Connecting with Plants: Lessons for Life

Papers from the 5th International Congress on Education in Botanic Gardens

Royal Botanic Gardens Sydney

Royal Botanic Gardens Sydney

29 September – 4 October 2002

Plants = Life

Connecting with Plants: Lessons for Life: papers from the 5th International Congress on Education in Botanic Gardens

Edited by: Christopher Hobson

Published by: Botanic Gardens Conservation International
Descanso House, 99 Kew Road, Richmond, Surrey TW9 3BW, UK

June 2004

ISBN 0 9539141 6 X

Editor's Preface

Finally, two years after the Sydney Education Congress, BGCI is publishing material from the Congress.

BGCI is now able to publish the following material in this volume:

- The majority of the papers delivered at the Congress. These are grouped according to the main themes of the Congress programme.
- Recollections of the Congress by several of the participants. This was originally published as an article in the winter 2002 issue of *Fronds*.

This volume will be made available for purchase as an Adobe Acrobat file (PDF format) on a CD-Rom. The file will also be placed on the BGCI web site.

Acknowledgements

We would like to thank Coordinator and Committee of the Botanic Gardens Education network (BGEN) for permission to reproduce the article "Connecting with Plants – Sydney" from the Winter 20002 issue of *Fronds* journal.

We would like to thank M. Patrick Péron (CBN-Brest) for permission to use photographs in the article "Children's gardens: an international partnership using the internet".

.

Contents

Forming partnerships

Volunteering

Evaluation and research

Recollections of the Congress[1]

BGCI's 5th International Congress on Education in Botanic Gardens (29th September – 4th October 2002) was held at the Royal Botanic Gardens Sydney. Here are some thoughts and impressions of the event from BGEN members who attended.

Tess Darwin Edwards: reflections on Susan Strauss's address 'Passionate Facts, a story way of speaking science'

> *That long, long ago it was, in old time was it, when ne'er else in the world was formed,*
> *there yawned in space a vast gulf of nothingness called Ginnungagap.*
> *It hung like a windless summer day, Ginnungagap, and far, far to the north of Ginnungagap*
> *was Niflheim. Oh Niflheim, the realm of icy misty darkness,*
> *Niflheim, where twelve rivers of ice creaked and crashed into Ginnungagap*
> *and venomous vapours wisped through and about huge heaps of ice ...*

From the first word, Susan Strauss, storyteller supreme, had her audience enthralled. It was 9.30 am, and however late they may have been enjoying the delights of Sydney the night before, I doubt that a single member of the audience dozed through this unique keynote address. The Norse myth of Yggdrasil, the World Tree, I had thought I was familiar with. In Susan's performance, it came alive: she told the story using the full range of her voice and her entire body. We could feel the terror of that vast yawning space engulfing us, shiver as we heard the creaking ice and whirling winds of Niflheim.

Susan has been a storyteller for over 20 years, with a particular interest in stories about the natural world, and she is undoubtedly a world leader in this field. I had read her book *The Passionate Fact* some years ago, and increasingly find myself using a storytelling approach, and employing professional storytellers, in my environmental education work. Meeting Susan at the workshop she ran before the Congress, and hearing her keynote address, reinforced my belief in the power of storytelling as an effective medium for engaging people's interest and conveying important messages about our relationship with nature. The workshop focused on creating a story from personal experience, paying particular attention to the sound and rhythm of the words we used, which, as Susan demonstrated, can convey as much meaning as the words themselves.

For me, Susan's contributions were the highlight of a stimulating and thought-provoking Congress. The other aspect I found particularly interesting was the attention paid to issues relating to indigenous people. When I was last in Australia, in 1993, I was disappointed and disturbed at the lack of interest and interpretation in botanic gardens on the original inhabitants of the land and their intimate relationship with plants and the land. Now - in Sydney at least - that has been completely reversed; the Aborigines are honoured and their knowledge is interpreted with great respect. Many of these issues discussed in various presentations, workshops and conversations were as relevant to my work in Scotland as they are to people in Australia, India or anywhere else in the world where traditional knowledge is being lost from one generation to the next.

All of us working in this field are seeking ways to keep our connection with plants a living, meaningful part of life, and it was very encouraging to attend this Congress where so many useful ideas and approaches were being shared.

[1] Several of the participants at the Congress subsequently described their impressions and conclusions in an article which was published in the Winter 2002 issue of *Fronds*, the journal of the UK Botanic Gardens Education Network (BGEN). We are very grateful to the BGEN Committee for allowing us to use this article as a basis for this section of the Proceedings.

Michael Holland:

I feel rather fortunate to have had the chance of attending the Conference at Sydney. It not only gave me the chance to learn some new skills and ideas – both practical and theoretical; but also to meet a range of other educators (140 from 20 countries). I also left Sydney having reaffirmed my reasons for being in the field of environmental education in the first place.

Some of the highlights of the congress for me were the practical workshops including Mark Loveday (RBG, Melbourne) on environmental art, and Jenny Stuart (Brisbane Botanic Garden) on 'Botanical Boats'. We had the chance to make our own boats from natural materials (including intricate sails) and try them out (albeit in a paddling pool). This was most useful – and has given me the idea of attempting a family day on the same theme.

One of the five sub–themes of the Congress was 'Multiculturalism and Indigenous Issues in Interpretation'. John Lennis of the RBG, Sydney gave an eloquent keynote speech on the need for respectful involvement when working with local, indigenous communities.

We were whisked to the Mount Annan Botanic Garden for a day-long field trip. Here we learnt all about the 'living fossil' that is the Wollemi Pine; their discoveries, stories and plans. We also explored (and commented on) the terraced garden which they plan to 'redo'.

I found Elizabeth Beckman's keynote about quantifying, justifying and monitoring the types of evaluation in gardens, museums etc, very interesting and useful. And Wendy Barry of the New Zealand WWF led an informative and practical session relating to partnerships - both new and existing and some of the areas and pitfalls to be aware of throughout. I also learnt some of the activities for secondary schools devised by Jesus Piqueras of Sweden.

These are just some of the highlights for me, and it was certainly worth going all that way for.

Dawn Sanders:

Sydney synopsis

The author and artist Jeannie Baker presented on Monday. Her presentation was the highlight of my week. Her remarks about supporting children to move away from fearfulness when experiencing a landscape, (as in her book *The Hidden Forest*), leaving spaces in a story for children to contribute their own narrative (for example her books *Window* and *Where the forest meets the sea*) provoked discussion by using questioning endings, and exploring the fearful paranoia children (and adults) can have about the strangeness of the undersea environment or the forest; all had deep resonance for my work as a botanic garden educator. As an artist she works on a very small scale with intricate detail in order to `become absorbed in the 'complexity of reality'.

Botanical boats and schools in the forest

In a workshop making botanical boats, we were given a range of seedpods, flowers and waxed paper to design and build our own miniature boats and set them to sail. In making the boats, as well as exploring the art of boat making, children can create their own stories.

In Suprabha Seshan's workshop on Gurukula Botanical Sanctuary, India, we heard about the excellent long-term experiences that schoolchildren have in the sanctuary. Part of the discussion time found us trying to find ways of living akin to our environmental beliefs, without isolating our need for community. Layered communities, notions of custodianship of the land and cultural knowledge were a key part of John Lennis' keynote talk on multiculturalism and indigenous issues in interpretation.

In the Forming Partnerships section Abel Atiti from Nairobi Botanic Gardens, Kenya, gave an excellent presentation on linking with schools for joint interpretive processes. He encouraged us to put our practice `under scrutiny' and use review as `a learning process'.

Interestingly one of the best-attended (in terms of numbers) workshops, was 'Communicating science to the wider public' facilitated by Anle Tieu, from BGCI. Dialogue was varied, responsive and sometimes quite fiery! A subject that obviously attracts the attention of many scientist/educators.

Emerging research community

The other main highlight of my week, as a researcher, was to meet with colleagues who are engaged in MSc, MA or D.Phil research degrees. We are a growing group of people from a variety of gardens in different countries who are committed to developing the 'reflective' practitioner in an emerging field. A major outcome from the conference will be to develop a database of research on botanic garden education / interpretation from around the world and the facilitation of discussion and possibly joint publication. A big step for a community that previously was almost invisible within the botanic garden education field. This is the strength of international meetings- the making visible of communities previously isolated to build knowledge and partnership.

Gail Bromley: some very personal memories

- Renewing old friendships and remembering shared experiences
- Forging new friendships and exploring new partnerships
- Sitting in the silence (where you could have heard a pin drop) throughout a storybook opening with Susan Strauss
- The wow factor of innumerable huge trees and their buttress roots within the Botanic Garden, all framed against the Sydney skyline
- The eternal chatter, chatter of birds at dawn and dusk
- Environmental statues – an activity completed amongst the greenery and shared with stalking Ibis on a warm sunny afternoon
- 'Teardrop' colonies of bats frenziedly and clumsily coupling high above our heads in late afternoon
- Shared food and wine with new and old companions in the glow of Sydney's Opera House
- Australian flora in its natural splendour at Mount Annan Botanic Garden
- The velvet white bracts of Australia's flannel flowers
- A fond farewell to Lucy Sutherland
- Exchanging ideas, sharing views, reinforcing commitment and realising that our joint effort really can make a difference.

Rob Brett:

In a nutshell I found the Congress to be fantastically organised and well attended with educators from all parts of the globe. Everyone was of course warm and friendly.

This really helps in providing `good vibes' for the Congress. It also helps in the further development of your own thoughts and ideas as it provides you with a diversity of views from a diversity of educational projects. The Congress allowed for you to learn and engage with others. It gives you a comprehensive insight into what wonderful educational projects exist and the different ways they are undertaken and achieved. Bringing people together always allows for you to recognise that you are not alone in your ideas and frustrations, but more than that it provides for inspiration, guidance and the making and renewal of friendships. It also was an honour as it was the first time that I had been involved in presenting.

I would also like to add that the Congress provided opportunity for many people to be part of an important network and be heard, such as Benjamin Serkfem from Limbe in the Cameroons who wrote to me afterwards and said "The experience of the Congress was a great one for me. In my 17-year career in environmental education it was a veritable high point for me."

Christine Preston:

My overall impressions of the Congress were that it was a very constructive and enriching experience. For me, the week started with a real WOW when I plunged (still a bit jet-lagged) into Susan Strauss's storytelling workshop.

