S^E F B	You get to see the gardens and go fun places.
S^E B	There are things you can see like plants.
S^E B K	You get to see the topic (plants of course) you're learning but at school you might not have the plant to look at.
S^F K Y	It's hands on. You get to touch the thing you are learning about and not just read it from books.
S^F K	You get to feel the texture of the plants rather than just hearing about it.
S^F K	Because you can touch the things you are learning about.

S^F K	You actually got to touch the things you learn about.
S^F K	You are actually there, touching the plants.
S^{FE}	Because you can touch things and look at them.
S^F Y	You get to feel the plants and do lots of stuff.
S^E K	You look at plants no(sic) just pictures.
K	You're actually there instead of looking in books.
K B	You can get an example of a rainforest right in front of you whilst at school you'll be watching videos.
WS^E K	It is phisicle(sic) and you see plants for real instead of in pictures.
W Y	You get to walk and explore a lot.
W	You were walking around.
W	You walk around.
W	We had to walk around in the gardens
W	We walked to (sic?) much and a lot of talking
W B	You have to walk around more and it's a much different environment.
W S^F	Because you can walk around and feel and smell.
W Y	It different because we have to move around and it hands on stuff
W S^F	Your outside, your walking, talking and feeling the plants.
W	You are outside.
W	It's outside.
W	Going out
W S^F	It is outside and you get to touch and feel.
F W	Learning at the gardens was much more fun than learning at school because you're out in the fresh air.
W U	You're learning outside and it's pretty and at the Gardens it's about trees and plants.
W U	You get to walk around the plants with a clip board and we would just learn about the plants and trees.
W	Because you walk around and don't sit down at a desk.

W	At school we have desks and at the Gardens we walk around all day.
W	Well at the Gardens you walk around heaps and at school you sit down.
U	We learn about plants and not math or spelling, reading.
U	You don't do different subjects like school does english and maths.
U	Because learning at school said(?) doing maths, spelling and language while at the Gardens you learn about trees, plants, rocks and animals.
U	At school you learn lots more things than about rainforest tree and plants.
B	There aren't even pot plants in the classroom.
B	You see lots of different things of nature at the BG but at school you see the same things.
B	There are rainforest plants at the Gardens and not at school and the teachers are different.
B	There is(sic) plants everywhere and not at school.
B	You learn more things at the BG because there are more plants from different places.
B F	At the patanical(sic) gardens you don't have to work much and at the patanical(sic) gardens there was far better combination of plants and animals which I love.
B Y	You get to discover new plants.
B	You get to go some places where you haven't been before.
B	The people at the Gardens can show you things at the gardens.
B	There is a lot more plants and trees and pros to talk to.
B	Air is much humid.
F	We can enjoy some games and don't have to do lots of work.
F	1.It's fun. 2.Get to bring lollies. 3.It is full of new things to learn.
	Yes
	One nil response

Appendix 5.1 **School H Student response to survey item 'What do you think is the purpose of your excursion to the RBGS?'**

P	To allow us to identify different plants and help us gain a better knowledge of the plants and the environment in which they live.
P	The purpose of this is for us to learn about different types of plants etc It was very interesting to learn about different types of plants around the world.
P	To look at different types of plants from all over the world.
P	How plants grow and how they bread. To save as well as learn more about them.
P	To know about plants and their adaptation to the particular environment
P	To know more about plants and their adaptation
P	To teach us about plants and the history behind them by showing us specimens
P	To learn more about the diversity of plants.
P	To learn about plants & trees and their importance
P	To find out more about plant life & their job.
P	To find out more about trees, plants and etc
P	To learn more about plant and how they live
P	I think it is to show or inform us (students) about plants and stuff.
P	To learn more about plants because they give us oxygen and many more.
P	To learn more about plants because they give us work sheet
P	The purpose of this excursion was to learn about various plants
P	To learn about plants, forests
P	To find out more about trees and forests
P	To learn about our native and exotic plant life and their origins
P	To learn about our native and exotic plants and their origin
P	To learn more about native plants and tropical plants
P	The purpose was probably to help us understand more about plants and its origin.
P	To learn more about plant how they became what they are now.
P	To study and learn more on plants and other things. Also what they are.
P	To learn and study about plant life and the environment