My paper about Development of Facilities and Services for Visually Impaired People seemed to be well-received, despite being a topic that is far from mainstream. I was able to share ideas with interested colleagues and also gathered useful leads, especially in South Africa - so I suppose I'll just have to go there when I've accumulated enough funds for that kind of a holiday – grumble, grumble.

My colleague Rob Brett's paper *Changing the face of a Botanic Garden by tackling the concept of sustainability head on* was more mainstream. Rob is an energising communicator and I heard good feedback about his paper and about the Discussion Group on Planting for Education he co-chaired with Abdul Kareem from Bangalore's Foundation for Revitalisation of Local Health.

CUBG had some funds available in its Margaret Keay Bequest; this was used to sponsor an African delegate, Benjamin Sekfem, who is Head of Environmental Education and Training at the Limbe Botanical and Zoological Gardens, SWP Cameroon. Benjamin contributed greatly to the Congress in terms of his very outgoing and colourful personality. We hope that this will be a positive link established for both organisations.

One of the things that impressed me most about the work of other organisations was the productivity and achievement of community-based EfS programmes in southern India, notably:

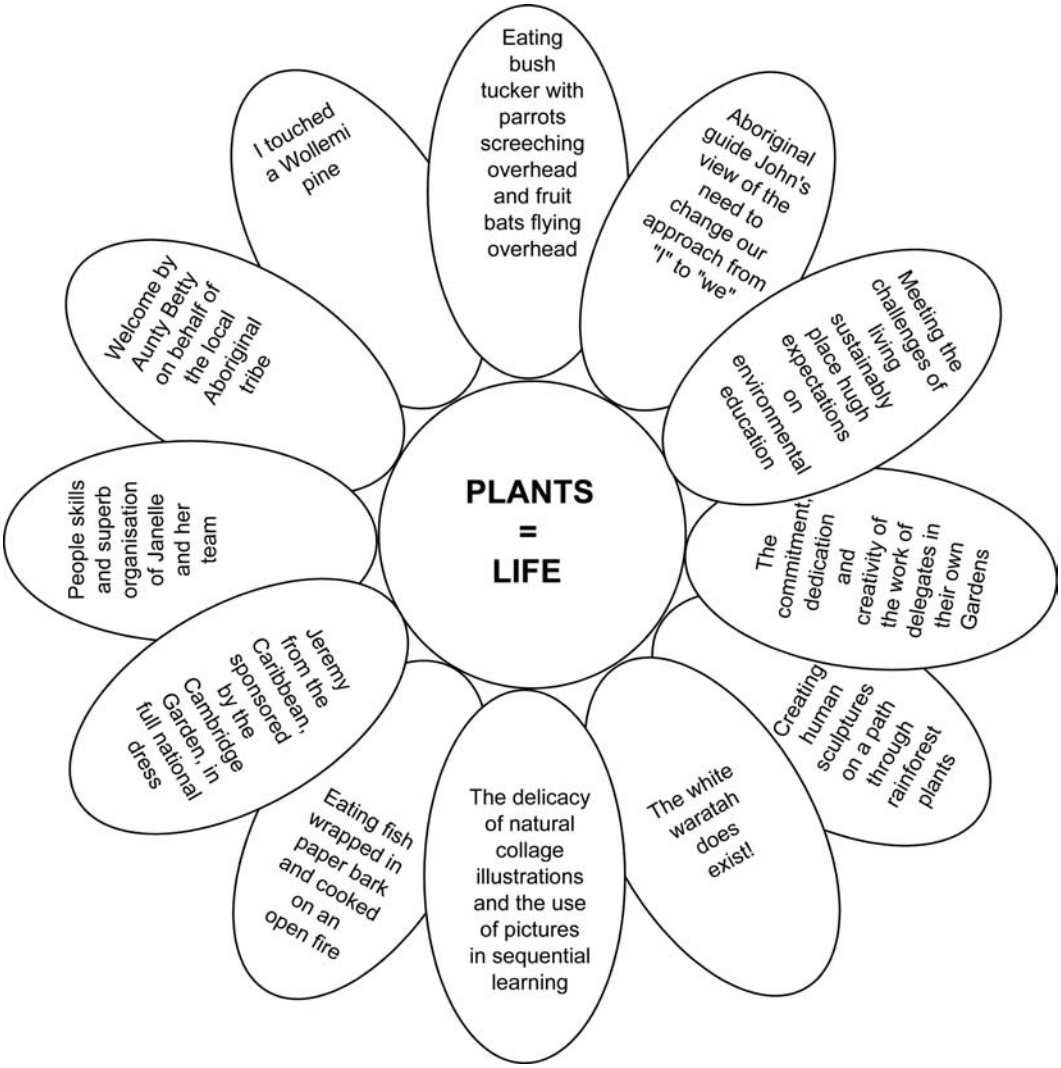
- Alexander Amirtham at Annai Genetic Garden in Tamil Nadu
- Abdul Kareem at the Foundation for Revitalisation of Local Health, Bangalore
- Suprabha Seshan at the Gurukula Botanical Sanctuary, Kerala.

They seem to achieve continuity for their programmes, greatly enriching their output over the years. I thought the UK generally, and not just botanic gardens could learn a lot from their level of commitment.

Overall, the keynote speakers were without exception inspiring and wholly relevant to our work; the range of topics for papers and workshops was wide but never irrelevant. There was a good range of countries represented and the ambience and environment were good for networking.

The Congress was well organised – RBG Sydney and BGCI did a great job and were very hospitable. Sydney was an exciting venue for the Congress and my onward visits to Blue Mountains, Adelaide, Melbourne and Geelong were added bonuses.

Jillian Galbraith: a corolla of impressions:



Environmental education through Eco Clubs in selected schools in three districts of Tamil Nadu, India

Amirtham Alexander & S John Britto

Annai Genetic Garden, Inba Seva Sangam, Tamil Nadu, India.

Introduction

Inba Seva Sangam, a voluntary organisation, was established by the Belgian-born Mother Lea Provo in 1969 in Sevapur, Karur Dt, Tamil Nadu, South India. To acknowledge the 'green' work of Mother Lea Provo, we set up an organisation called the Lea Eco Club. The Club is involved in developing rural projects; one of these is the conservation of locally threatened flora and medicinal plants in a five-acre conservation plot called the Annai Genetic Garden. We are working to involve the local community in the conservation of local biodiversity and the local area's natural resources.

In 1993 we started collecting plants from the Ayyalur Reserve Forest range in the Eastern Ghats. These plants were then replanted in the Annai Genetic Garden. After a few months of collection we started to involve the schoolchildren and villagers of the area. In 1997–98 we launched 20 Eco Clubs in the Karur, Trichy and Dindigal district schools in the foothills forest region. After a few years of hard work, Eco Clubs had been set up in a further 20 schools in the Karur district. Groups of enthusiastic, environmentally concerned and socially committed students studying 6^{th}–7^{th} standard, aged between 11-15 years, are chosen to form an Eco Club. For each new Club, 40–50 students are registered and become members, as well as interested teachers who have enrolled as Eco Club coordinators. The teachers are responsible for the Eco Clubs in their schools. They manage green activities, such as growing trees and medicinal plants, and cleaning-up activities such as collecting rubbish. About 40 Eco Clubs have been established in the Karur, Trichy and Dindigal districts. Schools are divided into five eco-zones, and each zone has eight schools.

Students are initially invited to help with our local environmental activities and those who are interested are then selected to enrol. The membership fee is 10 rupees, and they receive a Lea Eco Club note book.

Objectives of the Lea Eco Clubs

Their objectives are:

- To create awareness of biodiversity conservation and local environmental issues among schoolchildren.
- To create a 'clean and green consciousness' among students through various innovative methods.
- To involve Eco Club students in open-orientation programmes in schools and public areas.

Phase 1: environmental awareness programmes

In the first year we grew tree saplings on the school premises and motivated the students by holding competitions.

One-day environmental education programmes

One-day environmental education programmes (EEPs) are exclusively for Lea Eco Club students. Once an Eco Club is formed, all members are brought together to the Genetic Garden, and briefed with a short introduction about: the environment, an explanation of Eco Club goals, a slide show on the vanishing forest, a video on 'Green Health', as well as an overall description of the present status of, and future threats to, plants. This is followed by a guided walk around the Garden, where they see native medicinal plants and threatened floras, as well as the waste recycling unit. Before their departure, students are divided into groups for an informal quiz to gauge their understanding and get feedback about the EEP. The group winners are

provided with a small token gift. At the end of the day, students are encouraged to write imaginatively about their experiences.

The strength of the one-day programmes is that, for many students, this is their first time out of their classroom in a more informal learning environment. For them it is an unusual and exciting experience. It is important to us that we treat each student as our friend and encourage him or her to interact with us freely. Eco Club coordinators from different schools have commented that, after a programme, students have volunteered to water plants, clean their school campuses and generally get involved in environmental work.

Environmental bins

Environmental dustbins are provided to all the schools after they attend the EEP. The students are responsible for keeping classrooms free from paper, plastic carrier-bags and food. The Club members regularly come to check and collect the bins and once a week all Eco Club members clean up the school campus and take care of the planted tree saplings**.**

Core team teachers and the Teachers Forum

The core team for this environmental education work is a group of enthusiastic teachers who represent schools from each eco-zone. They meet once every two months to share their experiences and plan the implementation of outreach programmes. A Teachers Forum group then approves all programmes before they are implemented in the field and passed on to the Eco Club coordinators. Each school Eco Club co-ordinator prepares monthly and yearly reports which describe experiences shared with other schools and stories of success stories and sends them to the Genetic Garden Manager. Eco Club teachers are encouraged to attend a 4-day leadership programme at the Anglade Institute of Natural History, Shembaganur. Every year 10–15 teachers are also sent on an environmental leadership training programme, where they meet conservation experts and other environmentalists. This enables them to gain extra knowledge and focus on their goals.

Nature Camps

Three-day Nature Camps are organised for the Lea Eco Club students. Five students are selected from each school to participate. The three days are designed to give students:

- an acquaintance with nature and the conservation of biodiversity
- an exposure to the fauna and flora of the local hills
- an impression of the degradation of forests caused by human interference, and
- an awareness of how to protect and preserve natural forests.

On the first day, students are encouraged to interact with local people to find out know about their traditional herbal medicines and the animals and birds of the hills. On the second day, students are taken on a guided walk through the forest and learn how to identify common medicinal plants, different wild species, butterflies, and to observe the symbiotic relationships of lichens. On the third day, students concentrate on combining their information on solid waste management and nursery techniques. At the end of the third day, the students are required to write a report summarising their 3 days' activities.

Keystone Students Training Program

The Keystone Students Training Program (KSTP) is an environmental education programme that works through the concept of 'students through students'. Students eligible for the KSTP must have participated in the EEP, Nature Camps and other open-orientation programmes in schools. Five days of training focuses on local environmental issues, such as biodiversity conservation and water conservation. They also talk to field experts.

Competitions for Eco Club members

Several environmental competitions have been organised for Lea Eco Club members. Competitions comprise essays, quizzes, and drawings and are rewarded by prizes. We found that these kinds of competitions encourage the students and boost their environmental involvement with outdoor field programmes. One of the competition essay headings was 'Medicinal and threatened plants of your village'**.** Students collected

information from their grandparents and the elders of their villages. We received 200 essays; the prize-winners were brought for 3 days' environment training at the Anglade Institute of Natural History and Kodikanal.

Exhibitions at the Annai Genetic Garden

Every second year an exhibition is held at the Annai Genetic Garden, with different science themes that focus on biodiversity and natural resource management. The main objective is to provide an outlet for students' creativity and to enable them to channel their imagination into practical work. Their ideas and messages not only spread to other schools but can reach the public as well. It also is a golden opportunity for non-Eco Club students to visit the Garden.

Mobile science and environmental exhibitions

Mobile exhibitions are also organised in collaboration with the Thrunelveli Science Centre. Once a year a large exhibition carried in a bus tours all the Eco Club schools in the local three districts. The exhibition contains 22 science models and environmentally-related films and video shows which are shown to the school students.

Phase 2: the impact of our awareness programmes

We have created several programmes to help students' understanding and imagination:

The *Eco Echo Newsletter*

The *Eco Echo Newsletter* is the student's environmental development magazine. It contains articles written by both the teachers and the students. The student articles are based on their training and experience, and are chosen for their originality, environmental message and creativity. The *Newsletter* is filled with; poetry, essays, songs, proverbs: anything about the environment and nature. Interested teachers are involved in the editing and select the best articles for the *Newsletter*. So far nine issues have been published and about 2000 copies circulated.

Growing and maintaining medicinal plants at school and at home

After attending our training programmes, motivated students have collected tree species from our Garden nursery or from the local forest nursery, and grown these trees in their schools. These students collectively take care of each tree. A lot of students have also collected medicinal plants from our Genetic Garden at a minimum cost, and planted them in their backyards. By planting specific plants useful in primary health care, families now know more about medicinal plants and rely more on their indigenous medicine.

Eco Club students are encouraged to work in the Gardens in their own time. The green school gardens are divided into medicinal, green vegetable, nutrition and an herbal demonstration garden. The overall objective of the Garden is to grow plants and encourage the students and public, to access medicinal plants for their primary health care use. The students look after the watering and weeding, and organically maintain the Garden with effective utilisation of solid waste and organic pest control measures.

Phase 3: open-orientation programmes

Part of our training is to take the Eco Club students onto the streets to help spread awareness to the public.

Rallies in the street, cleaning dirty towns, and cycle rallies

In Vadamadurai, Dindigal district, in 2001 a mass procession was organised. The procession was split into groups: one group distributed handbills to the public saying 'No plastic carrier-bags', another group picked up carrier-bags from the street and the rest walked in the procession, with banners against using plastic carrier-bags. The procession and the efforts of the Eco Club students were well received by the public.

Next, we sent our team to the town of Tharagampatti in Karur district. With the support of the Karur district administration, the Tharagampatti School, local women's sangams, the Holy Cross College Exnora Wing,

and the local Panchayat completely cleaned the small town. Collected organic waste was transported to the school campus for compost preparation and the non-degradable waste was taken by the municipal workers.

In October 2001, about 52 energetic Eco Club students cycled from Tharagampatti to Puliyur, covering a distance of 35 km in the Karur district. The message this time was about the conservation of water resources: 'In search of water'. Stopping at five Eco Club schools, the rally addressed every village about current water problems, the importance of rainwater harvesting and the reasons for the current water crisis. These cyclists were cheered from both sides of the road.

Cleaning schools and public places

Once a year, Eco Club students meet to evaluate their work and fill in a questionnaire. They are also expected to get involved in the waste-recycling management: cleaning public streets, removing plastic carrier-bags, bottles, plastics and organic waste. Carrier-bags and organic waste are then buried in a deep pit. Eco Club students are also encouraged to clean their school once a fortnight. Cleaning includes organic composting and taking care of the gardens.

Phase 4: planning the future of the Eco Clubs

We are planning to establish 100 Eco Clubs, so that local schools can access our resources and create awareness amongst students and the wider community, for the protection of our environment and biodiversity conservation.

Senior Eco Club Students Association

After the successful completion of their third year, Eco Club students are encouraged to join the Senior Eco Club Students Association (SEA) movement. The senior students help select new Eco Club members and guide the students in keeping school campuses clean and green. They occasionally participate in regular meetings and play an active role in the orientation programme. SEA members should be role models for their peers and live an eco-friendly life on all levels and, of course, be supportive of all Eco Club activities.

Conclusions

Any successful project requires determination, dedication, commitment and an active role-model. We have also recognised the need to create a strong, consensual network between all members. We should always keep in mind the following maxims:

- BE A ROLE MODEL
- AWARENESS & EDUCATION FIRST
- GOOD RAPPORT
- AWARENESS + ACTION = SUCCESS
- REGULAR FOLLOW UP
- REGULAR EVALUATIONS
- LOVE KIDS + RESPECT TEACHERS = EXPECT MIRACLES

Acknowledgments

We would like to mark our respect for our late Belgian lady Mother Lea Provo, founder of the Inba Seva Sangam, Sevapur, who dedicated her life to the poor and the conservation of nature. Also our hearty thanks to the Belgium organisation SAWES for their great courage and continuous support for the Annai Genetic Garden and Eco Club activities; without their support the Garden and the environmental education programmes would never have existed. Our special thanks to our colleagues Mr. K. Arumugam, Eco Club organiser, and Mr. Subramani, for their continuing assistance in carrying out the project in a very successful way. We would like to thank members of Inba Seva Sangams. Special thanks for Karur, Trichy and Dindigal

districts of Tamil Nadu, Lea Eco Club school coordinators and the headmasters who dedicated themselves to their implementation and made it a grand success.

Interpreting the garden for visitors with sight difficulties

Christine Preston

Cambridge University Botanic Garden, Cambridge, UK

Context

The University Botanic Garden in Cambridge, UK, comprises over 16 hectares of mature trees, a lake, glasshouses, themed plantings and wonderfully informal areas of naturalised woodland and wildflowers. Much of the Garden is now over 150 years old and provides a significant wildlife habitat in the city of Cambridge as well as being an important amenity for local residents and tourists. The primary remit of the Garden is educational – it supports teaching and research within the University and beyond, to all members of the wider community. It is enjoyed by around 100,000 visitors each year, including educational groups of all ages.

Encouraging and enabling inclusion is an important aspect of our work, if the Garden is to fulfil its potential as an education provider and amenity within the community. We believe that access to environments of the quality of the Botanic Garden is the right of every individual, whatever their age and ability.

Indeed, current UK law requires that all service providers, whether shopkeepers, hoteliers, health clubs or botanic gardens, make "reasonable adjustments to the way that they deliver their services so that disabled people can use them." This requirement of the Disability Discrimination Act 1995 is currently being phased in over a period of years and will become fully implemented in 2004.

In westernised countries, the number of people with some form of disability is around one in five of the population and this figure is predicted to rise in line with increasing life expectancy. So, what "reasonable adjustments" can we make at Cambridge to reduce barriers that may deter disabled people from enjoying the Botanic Garden and learning from its collections?

In the UK, many people associate disability almost entirely with impaired mobility, perhaps because other forms of disability are often less explicit and may go unnoticed. For example, a person with seriously impaired vision or hearing may present virtually no outward sign of their disability and make no strong demands for their needs to be met.

One person in every 60 in the UK is officially registered as blind or partially sighted. This amounts to around 6 million people and, extrapolating from this, we calculate that about 1,333 of our visitors each year may have been clinically diagnosed as visually impaired. Visual impairment manifests itself in many forms and degrees of severity, but only about 1 in 6 of those affected are actually blind.

A high percentage of visually impaired visitors are aged 50 years and above – the age group which accounts for over 50% of our current visitors at Cambridge University Botanic Garden. In addition to those who are officially visually impaired, one can add the many more elderly people whose sight is deteriorating gradually due to inevitable ageing processes. They may experience difficulty distinguishing fine detail and reading small text in poor light conditions. So, what can we do to enhance access for these groups, to enable them to enjoy the Garden and its collections more fully through senses other than sight?

For most of us, sight dominates our experience of the world. It is what we see that so often creates the initial impact. Our culture is highly visual. In botanic gardens, text and graphics are the principle means of communicating information, both when interpreting our collections and when publicising or promoting access to them.

In the first place, anything we can do to improve our standards of textual and graphic communications is likely to benefit all whose sight is failing, as well as young children who are still novice readers.

Developing access for people with sight difficulties

'In to Touch' and the introduction of sighted guiding

For about four years, we have been developing contacts with visually impaired people in our local communities and with those who provide them with support systems. Our aim has been to encourage them to derive more benefit from the green haven that the Botanic Garden embodies. It is an environment that has much to offer in terms of non-visual attractions.

I would like to outline some of our strategies and to share with you some of what we have been doing so far. So how did it all start?

- During 1999 and 2000, we worked in partnership with education officers at other local organisations to coordinate a festival of activities for visually impaired people (VIPs). At each festival venue, events were promoted highlighting techniques for accessing information by means other than visual. We worked under the promotional banner of 'In to Touch'. Partner organisations in the festival included museums, an art gallery, a cathedral and a theatre.
- To help us get started, initial training in Visual and Disability Awareness and Improving Access was provided by the staff of Cam Sight, a local charity supporting VIPs. This proved invaluable.

During the festival we pioneered our first sighted guiding events. We enrolled a small number of volunteers from our Friends organisation and we all received preparatory training in the skills of sighted guiding. This, for any who may not have encountered the term before, refers to the accepted techniques for the safe guiding of a blind or partially sighted person.