P	Because to learn about plants and the environment
P	To learn about plants, environments
P	To learn the plants & environments.
P	To learn more about plants and do work sheets
P	The purpose of our excursion is to understand the plant life.
P	To find out more on botanic subjects
P	To learn more about plant life.
P	To increase our knowledge of plants
P	To increase our knowledge of plant life
P	Learn a lot about plants
P	Learn about the flowers
P	To learn about different types of plants
P	So we get to know about the different types of plants
P	To expand our knowledge of plants
P	The have some idea of science (plants) and learn.
P	It was a pretty good excursion. I learned lots of things about plants.
P	To learn about plant orgasims
P	The purpose is to learn more about plants
P	Something about plants
P	To learn more about some plants
P	To know more about plants
P	To learn more about plants
P	To learn more about plants
P	To learn about plants
P	To learn about plants
P	To learn about plants
P	To learn about plants
P	To learn about plants

P	To learn about plants
P	To learn about plants
P	To learn about plants
P	To learn about the plants.
P	To learn about flora
P	To learn about the flora
P	To study plants
P	Learn plants
L	To learn more about our environments, so that we can broaden our knowledge
L	To learn about the natural habitat
L	This excursion is for us to know more things than at school
L	For our unit we are doing at school
L	To learn
L	To learn stuff
Z	To learn about nothing
Z	I don't know
Z	I don't know
Z	Boring
Z	Nil

Appendix 5.2 **School H Student response to survey item 'What did you enjoy doing the most at the RBGS?'**

$L^{A}\ P^{R}\ B^{GC}$	Visiting the tropical rainforest & the succulent garden (2)
$L^{A}\ P^{R}\ B$	The Tropical Rainforest and the gardens of the Botanical Gardens
$L^{A}\ P^{R}$	Tropical rainforest (4)
$L^{A}\ P^{R}$	Tropical forest
$L^{A}\ B^{G}$	The tropical rainforest area
$L^{A}\ B^{G}$	the tropical rainforest centre
$L^{A}\ P^{R}\ B^{G}$	the pyramid, the rainforests
$L^{A}\ B^{G}$	Pryamid (3)
$L^{A}\ B^{G}\ O$	Pyramid and lunch
$L^{A}\ P^{D}$	Ferns and moss
$L^{A}\ P^{D}$	The banana trees
L* P*	*The facts and information about plants*
L^{A}*	I enjoyed the experiments
L* P*	Finding out information from the plants and answering the questions.
$L^{A}\ S^{E}\ P^{D}$	Looking at the thing through the microscope
L^{A}* P^{D}	Working at Education
$L^{AE}\ P^{R}$	Exploring rainforests
L^{E} P	Exploring the plants
L^{E}	Exploring
L^{E}	Exploration
L^{A}* P^{D}	Learning about moses
L^{A}* P^{D}	Learning about the spores
L*	Learning
L* S^{E}	Learning and looking
$L^{A}\ S^{E}\ P^{R}$	looking at the tropical forest
L S^{E} P	looking some forest

$L^{AE} P^{D}$	observing the plants and trees, different kinds
$L^{E} P$	observing the plants
$L S^{E} O$	Meeting other people and looking
$L^{A} P^{D} W$	Walking near the conifer
$L S^{E} P^{*}$	Walking around looking at trees and plants
$L^{E} W O$	walking & exploring
L W O	walking around (2)
L W O	walking
L O	I enjoyed everything equally
$L^{A} B^{G} O$	Besides having lunch, probably the rainforest section
$L S^{E} O$	Eating and looking at things
O	The colourful flowers
O	The lovely flowers
O	the scenery
O	Eating lunch and leaving (2)
O	Eating lunch
O	Having lunch (2)
O	Lunch (6)
O	Eating
O	Free time
O	Playing
O	Home time
Z	Yes (2)
Z	Nothing (6)
Z	Nil response (2)