We also made sorties in the Garden, wearing 'simulation specs'. These are sets of goggle-like contraptions that mimic forms of visual impairment such as tunnel vision, peripheral vision and macular degeneration. We found these optical distortions extremely disconcerting, but valuable in raising our awareness of how diverse and disabling the effects of sight impairment can be.

We organised two events each year, to which VIPs and their sighted companions were invited. Local Social Services laid on transport for those unable to reach the Garden unaided, whilst others came with family or friends. We provided a sighted guide for each VIP and after a few welcoming words everyone dispersed into the Garden to pursue their own interests, later meeting for tea at the Café. The age range of those attending was between 8 and 90 years old.

Sighted guiding is social and informal. It works well, for both parties, when the guide is able to tune rapidly to a compatible wavelength for the VIP in their company. Once a rapport is struck, the VIP feels confident of influencing the proceedings and negotiating a Garden experience to suit his or her inclinations and fitness. The guide's role is as facilitator and interpreter. Not surprisingly, VIPs' interests cover as wide a spectrum as would those of any diverse group. Some may have an intellectual interest in the Garden and its plant collections, whilst for others their visit may be purely recreational.

Visual impairment typically enforces varying degrees of social withdrawal. Cherished activities such as allotment-keeping or gardening may no longer be practical. The guide will be alert to hints as to which plants have significance for the VIP and may be able to locate favourite examples and kindle memories, for example through:

- exploring the impressive shape and scent of the flowers of *Magnolia*
- comparing the diversity of bark textures, fruit or seed forms
- the pleasure of smelling and comparing a range of different mints or
- the fun of finding ripe mulberries amongst the leaves or re-experiencing the distinctive scent and feel of a tomato plant in fruit.

Others, perhaps living in a city apartment, may have little access to open space and relish the opportunity to sit on a bench in the fresh air, chatting or listening to sounds around them, such as birdsong, the fountain or the voices of people relaxing together.

In our unpredictable climate, we have found it helpful to collate a handling collection of plant materials and related objects with interesting associations. Exploring these provides an enjoyable fall-back activity if the weather is unaccommodating or if a VIP tires quickly and wants to return to base to sit down.

Our sighted guiding events reached relatively small numbers, but participants' responses encouraged me to feel that there could be value in extending the service throughout the year, making it available to any VIP able to reach the Garden independently or with a sighted companion. I felt that some people might prefer an alternative to visiting as a member of an organised group.

Audio-guiding versus sighted guiding

I also explored the feasibility of developing a specialised audio-guiding system. The idea was to enable a VIP to seize the opportunity of good weather and turn up at the gate to borrow a pre-recorded audio-guiding wand that would assist with both way-finding and the provision of interpretation about the collections. Funding was available to develop this project, but it would have required substantial pioneering. Although such systems are now relatively familiar at indoor venues, I could find no specialised VIP audio tour in the outdoor environment to use as a model. We decided that with our limited human resources it would be an over-ambitious venture for the Garden to develop at present, although the appropriate technology will no doubt become feasible with further developments in wireless computer technologies.

Using a human guide offers many advantages. A sighted guide self-programmes instantly to respond appropriately to what he or she encounters on the day – be it the mood or fitness of the visitor, the season of the year, weather conditions or unexpected bumps and wrinkles in the ground surface. A human guide can exchange a joke over a cup of tea and make the most of interpreting the unexpected happenings that occur in gardens everyday – the great or small things that make gardens invigorating places to be and keep attracting people back for more.

We also have to be aware that using sighted guides introduces potential risk and inconvenience for both parties. An appointment may be broken, leaving one or other partner stranded, disappointed or annoyed. People with visual impairment are physically and sometimes emotionally vulnerable and may be anxious about walking off into a garden with a virtual stranger.

As for the guides, although covered by the University's Public Liability Insurance, they are aware that they may be putting themselves at risk of litigation, should a VIP have an accident whilst in their care. Similarly there is no guarantee that a VIP might not file an accusation of assault, whether true or false.

Such issues provoked considerable discussion and soul-searching for the guides and myself as we negotiated the guidelines for our longer-term modus operandi. Whilst it is worth pointing out that the guides are members of our Friends organisation, and not strangers to us, all were in agreement that when recruiting, we should obtain two references attesting to the applicant's suitability for this type of work. Even so, risks remain.

Where we are now

We now have 10 trained volunteers to call on to act as guides in response to requests from VIPs, at any time of year. The demand has grown gradually. We were warned to expect this, as we are promoting a new concept to people for whom most forms of advertising are inaccessible and many of whom are elderly and may take time to respond to new ideas. For some, the journey to the Garden is certainly a real barrier.

I am satisfied with the current volume of demand. If we were to be swamped with requests for sighted guiding, we would find it hard to devote the necessary time to managing the scheme. We currently provide guides for around 50 VIPs each year and more than half of these attend as members of a group visit. The development of tactile maps and interpretive diagrams is an issue that I am currently exploring. Whilst we develop our work, we learn more about how we can enrich our interpretive repertoire. We believe that this can only offer benefits for all of us and for all visitors to the Garden.

Is there anyone else out there?

For anyone who might be considering assessing their own garden in terms of accessibility to people with sight difficulties, I have drawn together in Figure 1 some of the concepts that may be worth considering. By doing so I do not wish to imply that we have achieved all these aims at Cambridge.

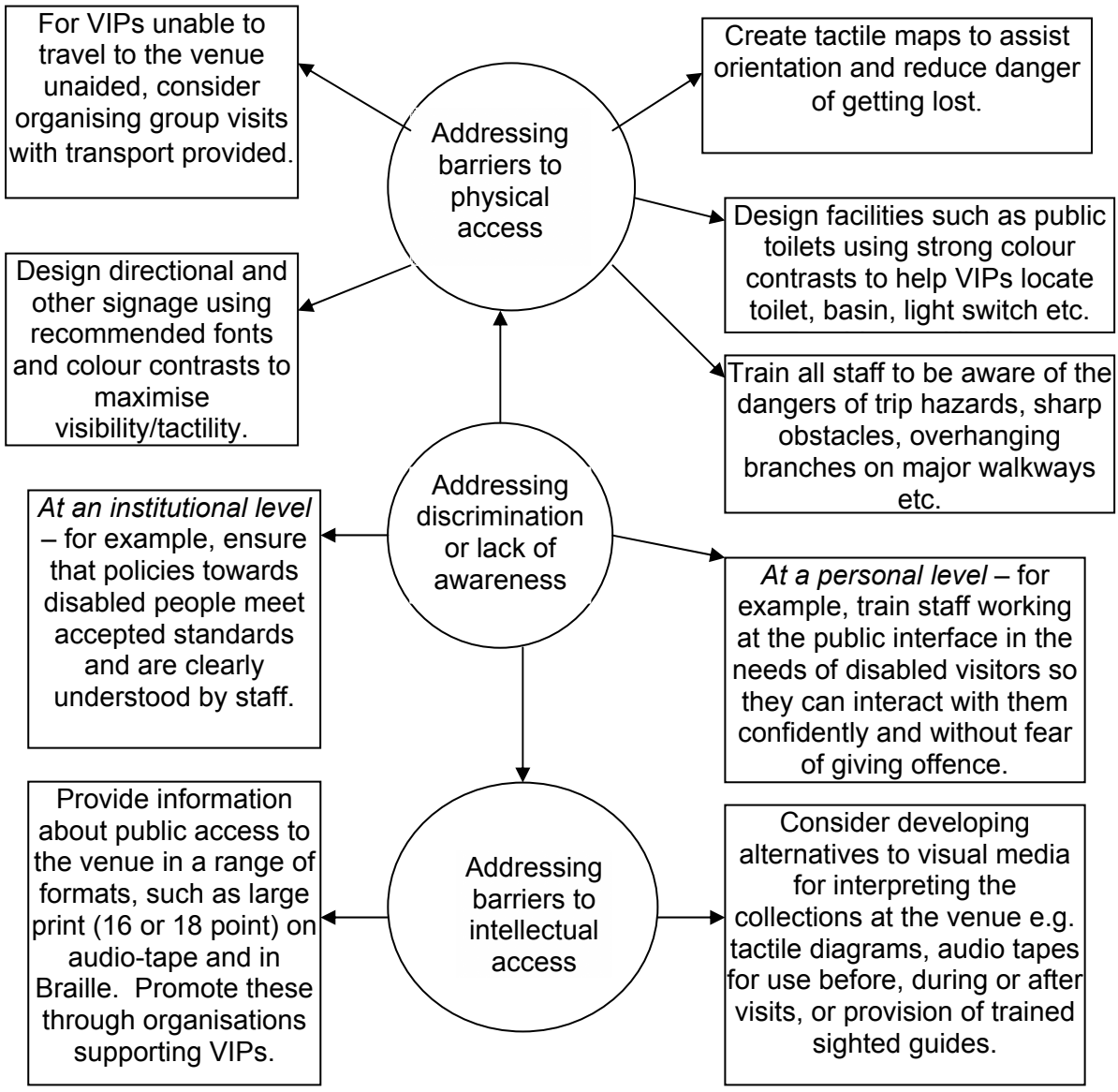
Improving accessibility for people with sight difficulties calls for wide-reaching changes and takes time. We are only a small part of the way along the road to incorporating better practice in all the relevant areas of our work. I would love to hear from any colleagues who have also been working in this area.

References

United Kingdom (1995). *Disability Discrimination Act 1995 (Part III – Access to Goods and Services)*. www.disability.gov.uk/dda

British Standards Institute (2001). *Design of buildings and their approaches to meet the needs of disabled people – Code of Practice*. BSI. Chiswick, London, UK. ISBN 0 580 38438 1

Figure 1 Organisational issues relating to the development of access for visually impaired visitors



Auto-guide series for the Francisco Javier Clavijero Botanical Garden

Maite Lascurain & Nancy Conde

Jardín Botánico Francisco Javier Clavijero, Xalapa, Veracruz, Mexico

Introduction

The Francisco Javier Clavijero Botanical Garden offers a service of guided tours as a one of the main visitor facilities. This service is doubly important. Firstly it provides a useful method of transmitting relevant information which can generate feedback from the visitors in the form of opinions, suggestions, preferences and complaints. Secondly, the visitor can receive specific information and consult those areas that may be of personal interest. Public interaction in this way results in a friendlier and more relaxed tour. Another advantage of the guided visit format is that it can adapt to the context and style of particular groups and can be combined with other creative and spontaneous activities (Cross 2000).