Appendix 5.3 **School H Student response to survey item 'Was there anything you did not enjoy about the day?'**

No (31 responses):
Nothing. X2
No because it was all good.
No. I enjoyed all the events.
No I enjoyed everything.
Enjoyed everything.
No. x25

Not enjoyed some aspect of the day (30 responses):
- Organisation of the day (13 responses)
The writing and walking.* x2
The walk it was too long.
The walk too long.
Walking all around.
Yes too much walking.
The walk around the gardens.
Getting lost and walking a lot.
Walking.
We had to wait a long time before we could rest.
No freedom, had to walk with teachers. Walking 150m to the toilet.
We did not have any freedom. X2
- Worksheets and working (eleven responses)
Experiment.
The worksheet because it was boring.
Too much worksheets.
Yes, completing the worksheets we had to do.
The worksheets
The worksheet
The work.
Watching. I like plants.
Learning too much.
The writing and walking.* x2
- Locations at the RBGS (six responses)
Being in the pyramid I couldn't breathe.
Yes the rainforest because it was too humid.
The succulent area because it isn't interesting to me.
The succulent area nothing to enjoy.
The succulent area because it wasn't interesting.
The arid area was boring.
- Other issues (two responses)
Yes, no animals.
I hurt my finger.

Everything / nil responses (eleven responses)
I don't know.
Everything. x4
Yes everything. x4
It was boring.
Nil response

Appendix 5.4 **School G Student responses to survey item 'What have you enjoyed most about the day?'**

L* P S^E	Seeing plants that I haven't really seen before. Finding out facts I didn't know.
L^A B^G	The variety and detail of each place especially enjoyable was the tropical plant greenhouse.
L*	The fact that I'm learning something new and worth while out of school.
L*^{A} P S^F O	Learning about the different plants, lunch, tasting the jelly stuff.
L* P	Learning about the different types of plants
L* S^E	Learning stuff and seeing different things.
L*^{A} P B^G	Learning about the different sorts of plants and the rainforest section.
L* P O A	Learning about different plants and their characteristics, the ducklings!
L*^{A} B P^A S^F	The education centre where we observed algae and got to taste foods produced from algae.
L^A P^{AI} B^G	The algae and aboriginal plant demonstrations and the tropical arc
L^A P^A	The demonstration of all the different types of algae.
L^A P^A B S^F O W	Eating seaweeds in the Education Centre and taking photos with friends at lunch time.
L^A B S^F O W	1. (Education Centre) In Stop 1 because you get to eat, 2. lunch time we get the talk to our friends and taking photos.
L^A P^A	Algae jelly
L^AP^A S^F	Eating algae stop
L^A S^F	The food tasting part.
L^A P^A	The section on the seaweed ect
L^A P^I	Learning about the Aboriginal food, medicine and tools.
L^A P^I	Aboriginal uses of plants.
L^A P^I F	Everything – I particularly liked the Aboriginal plant use part.
$L^AB^GP^I$	Tropical centre and Aboriginal food stop
$L^AB^GP^I$	Greenhouse, aboriginal talk
L^A B^G F	Tropical Centre. Being away from the school.