At the Francisco Javier Clavijero Botanical Garden, there is a big demand for guided visits which is impossible to satisfy because of lack of personal and time. Therefore it is necessary to look for new ways that can satisfy this demand, in a pleasant manner, probably with a different content of the guided tour.

An auto-guide describes a particular trail in the Garden. It can be provided as a printed booklet, a series of labels or posters, or a recording. It has a name, and generally has a plan of the route to be followed and its stopping points, each with its own title and associated explanatory material. It can be addressed to small groups of four to five persons, or to smaller groups of one or two persons in that it includes a safe, well oriented, clean and organized route.

The printed auto-guide gives the visitor, at any hour and day, accessible information about plant sites, in an organized sequence which they can access in their own time. It is a means of enhancing the appreciation of botanical gardens and to attracting the attention and stimulating the imagination of visitors, as well as giving them capacity to discover plants and other resources. by themselves.

Objectives

The guides are provided in order to enable visitors to:

- become aware of the role of plants in everyday life , their history and their diversity
- learn about the diversity and uses of the plants represented in the collections.

Methodology

The methodology on which the trail guide literature and trail signing is based is from Cross (2000), particularly as regards content and structure and the requirement for the guide to be used in the open air. The following requirements were considered:

- To be brief
- To be written in a direct and informal tone
- To avoid using technical words
- To provide attractive titles and illustrations
- To use short phrases
- To provide motivation for creativity and expectation.

The structure and contents of the guides are also based on Ham (1992), from which the following concepts were taken:

- Trail total distance. Generally the auto-guided tours are less than 1.6 km long. Most experts recommend a trail length of not more than 800 m. Time to complete the trail should be less than 30 to

40 minutes. The main idea is to maintain the interest and motivation of visitors so that they can discover what to find at every stopping-point.

- Stops. A trail should contain less than 15 stops, with a distance of 53 m between one stop and the next, although these distances can vary in different situations. It is recommended that each stop should be interesting, safe and comfortable.
- Layout of the trails. The auto-guides should mention any of the following conditions: whether the trail is on land that is flat or with steep slopes; describe the shape of the trail (rectangular, irregular or square); and state its length or area. It should also state the start and end of the route, and list a selection of objects and places to be viewed. Trails could be lineal, circular, zigzagging, figure-of-eight shaped etc.
- Information provided. The signing at each stop needs a precise and clear title that attracts interest and reveals something of the subject. The information shown at each stop should have the following structure: an introductory sign, a body and a conclusion.
  - ♦ Introductory sign. This is a physical sign found at the beginning of the trail. It shows the title of the trail and an image similar or identical to one in the corresponding guide book. The introductory sign acts as a poster indicating time, distance, and the position of the start and end of the trail.
  - ♦ Body. This is the content of the information about the subject. It should have the following characteristics:
    - o A focus. The point of interest should be clearly visible and distinguishable for visitors, that is, the object mentioned in the auto-guide must be located right in the visitors' line-of-sight. If it is a plant, it is important to distinguish its label with a sign design or colour that is different from the surrounding labels. It is important to carefully select the information to be presented; this should correspond with significant features of interest to the visitors. For added interest, we strongly recommend the use of interactive aids which allow actions by visitors such as touching, listening, smelling etc (Ham 1992).
    - o Explanation. This should describe in few words the most important aspects to be observed, and it should also be a link between the auto-guide title and subject.
    - o Link. At each of the stopping points, aspects of special interest should be emphasized. There is an opportunity here to interact with visitors by posing questions or suggesting ideas or concepts that create an element of surprise or increased interest.
  - ♦ Conclusion. This refers to the signage at the last stop of the trail, which should state a conclusion that emphasises the most relevant aspects of the trail, in a way that arouses the interest of visitors.

Results

Three auto-guides were produced:

- 'Foggy Forest, between Ferns and Orchids' (for the forest trail)
- 'Old Trees, Amazing Trees' (for the pinetum trail)
- 'The Princesses of Nature' (for the palmetum trail).

Characteristics

Each auto-guide is a printed booklet with a distinguishing colour for each trail . It contains a sketch showing the trail and its stopping-points. Each stopping-point has a brief explanation; and at the end the auto-guide presents a general conclusion about the trail.

- The distance: between stopping-points is 245 m for the pinetum trail; 320 m for the forest trail and 110 m for the palmetum trail.
- There are nine stops in each trail.
- The forest and pinetum trails are circular, starting and finishing at the same point. Since the palmetum lies on flat land and has a small area (18.6 sq m), its trail is a zigzag shape.

- The information displayed at each stop is about the diversity and traditional uses, local, national or world-wide, of the plants in view. Some additional notes were added regarding species conservation and distribution.

The text of each stop has between 35 to 170 words, with a total of between 841 and 910 words per auto-guide. The letter-size used is 10 points and the printed area of the message is 27.1 cm high by 9.3 cm wide.

Signage system

The signage system for each auto-guide features a distinctive colour. It begins with an introductory sign placed on a post 50 cm high. At each stopping-point there is a numbered post with an arrow which indicates the direction of the route. Plant specimens mentioned have a label similar to those commonly used in the Garden, plus a circle in the colour of the relevant auto-guide. Numbers and arrows are white with a background in the relevant auto-guide colour.

Evaluation

In a first attempt at evaluation, copies of the drafts of the three auto-guides were distributed to 20 adults. At the end of the tour, they answered a questionnaire (described in the Annex). Results indicate that in the case of pinetum and forest trail guides, 90% of the visitors noted insufficient arrows connecting successive stop-stations. In the case of the palmetum guide, 95% of the visitors noticed that some scientific names were misspelt. After correction, second drafts of the guides were evaluated by another 30 adults. This time the guide was printed in colour. No significant errors were noted.

Conclusions

We printed 120 copies of each auto-guide. They can be bought for $5.00 pesos (US$0.50) at the Garden entrance.

We need to monitor for changes to the trails, suggestions for improvements and the impact that the use of the auto-guides has on visitors. For example, do visitors view the whole of a trail, what do visitors do with the guide after use, what type of trails can be provided for visitors with special requirements, are there other subjects of interest to visitors?

Each trail is regularly checked for damage to labels, obstacles (such as branches) and litter.

Acknowledgement

We would like to thank all the staff of the Francisco Javier Clavijero Botanical Garden for their enthusiastic participation in the preparation of the guides.

Bibliography

Cross, S. (2000). Interpretation. Notes of Management Course in Botanic Gardens .Royal Botanic Gardens Kew. London, UK [unpublished].

Ham, S. (1992). *Environmental interpretation: a practical guide for people with big ideas and small budgets*. North American Press. Golden, Colorado, USA.

Fig 1 Cover of the Pinetum auto-guide.

Fig 2 Pinetum trail: introductory sign, stopping point number and path direction arrow

Annex

The questionnaire used to evaluate the auto-guide has the following structure:

Birth place _____ Level of school education _____ Occupation _____ Date _____

Orientation

Deficient ☐ Adequate ☐ Good ☐ Very Good ☐ Outstanding ☐

Suggestions: _____

Contents

Deficient ☐ Adequate ☐ Good ☐ Very Good ☐ Outstanding ☐

Suggestions: _____

Language

Deficient ☐ Adequate ☐ Good ☐ Very Good ☐ Outstanding ☐

Suggestions: _____

Time

Deficient ☐ Adequate ☐ Good ☐ Very Good ☐ Outstanding ☐

Suggestions: _____

Additional comments: _____

On the ground – making things happen

Peter Lehmann

Australian National Botanic Gardens, Canberra, Australia

Overview

How can the smaller botanic gardens, with few resources and perhaps without an education officer, provide quality educational activities? This workshop[1] looks at the issues and develops an approach that can be the basis for a whole raft of practical applications that can be achieved almost anywhere. There's nothing new here- its all about thought and planning up front.

A discovery approach

A new approach to education programmes at the Australian National Botanic Gardens challenges visitors to ponder the issues presented to them, provides choice in topics to pursue, and encourages further thought and research when they leave. It then allows our small staff of two (one of whom is an Education Officer) to get on and develop more fun activities with subliminal learning.

The approach works well for school groups, families and the casual visitor, and is non-threatening to the teacher because the responses are not important – what is important are the processes that give rise to the responses.

Teachers get a resource into which the student booklet is embedded. It contains the philosophy and background information, pre- and post-visit activity ideas, curriculum context and further research options.

What we need to do is engage participants in such a way that they:

- become focused and observe closely through the presentation of each challenge.
- arrive at a response that is appropriate for their current levels of understanding and skills; there is not necessarily one correct answer, and different people are going to interpret the hints differently.
- learn new things, have a better understanding about the living world and leave with a shift in attitudes and values about the living world. There is some overt learning, but much can be subliminal.
- ponder and research further after their visit, because we don't provide the ANSWER. More questions open up as students move along.
- are challenged, have fun, and leave with a sense of achievement.

The workshop:

- investigates creative approaches with limited resources that lead the learner to want to focus, observe closely and ponder.
- provides examples of student resources that have style and character, and resources that also attract the teacher's attention (particularly when teachers are working outside their field of expertise).
- challenges us to use different technologies for presentation grabs (particularly technologies not broadly available in schools).
- looks at ways of tapping into support from larger botanic gardens and similar organisations, and adapting or piggy-backing on other programmes that we might have.
- shares the successful marketing and evaluation techniques that each of us has developed for our education programmes.

[1] *Getting the Message Across – When You Don't Have The People To Do It*.

The main issues

Determining the learning outcomes

- Who is the audience?
- What are the desired and achievable student personal and educational outcomes.
- What do we really want the participants to learn? Is it knowledge, an understanding, something about comprehending or something higher up the scale of Blooms Taxonomy of Learning?
- Which values and attitudes do we want to transmit?
- We must remember that some learning is overt learning but much can be subliminal.
- We want learners to have a sense of achievement.

Working out the take-home message

- We want to give the attendees something to ponder.
- Do we also want to them something physical that their siblings and other group members can be involved in?

Attracting the learner's attention

- How can we engage the learner in a world of increasingly distracting influences? Why should they want to participate in our activity rather than something else that's going on? We will never be able to match fast-moving computer games and graphic screens, so how can we gain the learner's attention for just a while?
- We need creative and novel approaches in our presentation, such as graphics and other interactions
- Imply self-challenge
- Learning should be fun.