$L^{A}B^{G}S^{*}$ P O A	Tropical Centre and smelling the leaves, patting the ducklings.
L^{A} B^{G} O A	The Arc, the ducklings
$L^{A}B^{G}P^{R}$	The tropical rainforest
$L^{A}B^{G}P^{R}$	The tropical plants.
L^{A} B^{G}	Tropical Montaine
L^{A} B^{G}	Visiting the Tropical Pyramid.
L^{A} B^{G}	The Tropical Centre (8)
L^{A} B^{C} P^{D}	I enjoyed going to the place where the succulent plants were. They were interesting and it's the kind of thing you don't get to see anywhere else in this area (Sydney)
L^{A} B^{C} P^{D} F	Going to the place where succulent plants were. I enjoyed everything.
L^{A} P^{D} S^{F} Y O	Succulent plants. Picnic and hands on aspects eg taste testing
$L^{A}B^{C}P^{D}$	Cactus land
L O F*	Fact that I am on excursion
L O P S^{E}W B*	Looking and walking through the green flora and fauna.
L O W B*	Walking through the beautiful gardens because of the natural/fresh environment.
L* O B* S^{E}	Scenery, interesting new things to see and discover.
L OB* P	It was beautiful, heaps of plants
O B* W	The beauty of the gardens, fresh air and exercise
O B* W	The beautiful gardens and sunny weather
O B*	The beautiful scenery.
O B* W	The scenery and the weather and the relaxing lunch.
O B* W	The gardens the beautiful scenery. The free time we had to sit back and relax.
L^{A} B^{G} O S^{E} W	Free time at lunch to look around the park at our own will. Also the rainforest/tropical centre.
O W S^{E} B* F	The free time to sit in the sun and look around. The park was beautiful and great to admire. It was a great day, interesting, fun, peaceful and enjoyable.

O W	The gardens were relaxing and it was a beautiful day.
O W	Very relaxing
O W	Being outside basically all day.
O W B*	The weather and the scenery.
O W	The sun and air
O W	Lying down in the sun
L O F	It was all pretty good especially lunch
L^{A} P^{AI} O F	Lunch – playing hide 'n seek. Stop 1 seaweed stop 2. Aboriginal plant use. All of them.
L^{A} S^{F} F	Lunch time and station number 1 Because we got to eat and enjoy ourselves.
L^{A} $OS^{F}P$	Lunch time and the seaweed tasting
LOB*Y	Picnic lunch and good scenery. Hands on approach to learning
L*POB*	Lunch, but it was interesting finding out about all the different plants. Admiring the plants was also very good.
$L^{A}B^{G}$ P^{R} O	Lunch and the tropical and carnivorous plant arc thing.
L^{A} B^{G} P^{R} O	Lunch & the rainforest (especially when the sprinklers were on)
$L^{A}B^{C}P^{D}$ O W	Lunch in botanical gardens (lovely day) Cactus land
$L^{A}B^{G}$ O	The lunch & Tropical Centre
O B* W	Lunch – it was good to sit down and relax in the beautiful surroundings.
L^{A} B^{G} O B*	Lunch, peaceful environment and the lemon strepsils (lemon jokes) [??] tropical pyramid
O W	Lunch time sitting in the sun
O W	Lunch lying in the sun on the grass reading a book.
O B*	Lunch – it was nice and peaceful.
O B*	The lunch and its surroundings
O B*	Lunch time – nice view
O W	Having lunch and walking through the city and wearing my sunglasses.
O W	Lunch and the walk through the city.

O W	Lunch, shopping in the city after the excursion
O	Lunch time and going home.
O	Nothing – except lunch.
O	Lunch (5)
O W	Spending time with friends and walking around some-times
O W	Playing hide-and-seek at lunch!
O W	Playing hide & seek & sardines at lunch.
O W A	Being with my friends and throwing m&m's at the birds.
O I^{G}AB*	When Em fell in duck poo! The pretty scenes near the ocean.
O S A	Seeing the ducklings
O S A	Seeing the little ducks.
O A	Ducks and ducklings
O A	The duckies
O A	The ducks
O W	The train ride, walking through city and gardens
O	Sneaking away from the teacher to go have a smoke
Z	Nothing
N	Nil response (1)

Appendix 5.5 **School G Student response to survey item 'Is there anything you haven't enjoyed? Explain.'**

No enjoyed everything (26 responses)
No I enjoyed every stop because it was interesting.
No. Everything was great. Better than school.
No. The day has been alright – better than school.
No. the services and scene are all very satisfactory. Canteen too expensive.
Everything was great
Everything was fine.
No. I enjoyed it all!
No it was a lot of fun.
Not really.
No (17)

Nil response (11 responses)

Organisation (17 responses)
Being in class groups; walking around; not enough time at activity stops
Having to go in class groups. Some of the stations were really stupid.*
Going around in classes.
Having to go around in class groups.
The yellow jelly! I didn't get enough time at the Education centre to write things down.*
Yes, the day was too rushed we should have longer time at each stop and maybe went into more detail about the plants.
No – but more time on each stop was probably needed – we found we had to rush to each stop.
No but the rushing to each stop. There wasn't enough time for each lesson.
More time on each stop to look around, particularly in the rainforest/tropical centre and particular garden areas.
Worksheets and lunch should be longer – we need more free time just to enjoy being here, because the band area is heaps nice.*
I found walking around very boring. I felt there was not enough 'hands on' things to do.*
Walking / rushing around.
Walk too much, lunch too short. Write too much.*
Walking around 'cos you get lost, well my friend did.
Too much walking.
Walk too much.
Walking – too tired.*
Train ride. Too much walking around.

Specific activity spots (16 responses)
- Stop One – Algae (11 responses)
The dried seaweed tasted awful. The smell – fertiliser.
Not much except for the agar jelly it was a bit bitter.
Seed weed tasting, reason? It tasted like shit.
Tasting the jelly … Yuck!
The see-weed jelly stuff
The seaweed food.
The yellow seaweed thing
Tasting the jelly because it wasn't very taste full.
Yes, those yellow jellys in the Education centre.
The food tasting part because it didn't taste very nice.
The yellow jelly! I didn't get enough time at the Education centre to write things down.*

- Stop Three – Fernery (one response)
Fernery was a bit boring. Low level excitement for cycads and conifers.*

- Stop Four/Six - Cycads and Conifers (five responses)
Fernery was a bit boring. Low level excitement for cycads and conifers.*
Cycads and conifers are not very interesting. (2)
Learning about cycads and conifers.
Conifers and cycads.

RBGS; its facilities (15 responses)
Trying to draw things. Limited toilet facilities.*
The Botanical gardens and Ms Spry telling me I have an iron deficiency.
The botanical gardens
The Botanic Gardens.
Toilets limited.
The food in the canteen the taste is horrible.
No. Would prefer if café was less expensive and chips not so chunky. Chicken salt please.
No. the services and scene are all very satisfactory. Canteen too expensive.
No except the canteen prices are too expensive.
I enjoyed everything – food a bit expensive.
The food
Chicken mamies (?). Worksheets
Not really, but I hated all the bird poos on the ground, the toilets don't have locks and the day is really sunny, canteen too expensive.
No. Em didn't like the duck poo.
Birds. Especiall the ibis!

Doing worksheets; working (14 responses)
Yes. The worksheets. It makes you analyse nature to the extent you start to dislike it.
Worksheets. It would be better to find things that interest us rather than set us things.
Worksheets and lunch should be longer – we need more free time just to enjoy being here, because the band area is heaps nice.*
Filling out the worksheets.
The worksheets
Chicken mamies (?). Worksheets*
Working
Working because I hate work.
Working because it ruined the visit.
Writing & drawing.
Drawing a lot.
Drawing diagrams.
Trying to draw things. Limited toilet facilities.*
Walk too much, lunch too short. Write too much.*

Boring and tiring; not much to do; topic not interesting (9 responses)
Some of the classes were boring.
Not much to do.
I found walking around very boring. I felt there was not enough 'hands on' things to do.*
The day is too long and got tired.
It went on for ages. I got a bit bored.
Most of the day it was a boring.
It was quite boring – I think this was because it was a topic that does not interest me.
Having to go in class groups. Some of the stations were really stupid.*
Walking – too tired.*

Appendix 5.6 **School G Student response to survey item 'What do you remember learning here today?'**