Getting them to focus and observe closely

- When we have gained their attention, how do we get them to observe closely and focus on the task?

The right activities

There is a place for provocative questions.

We want the participants to feel the need to consciously participate and think in order to achieve.

Focusing on hardware, that requires the learner to interact in order to find out what it is about.

We want to encourage the participant to ask the question "What's this about, what is this for?"

Asking the right questions

Questions can be direct, or ones which really ask something deeper to ponder: the subliminal/covert outcome we are looking for.

Responses to questions are not as important as the processes that lead to the responses.

There is not necessarily one correct answer to a question.

When a question is asked, hints are provided but no answers are given.

Questions should involve minimal reading and writing, so that most of the time is taken in observing and pondering, and taking in the ambience of the venue.

We can ask open-ended or extended response questions, where the learner's answers relate to the depth accorded by their current levels of understandings and skills.

Questions should be non-threatening to teachers, carers, or learners

Questions can include ones which ask people to ponder about something long after the visit. Ask a question that initiates more questions in the mind of the learner.

Providing just the right information

Provide information in a minimal number of words, just enough.

Provide sufficient, but just enough information/interpretation to maintain a sense of mystery.

Provide a hint. Ask a second question linked to the first

'The grab'.

Resources

The design and provision of resources involves considering the following:

Different resources may be needed for the activity, for the teacher, for the learner/participants.

Their style and character.

Their look and feel.

Budget constraints on their development and production.

Time constraints on their development and production).

New technological advances and presentation grabs.

Teacher and carer resources could be in an A4 format in which the A5 student booklets are embedded – to provide some background information, pre- and post-visit activity ideas, curriculum context and follow-up research options.

Marketing the programme

- What are the target audiences?
- What methods are available?

Evaluation

This involves:

- Measuring teacher/carer reactions
- Measuring learner responses.

Botanical boats

Jenny Stuart

Brisbane Botanic Gardens Mt Coot-tha, Brisbane, Australia

Aims

To showcase some novel and interesting methods used in one of our successful holiday programmes, in an attempt to provide inspiration and food for thought for other botanic gardens educators.

Background

The Brisbane Botanic Gardens regularly runs holiday programmes for children aged 6–12 years. The aims of the programmes include:

- introducing children to the wonderful world of plants using the medium of the creative arts
- raising awareness of environmental issues in a relaxed, hands-on context
- developing relationships with local artists and giving them the opportunity to work under the auspices of the Brisbane Botanic Gardens to source inspiration and materials from the plant world.

I would like to introduce you to a particular holiday programme we ran called Botanical Boats. The Botanical Boats programme was developed to raise awareness of the importance and value of plants in our lives and the fact that many plants are in danger of extinction as a result of our activities on earth – land clearing, weed invasion etc. We wanted to emphasize the vital part plants play in everyday living and to encourage the children to see that they can have an important role in protecting and conserving them.

Our artist-in-residence at the time, John Fitzwalter, was invited to mastermind the project and to work on the preparation and presentation team along with the Gardens' education staff. It was decided to use storytelling and the visual arts to interpret and communicate our ideas in a novel and engaging way. The programme consisted of four linked strands:

1. Taking his theme from the story of Noah's Ark, John wrote a story called 'The Botanical Ark' which highlighted the problems of the modern world and their effect on our natural environment. Although many of the children were familiar with the biblical story of the Ark, the non-religious reworking that John wrote allowed us to introduce the concept of endangered plants and their need for our protection. Whereas in the traditional Ark story the Flood posed a threat to the continuation of animal species, John's story challenged the children to think of modern-day threats to plant species. The story was used to introduce the session.
2. Following a reading of the story, children were introduced to the real-life Botanical Ark, the frame and roof of which were constructed prior to the programme from cane, bamboo, paper and flowers. The children were invited to help weave in the body of the Ark using palm leaves, bark and other waste plant material. Some also helped to add to the paper and dried flower roof. In this way the children were able to become a part of the story they had listened to. The Botanical Ark became an ephemeral artwork in the Gardens for the succeeding few months, drawing visitors' attention to the issues through its visual impact and interpretive signage. In this way the children contributed to a piece of community art as well as making their own artwork. The Ark was later modified and used in the art programme that the Education Unit ran in conjunction with Jeannie Baker's touring exhibition 'The Hidden Forest'.
3. The children were then involved in the construction of their own miniature botanical boats, using plant materials collected in the Gardens. Hulls were made from blackbean and crows' ash seed pods, masts from bamboo twigs and sails from dried flowers pressed between wax paper. During construction there were opportunities to discuss these materials and how useful plants are in our everyday lives. As most of the materials were recycled we were able to emphasize the part that recycling can play in conserving our plant heritage.

4. The programme concluded with each child being given an Australian native plant, suitable for gardens, to take home and care for. This emphasized the message that everyone can be empowered to make a difference and help in small ways. By reaching out to the child's home, it also extended our message in time, location and audience.

Findings and recommendations

- Through stories, children can be introduced to complex and important environmental issues.
- Holiday programmes can involve children in the construction of large sculptural artworks that become part of the Garden display, giving them the chance to become community artists.
- Simple art and craft activities can be used to teach design principles and problem-solving, to explain the workings of nature and be used as symbols of personal stories and journeys.
- The theme of 'boats' can be used as an analogy in terms of what we bring or carry in them and what we take away. These types of activities could be used to encourage migrant children to tell the stories of their journeys.
- The reworking of traditional stories can be an effective hook, and hence a powerful tool, for communicating environmental messages.
- Children can be empowered to make a difference: from little things big things grow.
- There is huge scope for the involvement of community and local artists in botanic gardens; this can give both parties fresh inspiration.

Inspired by nature: art and the environment

Mark Loveday

Royal Botanic Gardens Cranbourne, Victoria, Australia

This presentation describes a selection of the output of artists who have made works in the natural environment using found materials, and utilising natural processes in the formation of these works. It will also consider artists who bring the natural world into the built environment.

How do these works, and the corresponding close observation of the natural world from without and within, lead us to a greater understanding of that world? And how can they be better used by educators to promote the necessary work that botanic gardens do?

Art about the environment, in the environment, using the environment

Many artists in Australia and elsewhere in the world use the natural environment as a starting point from which to draw inspiration. In this presentation I intend to look at artists who have used the natural environment as the setting for their work, used natural processes in the formation of their work, or use found materials (including plants) in the construction of their work.

In the nineteenth century and earlier, art in the environment was exactly that – placing sculptural pieces in outdoor settings. There is also a long history of Romantic landscape painting where the land is idealized and shown as bending to the will of humanity – serving our purposes.

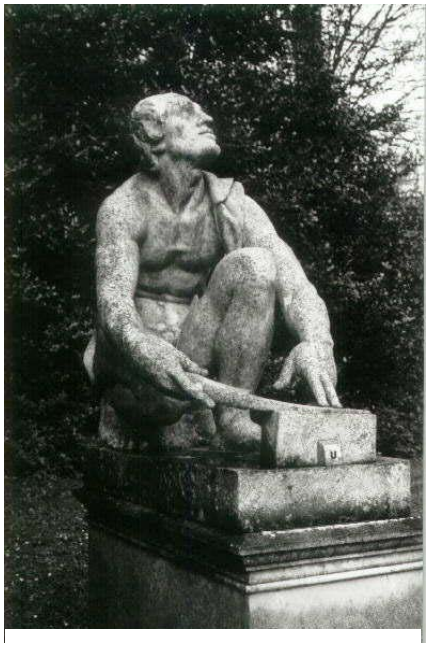


Fig 1. Sculpture at Powerscourt Gardens, Ireland

In 1890, at the age of 50, **Claude Monet**, the French Impressionist painter, bought a house and land at Giverny where he built his water garden (Barnes 1996). For the next thirty years he painted waterlilies. He painted colour and light and was not interested in formal composition. These images have become some of the most loved of all paintings.

In the twentieth century artists like **Pablo Picasso** began to make assemblages using everyday things, sometimes rearranging familiar objects to give them entirely new meanings. In his 'Head of a Bull' (1943), Picasso made use of a bicycle saddle and handlebars to create the illusion of a bull's head (Rubin 1980). The sculpture is playful and challenges our sense of order and reality.

In 1969 the sculptor **Christo** wrapped a one-mile stretch of coastline at Little Bay, outside Sydney. The intention was to draw attention to the wrapped object and encourage the viewer to look at things differently (Barnes 1996).

This large-scale style of work caught on in the United States. **Robert Smithson**'s **'**Spiral Jetty', built from tons of earth and rock, was swallowed up by the rising lake; it emerged years later, after Smithson's death (Popper 1993). 'Land Art**'** works like this are subject to erosion due to their massive scale. Artists like Smithson interfere with the landscape, excavating and moving tons of rock to leave significant evidence behind. The 'Earth artists' who emerged from this period made much more subtle or even invisible marks on the landscape.

Richard Long belongs to the Land Art Movement; many of his later pieces involve bringing nature into galleries and rooms (Popper 1993). Arrangements of stones or patterns made with river mud in great

sweeping strokes on marble floors create monumental works. Many of Long's works are subtle and cannot be seen – he walked from one side of England to the other, picking up a stone in each creek he crossed, dropping it into the next, and so on. The only evidence of this is his account, including maps and diagrams of his journeys, or the materials he collects and brings back to display in galleries.

Lothar Baumgarten photographed a red feather, a symbol of nature, beneath the floorboards of his studio to symbolize discovery – the feather shining out like a red light from the darkness (Barnes 1993). At a time when the idea or concept behind a work was as important as the work itself, the act of placing the feather in the floorboards could be considered as actual artwork.

Many people are familiar with the work of **Andy Goldsworthy**. Goldsworthy followed on where the Land Artists left off, having an involvement with the earth's own resources. Because of the temporary nature of this work, it usually remains only in the form of a photographic record. This New Age Earth Art reached a peak in the mid-1980s when Goldsworthy was the subject of a number of major exhibitions. One of his artworks is a tree at Mount Victor Station in South Australia which was plastered with wet earth after a rainstorm. It makes a striking image in the early morning sunlight.

John Wolseley is an Australian artist who has made many trips to remote parts of the country. He attempts to paint the parts of the landscape that we cannot see, such as the geological strata and the processes that shape the landscape (Grishin 1998). For example, some of his watercolours depict dune advancement. He has been known to bury paintings and drawings in the earth to bring part of the landscape away with them.

Tim Storrier has spent much of his career painting fire, an intrinsic part of the Australian cultural and environmental experience (Lumby 2000).

John Davis spent many years making sculptures from twigs, calico, twine and bituminous paint. He grew up on the Murray River at Swan Hill and often returned to the River with sculpture students from Prahran Art School in Melbourne where he taught. In 1979 on one of these trips he created a sculpture from a tree stump, twigs, bark and mud. He called the work 'Observatory' (Sinclair 2001). He said of it:

> *"It was an urge to make something on the river … I sort of just responded to this stump and it evolved really. I didn't know what I was going to do until I saw it. I wander around the bush for a while until suddenly there's a place that makes some sense and I feel, okay, this is where I want to work. It's also a sense of place. You embellish that, make it stronger and more obvious."*

Davis felt that the work was partly a commentary on the efforts to regulate the River since the 1880s. The exploitation of the River has given little thought to its associated ecosystems, which have often been poorly understood. The Murray has often been seen as a competitor for, rather than a guarantor, of water. When Davis returned, one year later, the sculpture had been dismantled by the River's natural processes.

Later John Davis returned to Swan Hill and created a work for the citizens of the town, involving stories and images from local people. These words became the current in John's image of the River. There was also a collaboration with Aboriginal artist **Yvonne Koolmatrie** which incorporated her weaving fish using native grasses.

Erik Samakh's **'**Installation for Communicating Frogs' (1991) is an aquatic installation with live frogs, intended to establish 'strange conversations' and interactivity through the use of the computer.

Irene Vincent ('Ping') studied Year 12 Art in 2001 at Beechworth in rural Victoria. One day at school she came across a pile of computer boxes waiting to be thrown out. She took them home and painted them white and proceeded to take them on a journey. They were photographed hanging from trees in the main street of Beechworth, strung across Beechworth Gorge and floated on a lake. Environmental art events like these leave no trace: photographs of the events are the only records of their occurrence. These works have elements of theatre about them and are also playful and funny. At the conclusion of Irene's use of the boxes they were taken to a childcare centre where the children set about playing with the boxes and painting them. Irene gave them no instructions, except that they could have the boxes to use. In this way the boxes entered a third phase of their existence.

David Wong is a sculptor who lives in Melbourne. David has made many works using plant material. One series of works involved placing layers of stones and plant material inside wire gabions (the type used to stabilize roadsides). For David, the layering in the gabions emulates the rock strata in cliff-faces at the beaches he loves to visit – as you go deeper into the strata the further you go back in time. Australia is an ancient country. David also sees a spiritual connection with Stonehenge. This method presents the plants in a format that creates a new aesthetic which challenges our perceptions of Australian plants. Over time the material inside the gabions dries out, changes colour and sinks down inside the cage. The process of decay is an intrinsic part of these works, and of others which include natural materials.

In the Glass Case sculpture which was displayed in the Visitor Centre at the Royal Botanic Gardens Melbourne, the glass echoed the wire gabions, but allowed the objects to float, creating an 'above world' and an 'underworld'. The globe made of *Callistemon* branches reflected the domes of the nearby observatory buildings and the pyramid of *Gahnia* roots reflected the shape of the Shrine of Remembrance opposite the Royal Botanic Gardens Cranbourne.

In exploring ideas for the Ian Potter Foundation Children's Garden at the Royal Botanic Gardens Melbourne, **David Wong** and the Education staff worked with groups of schoolchildren to create a large sculpture from plant material. It evolved as different groups came every half-hour to add their contribution.

A crescent-shaped pile of earth was laid down and the first group placed bamboo poles into the earth. Other groups created levels and made spaces within the structure, using *Strelitzia* leaves. Some children crawled into the middle to place objects like Bower Bird treasures. One of the children from an earlier group came back to look at it later and said "They've wrecked it".

David has also worked with teachers on professional development days to look at the possibilities and structure of plants in a new way. Close observation of nature is one of the keys to environmental education and using plants and natural materials to create artworks is rewarding way of doing this.

Author's note

This paper was given as a presentation, based around slide images of the artworks being discussed. The majority of those images cannot be reproduced here for copyright reasons. Educators interested in pursuing environmental sculpture as a method of teaching should be able to access a wide collection of art publications available, in order to source stimulus material for teaching sessions and workshops.

References

Barnes, R *et al* (1996). *The 20th Century Art Boo*k. Phaidon Press, London, UK.

Grishin, S. (1998). *John Wolseley: Land Mark*. Craftsman House, Sydney, Australia.

Lumby, C (2000). *Tim Storrier: Art of the Outsider*. Craftsman House, Sydney, Australia.

Popper, F. (1993). *Art of the Electronic Age*. Thames and Hudson, London, UK.

Rubin, W. (ed.) (1980). *Pablo Picasso – A Retrospective*. Museum of Modern Art, New York, USA.

Scarlett, K. (1988). *Places & Locations – The Sculpture of John Davis*. Hyland House Publishing, Melbourne, Australia.

Sinclair, P. (2001). *The Murray – A River and its People*. Melbourne University Publishing, Carlton, Victoria, Australia.

Vincent, I. (2002). *Interview with Author.* [Unpublished].

Wong, David (2002). *Interview with Author*. [Unpublished].

Working on a public open space or park

Bel Browning[1] & Mary South[2]

[1]Royal Society for the Prevention of Cruelty to Animals, Hastings, UK

[2]Independent consultant, Eastleigh, UK

Problems

These are some of the general problems which can be present when you consider the use of a site:

- No back up for materials, indoor facilities (such as photocopying) will be available. Everything from tables to paper and scissors will need to be transported to the site.
- Who owns the site? A public body? A private individual? Are there any local bye-laws governing its use e.g. that the turf or grass surface cannot be broken in any way?
- Is permission for use needed? Are any costs involved with this?
- Are there any procedures for using the site? Are there booking arrangements to be followed? How can you find out if another group plans to use the site at the same time as you i.e. is there any danger of your event being hijacked by another group?

Aims of the event

Be very clear what you want to have achieved at the end of the event:

- Promoted awareness of the local environment
- Raised the profile of your organisation
- Provided a showcase for local skills/artists
- Linked your group with other groups and individuals
- Provided opportunities for networking between community groups.

Planning the event

- Get to know the site and assess its potential for activities and performances. How big is it? How many groups and activities can it comfortably accommodate without depreciating the visitors' experience?
- Are there any features already on site e.g. goalposts, pond, garden features, a picnic area, a hardstanding, parking area. Can these be utilised for some planned activities?
- How many people can the site realistically accommodate?
- Are there any safety issues which should be considered? Should public liability be considered?
- Will it be possible to fundraise during the event? Is this necessary or desirable? Could a charge be made for some activities? Could an entrance fee be charged; unlikely when using a public open space.

Funding – a hot potato!

Network! It is surprising where small amounts of money may be available. Often these are from unexpected funding sources which can be utilised for specific items e.g. materials far a particular activity.

Sources worth approaching

These include:

- Local government (council) amenity funds, environmental groups, arts organizations; also private sponsorship such as local firms and shops, larger bodies and trusts (but read their statements carefully, as many will only help registered charities) and help in kind e.g. loan of tables. Schools may be able to help with some equipment and park maintenance departments may be able to help with setting up or lending items for activities such as climbing demonstrations.
- Use your friends, make reciprocal arrangements with one another. Do not be put off if there is no sponsorship available: it is possible to run a successful event on a shoestring!

Publicity – always a difficult one

It is always easy to wonder if it is possible to make the effort needed for publicity, especially when trying to arrange event participants and get funding – but it does need to be done, otherwise everything else is wasted effort.

Get as much publicity material as possible out during the two months before the event:

- Press and media releases: if you are running the event on behalf of your own or another organization, use their outlets and also any outlets associated with the site itself e.g. if a sports ground then the sports clubs and teams who use it regularly; if in a park then use the local council or whoever is responsible for its upkeep.
- If funding and facilities for paper, printing or photocopying are available then produce posters, fliers, programmes for the event and marker notices for the location of activities on the site.
- Distribution of posters: make use of the usual local outlets, but also particularly in the surrounding area adjacent to the site; do a leaflet/flier drop to homes and shops in the immediate area (this does not take as long as you might think!); put posters on trees or lampposts, but check with local authority if permission is needed for this and get it!

Activities that cost nothing and need little or no training for leaders

Natural sculptures		– leaves on frameworks
		– fallen flowers on sticks
		– prayer arrows
		– leafy patchwork carpet
		– willow weaving
Story-telling reading	and	– natural history themes
Games		– scavenger hunts
		– tree measuring (pencil or stick method)
		– competitions
		– animal homes (take care in countries where there may be poisonous species)

Trails	– trails, hand-written if necessary. These may need some props to be provided.
	– use ideas from the site location, link to possible wildlife in the area
	– use open-ended ones able to go anywhere
Competitions	– tree measuring etc. Use entrance tickets to your own site and events as prizes.

Practical sessions

Participants split into groups to write either a wildlife trail or a survival trail game.

Trails were open-ended enough to be useful on any site, so this activity was beneficial to anyone involved with running their own programmes on their own sites or unfamiliar sites.

Some possible activities if funding is available

- Art workshops. Activities such as having artists on site working in natural materials, dance or working in clay or tiles to produce a piece for the site
- Invite local musical groups and societies who are willing to showcase future productions, also multicultural groups.
- Theatrical groups, especially youth theatre groups, again previewing forthcoming productions.

Brooklyn Botanic Garden Interpretive Master Plan

Romi Ige

Brooklyn Botanic Garden, Brooklyn, New York, USA

The objective of this workshop was to present one method of developing an Interpretive Master Plan and to engage the participants in one stage of the process.

What is an interpretive master plan?

Generally, an interpretive master plan (IMP) is a framework for communicating the messages that a cultural institution wishes to convey to the public.

At Brooklyn Botanic Garden, our Interpretive Master Plan would define what the messages should be, how they are delivered and who would be responsible for what.