P*	An extension to the topic 'plants'. Learnt more about the plants habitats – seeing it in nature.
P* A3	Learn about plants. Moss, liverwort, ferns, angiosperms etc.
P* A4	About plants – cycads – conifers – about different sexes and varieties.
P*	About plants and how they survive in different conditions.
P*	Lots! – different plants from different regions + climates and the way they have adapted to these.
P* A1	I remember learning about plants and foods and sea weed.
P*	About the variety of plants and their differences. About the danger of sprinklers.
P*	About all the different types of plants and the species.
P* A4	different types of plants. difference between female & male cycads and conifers
P*	The difference between plants and what some look like. The conditions some plants live in & their features.
P* A4	I remember learning about different plants and how they produce e.g. conifers and cycads.
P* A4	Learning about different plants and the difference between conifers and cycads.
P*	About plants and different types.
P*	Different plants / trees.
P*	Different plants & species
P*	About the different families of plants.
P*	alot about the characteristics of plants.
P*	All about plants!
P*	Everything about plants.
P*	About plants
P*	Plants (3)
P*	The importance of plants and the great influence and impact it has on humans.
P*	That plants are very adaptable, important and useful for the world.
P*	The way plants work.
P*	I learnt that plants are very special, and we should care for them a lot.

P* A1,3,7	About algae used for food products, that there are different spore patterns on ferns, that thick fleshy leaves from the succulent plants stores water so that it lasts for long periods of time.
P A1	How algae live and survive in the water
P A1	Red algae largest group.
P A1	Marine algae is 50% of global oxygen
P A1	Brown algae – 900 spicies
P* A1	About algae and other plants.
P* A1,3	all about algae, ferns, and various plants and their characteristics
P* A1,3,4, 5	all about algae, mosses, ferns, cycads, conifers, gymnosperms, tropical plants, angiosperms.
P* A1,4,5	algae, conifers, cycads, rainforest
P* A1,2,7	algae, trees, leaves for medicine and cactus
P* A1,4,7	all about algae and about succulent plants and about cycads and conifers
P A1,3	Algae, Ferns etc
P A1	Algae
P A1	About seaweed.
P* A1,4	Things about seaweed, cycads, evolution, so much I can't write it in one sentence.
P* A1	About seaweed and the trees
P A1,2	Seaweeds, tools
P* A1,2,3	Jelly can be made from seaweed, the reproductive system of mosses and plant medicine
P A1	The taste of the brown algae is extremely horrible (those yellow jellys someone made in the Education Centre) they made it with some brown algae.
A1	Not to eat the yellow thing!!
P A1	That cold sores are a virus and once you've had them they never go away. Seaweed has a holdfast.
P A1,2	That there are many different algae, that there were so many different plants/trees used by the Aborigines.

P A1,2	Learning about seaweeds and what aborigines eat, drink, use.
P* A1,2,3, 4,	Aboriginal food + culture. Temps needed for certain plants seaweed, mosses + liverworts, gymnosperms.
P* A1,2,4, 7	About the aboriginals (sic) way of life, the lifestyle of plants, cacti, the structure of cacti, the passing of seeds, wind dispersal, male and female cycads + conifers. The algae and its parts. The respect for the plants + the gardens by the Public!
L A2	About the aboriginals and their food etc
P* A2	Aboriginal food and plants
L A2	lots of things foods and tools used to help the aborigines
P A4,7	The cycads + conifers how they reproduce through the air. Succulent plants are cactuses which aren't the prettiest plants.
P A4	The difference between cycads and conifers
P A4	Conifers – male and female are on the same tree.
P A4	That cycads have two separate plants for male and female and the female cones are bigger.
P* A4	Differences between conifers and cycads. All types of features needed by plants.
P A4	That .....Something about the difference between cyclads & conifers.
P A4	Something about cycads & conifers
P A4	About gynosperms with cones
P A1,4	About cycads and algae.
P A4	Cycads
P A4	About pine trees
P A4	Male and females of a plant are not necessarily on the same tree.
P* A1,3,4	about spores, cycads, holdfasts, different plants, why plants are the way they are
P* A2,5,7	The tropical trees & succulent plants & Aboriginal uses of trees etc.
P A5	I remember learning about the tropical centre and how hot it has to be for plants
P A2,5	- Tropical plants – climate & stuff - the types of foods ect of plants
P A5	Tropical plants have bigger and darker (green) leaves. (2!)
L A5	About the Tropical Centre

L A5	The Tropical Centre.
P A5	About the carnivorous plants. The pitcher plant.
P A5	Ms Spry explaining the insect eating plants in the tropical centre & how if we stuck our fingers in they would probably end up dying.
P A7	variety in succulent plants
P A3	fronds
P A3	How ferns reproduce.
P*	The diff. reproductive systems
P*	- life cycles energy production, systems of plants, plants in Australia
P A2,5	lemon grass tropical pyramid
P A2	leaves smell like lemon
P A1	Everything eg – the food is made out of seaweed
L	That nature is beautiful.
L	I did learn a lot of things I didn't know although I did not find it interesting.
L	Everything (2)
Z	I saw 17 ducklings with a mummy duck!
Z	Don't open your mouth when you look up as the birds fly across.
Z	Nothing (4)
Z	Nothing I was stoned off my nut!
Z	Nothing I didn't already know
N	Nil response (3)

Appendix 5.7 **School G Student response to survey item 'Compared to learning science at school is learning here at the RBGS any different?'**

Y G	Yes. The hands on experience makes biology more realistic and relevant to the classroom.
Y G	Yes. Because it has a more hands on approach and it makes what we learn in the classroom relevant.
Y F	Learning at the RBG is more of a hands on experience – much more enjoyable.
Y B F	Yes, hands on material & the atmosphere make it more enjoyable.
Y S	Yes, more hands on things to do – like we had the chance to smell leaves and eat food.
Y S^K	Yes, more hands on work, see everything.
Y S^K	More hands on Experience. Actually see the differences.
Y B	Yes – it is more hands on and your outside.
Y B	Yes – hands on experience; being outdoor, sitting on grass.
Y	Yes. It is good – more hands on.
Y	Yes, it's more hands on.
Y	Its more hands on
Y	Yes, because it is hands on.
Y	Yes, because there is more 'hands on'
Y	More interaction with outside life.
Y L^M	Yes, because it is very interactive and hands on. You can learn from your own experiences and senses.
Y S L^M K^B	Yes as it is more practical and hands on we have to observe, touch etc instead of just reading information.
Y S^K K^R	It's more practical, and you can actually see the actual plant.
Y L*	You get some actual practical experience & understand better.
Y	Yes practicle (more)
Y F	Yes – Practical work. Much more enjoyable.
K S L^M	Yes, as we are thought (sic) among surroundings and can observe and touch rather than just being told by words.
S^K K^{RB} L*	At the Royal Botanic Gardens you can look at the real plants, not only pictures more easy to understand.
S^K K^R S B W	See the real trees, samples, something to eat, real leaves etc big garden, walk around
S^K K^R	Yes it is very different you have real life things to look at and touch.
S^K K^{RB} L^M	Yes because it allows us to actually see and sometimes feel (in real life) and learn not just by reading and observing photographs.

S L^M	Yes because you get to experience through seeing.
S L^M	Yes because you can visualise everything
S^K K^R	Yes, you actually get to see plants in conditions which they would live.
S^K K^R	You can see the plants in their habitats.
S^K Y	It is probably better as you are seeing what you are learning about & learning becomes practical.
S^K K^R	Yes, becaue I can see the actual plants but sometimes very dirty too. Overall is okay.
S^K K	Yes because you can actually see them close up.
S^K K^R	Yes. I got to see actual samples of the plant.
S^K K^R S	Yes, we get to see the plants and eat the seaweed!
S L^M	Yes. We can see things ourselves.
S^K K^R	Yes, we see the plants
S^K K	You can see it close up.
S^K	Yes, because you get to see what you are [no further response]
S^K	Yes it is different because you actually get to see what the teacher is talking about.
S K^R	Absolutely Witnessing rare + tropical plants
S^K	Yes. Because you actually know what the teacher is trying to refer to.
S^K	Yeah 'cause you can see what the teacher is talking about.
K^R L* B	Yes. It's more lifelike and you learn a lot more and get fresh air.
L* B^R	Yes learning there is better. The botanical gardens has more variety etc.
S^K K B	Here you see many different species & types up close & it is also different to be out of the same building at school.
S B^R	Yes, more things to look at.
S B^R	Yes, more info + visual material.
B^R	Yes in the RBG there are so many different plants in one place at school it is so boring.
B	Yes. Because you are in an open environment.
B L^M F	Yes, because your in the open experiencing a great deal more than at school which is fun.
B W*	Yes, open spaces, more freedom, less lecturing by teachers.
W*	Yes, more freedom.
B L*	Yes, it out doors, more interesting, learn more.
B	Yes, because your outdoors.

B Y S^K	Yes, because you aren't locked up inside and it was more practical when you could see what you were talking about.
K B	Yes. It's better to be out amongst the things we're learning about & in the fresh air.
B	We were outside at Botanical Gardens. At school we stay inside which is really dull.
W Y	Because we get to move around and its' hands on learning
W	Yes, you get to walk around more.
W S	Walking and visual and verbal
Y S	Yes. It is more physical learning like whatching and seeing all the things.
F L*	Yes because we get to talk as well as understand. The worksheets were easy.
W* L* Y	Yes it is more relaxed, easier but you learn more (gymnosperms, angiosperm, ferns, algae, moss) you don't get bored it's practacly hands on to.
B^L W*	Yes, because it's a lot more of a pleasant and relaxing environment to work in.
B F	Yes. It's heaps better here. The surroundings are beautiful which helps us to enjoy it more.
B^L	Yes, it's a much better environment to learn in.
B W*	Yes – it's a nice environment and more relaxing.
M K^R	Yes, gain interesting experience, authentic experience.
M S^K	Yes! More interesting experience. We can see exmples of wht we are learning.
M S^K L*	Yes (RBG) It is <u>much</u> more interesting and you get to see the plants and therefore faster and easier to understand.
M	Yes, More interesting
K^B	Yes its not all out of the textbook and looking at hand drawn pictures.
K^B S^K K B	*Instead of looking at pictures we got to see the plants we were studying up close in a beautiful environment.*
K^{BR} S^K	Yes because all you see at school is words written about plants on the blackboard but in the Royal Botanic Gardens you can actually see the real plant.
F M	Yes. It is more enjoyable and you want to learn more.
L* S^K K	Yes. You remember more because you can see the things up close and remember them easier.
M L*	Yes. More interesting, the teachers arnt (sic) nagging you and telling you to shut up. We also learnt something which is a big change.
L*	We actually did something.
L*	We actually learnt something!
B^R	Yes because there are even more plants to learn.
F Y	*More enjoyable / hands on*
F M	Yes more enjoyable, teachers are nicer, talk to friends more time to learn, activities more fun and interesting.

F	Yes. It's more enjoyable & I don't like my science teacher so it's good to get away from her for a day.
F Y W	Yes. It's more fun + enjoyable. It's not always the teacher speaking. We get to do practical things and wlk around. We can draw and TALK!!
F	Yes, it's fun. (2)
F	Yes, exciting
B	Yes, no place to sit and write.
B W	Yes, classroom is more comfortable, you get to sit down and don't walk around.
F L*	In our class learning is difficult as our teacher doesn't teach us very well. Learning from other people besides our teacher is more understanding & comprehensible. Learning like we did much much more enjoyable. It was a bludge we learnt something unlike we do in class.
M	In our class our teachers often refuses to tach us anyway. His method is boring, slow, indigestible, arrogant and extremely simple! I think science could be interesting and unique and probably is in other classes which is why we constantly referring to our friends books in other classes for information.
L* Y	We actually learnt more in the garden than we did in the classroom because its practical and gives a better interpretation. Our teacher's method is slow and boring. It was easier to take in information out in the field.
W*	Yeah, don't have to do that much. More relaxed.
*	Yes & no – it was a bit like a normal science lesson doing biology we didn't actually do much.
*	Not really. But RBG has more beautiful plants.
N	Nil response (4)

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