Interpretive Master Plan Committee

This committee was formed by the co-chairs, the Vice President of Science and the Vice President of Education with Director of Continuing Education (Steering Committee) and Coordinator of Interpretation & Internships (Steering Committee). It also includes the Director of Children's Education & Family Programs, the Teacher Education Coordinator, the Director of Visitor Services and Volunteers, the Foreman of Conservatories, the Director of Horticulture, Labels & Graphics, the Director of Library Services, the Director of Publications, our Horticultural Taxonomist, the President (*ex officio*), the Vice President of Marketing (*ex officio*)

Overview of Brooklyn's Interpretive Plan Process – the five stages

Stage I: reviewing existing interpretive vehicles:

- Interpretive vehicles:
    - ♦ Signs
    - ♦ Brochures
    - ♦ Live: Garden Guides, Discovery Carts
- Other Gardens' Interpretive Plans.

Stage II: developing interpretive content:

- Brooklyn Botanic Garden:
    - ♦ Our reviewed mission
    - ♦ Discussion and selection of the 'Big Idea':
        - o The Big Idea is the primary theme or message that we want visitors to come to understand from their visit(s) to Brooklyn. From this Big Idea we developed sub-themes and we will eventually develop interpretive vehicles to get these themes across to the public.
        - o The Big Idea we wish to convey is: 'Plants are essential to life'.
- Living Collection (Interpretive Units)

- ♦ Discussion of ed all Units with appropriate staff
- ♦ Developing unifying Themes and Sub-themes
- ♦ Assigning and prioritizing Themes to Units, see *Matrix* (Fig 1)
- ♦ Discussing communication goals
- ♦ Discussing messages
- ♦ All the information obtained was then synthesized into a single document, with the following format:

  1. Discussion: A description of garden/interpretive units their unique characteristics, design concepts, special historical context and botanical features

  2. Primary Interpretive Theme: Themes that support the Big Idea

  3. Communication Goals: What are we actually trying to tell the visitor?

  4. Messages: How are we saying it?

  5. Interpretive Vehicles: What are we using to deliver the message?

Stage III: Determining interpretive vehicles

Assigning appropriate vehicles to the interpretive units and connecting similar themes, see *Matrix II* (Fig 2)

Stage IV: Develop interpretive prototypes

- Interpretive: identification, plant labels, communication goals, brochures, exhibits and others
- Directional and regulatory: orientation, direction and way-finding, regulation and temporary
- Other languages and use of symbols.

Stage V: Assigning responsibilities, developing guidelines and designating priorities.

Summary and observations

Only a few of the 34 Congress Workshop participants had already developed an Interpretive Master Program, but most were interested in developing one for their gardens. There seems to be a need to organize interpretation goals and methods to ensure that the desired messages are communicated to the public. The question of including stakeholders in the process was discussed. While at some gardens they were included in the whole process, Brooklyn has chosen to perhaps include the stakeholders in the interpretive prototype stage. For most of the Workshop, participants worked in groups to discuss and develop their own 'document' for the Brooklyn Garden's Japanese Hill-and-Pond Garden, after a presentation of slides, photos and a video.

Each group presented their ideas and generally most concepts and themes were similar to Brooklyn's, although more community involvement was suggested. There are as many types of interpretive master plan processes as there are gardens. A garden should investigate many current Interpretive Master Plans and develop their own process to suit their own garden's particular needs and goals.

Figure 1 Matrix of themes and units

THE MATRIX		Plants are Essential															Other Concepts		
		Commodities				Human Society						Ecological Services							
		Food	Medicine	Fiber	Other	BBG History	HumanHistory	Culture	Spiritual Development	Urban Life	Aesthetics	Air	Soil	Water	Animal Habitat	Climate	Conser-vation	Geology	BBG Programs
Outdoor Gardens	Osborne Garden					x		x			x	x				x			
	Native Flora Garden	x	x	x		xx	Xx	x	x	X		x	x	x	x	x	x		NYMF
	Spencer Lilac Collection				Fragrance			x			x								
	Overlook								x	X	x								
	Cranford Rose Garden		x		Fragrance	xx	Xx	x			x				x		x		Publ. Prog./AARS Display
	Herb Garden	xx	xx	xx	Fragrance	x	Xx	x	x	X	x								
	Fragrance Garden	x			Fragrance/Sensory	xx		x		X	x								
	Shakespeare Garden	x	x				X	x		X	x								
	Cherry Esplanade					x		x	x	X	x								Publ. Prog.
	Cherry (*Prunus*) Collection										x						x		Cherry Watch
	Japanese Hill-and-Pond Garden					xx		x	x		x			x	x	x	x		Publ. Prog./Ed.
	Magnolia Plaza				Fragrance	xx					x						x		
	Lily Pools							x		X	x			x	x				
	Annual Borders									X	x								Botany/Life Cycles
	Perennial Borders										x				x				Botany/Life Cycles
	Plant Family Collection	x		x		xx	Xx			X	x			x	x		x		Taxonomy/Ed.
	Rock Garden					xx		x			x			x				x	
	Peony and Iris Garden					x					x								
Conservatory	Entry House/Trail of Evolution	x		x		xx					x	x	x	x	x	x		x	Ed./Science
	Bonsai Museum					xx		x	x		x						x		Ed.
	Indoor Aquatic House	x	x	x	x	x		x	x		x	x	x	x	x	x	x		Ed.
	Desert Pavilion	x	xx	x				x			x	x	x	x	x	x	x		Ed.
	Tropical Pavilion	xx	xx	xx	Rubber			x			x	x	x	x	x	x	x		Ed./Publ. Prog.
	Warm Temperate Pavilion	xx	x	x				x	x		x	x	x	x	x	x	x		Ed.
Other	Amazing Plants Exhibit							x		X									Family Prog.
	Compost Exhibit									X			x		x		x		Composting
	Children's Garden/Raised Planters	xx	x	x	Fragrance	xx	X	x	x	X	x	x	x	x	x	x	x		CG
	Discovery Garden				Sensory			x	x	X	x	x	x	x	x	x	x		Family Prog.
Nonliving Collections	Visitor Center																		
	Buildings																		
	Art/Statuary																		
	GRC/Library																		

Figure 2 Matrix of interpretative units and connecting themes

The Matrix II		Onsite										Take-Home			Offsite			
		Visitor Center Exhibit	Orientation Maps	Plant Labels	Signs	Exhibits	Interactive Displays	Live	Audio Tours	Suitcase Kits	Other	Brochures & Trail Maps	Kids' Activity Guides	Other	Website	Publica-tions	Media Message	Other
PLsANTS ARE ESSENTIAL	**COMMODITIES**																	
	Food	x	x	Xx	xx	x	X	x	x		Disco. Cart	x	x		x	x		
	Medicine	x	x	Xx	xx	x		x	x			x			x	?		
	Fiber	x	x	x	x	xx	X	x	x	x	Disco. Cart	x	x		x	x		
	Horticulture	x	x			xx									x	x		
	Fragrance	x	x	x	x	x	Xx	xx	x	x	Disco. Cart	x	x-potpourri		x	x		
	HUMAN SOCIETY																	
	Human History	x			x	xx		x	xx			x	x		x			
	Culture *	x		x	x	x	x	x	xx	x	Disco. Cart	x	x		x	x		
	Spiritual Development	x			x-Liberty Oaks	x		x										
	Urban Life **	x			x	x	x-Compost/ Amaz. Plts.			xx	Classes	x	xx		x	x	x	
	Aesthetics--Garden Design	x	xx- photo spots		xx	xx	x	xx	xx	x-?	Disco. Cart	x	x		x	x		
	ECOLOGICAL SERVICES																	
	Air	xx			x			x				x			x			
	Soil	x	x-compost disp.		x	xx	x-mulch, compost	x				x	x		x	x		
	Water ***	x			xx	xx	x	x				x			x	x		
	Animal Habitat	x	x		x	x		x	x	xx		xx	x		x	x	x	
	Pollution Mitigation	x			x	xx						x	x		x			
	Climate	x			x	x	xx	x				x	x		x			
	OTHER CONCEPTS																	
	Plant Conservation	x			xx	x		x	x			xx			x	x		
	Geology					x						xx			x			
	BBG History	xx			x	x		x	x			x			xx	x	x	
	BBG Programs																	
	Plant Communities	x	x		xx	xx		x	x	x		x	x		x	x	x	

* We defined Culture as 1) the integral role of Gardens in culture, 2) gardens that were designed to reflect a culture, and 3) Gardens as reflecting cultural values

** Urban Life is 1) demonstrate how plants can affect the urban environment, 2) demonstrate how plants can be used by urban people

*** Would like to interpret water cycling in the future, when we do water cycling with the Japanese Pond/Stream/Terminal Pond system.

Multiculturalism and indigenous issues in interpretation

John Lennis

Royal Botanic Gardens Sydney, New South Wales, Australia

Fig 1 Aboriginal painting

I am a Dharawal man, and for those that do not know the Dharawal people, we live around Botany Bay, along the Georges River, south through the Picton–Illawarra escarpment of the Sydney basin. I too would like to acknowledge and pay my respects to the ancestors of the Cadigal people, whose land we are on here today.

Cadi'ngun buriguru, birrung wedao'miya
Kamawi maruwan,
Ngaranga nadunga, kamawi ngurang
Gamiri Cadi'gul ngurang
Walama miya'gul
Nula yan'del jam'baru

which translates to:

We the descendants of Cadi, welcome you
Who come from across the seas
From across the mountains, and from other lands
To our traditional lands,
And hope that you return to your own lands
In peace and safety.

This paper is about multiculturalism and indigenous issues in interpretation.

Multiculturalism

Fig 2 Multicultural Australia

What is multiculturalism? Multiculturalism is described in the web version of the *Columbia Encyclopedia* (www.encyclopedia.com) as "Multiculturalism or cultural pluralism, a term describing the co-existence of many cultures in a locality, without any one culture dominating the region. By making the broadest range of human differences acceptable to the largest number of people, multiculturalism seeks to overcome racism, sexism, and other forms of discrimination."

Let us look at that definition. Australia has always been a multicultural country. To appreciate the cultural diversity of Aboriginal people we will need to look at how Australia was before the British invasion, colonisation or settlement – the choice of words depends on how you look at the history of Australia in 1788.

Indigenous Australia

Fig 3 Aboriginal Australian countries

This map shows that over 400 different Aboriginal countries existed prior to this time. This might surprise some people!

In each of these countries the people had their different cultural beliefs in the 'Creation', their ceremonies, as we have in the modern multicultural Australia. An initiation ceremony, for example, can be compared to the baptisms which are held in Australian society today.

Cultural beliefs

Fig 4 Australian cultural monument

Australia as we look at it now is one of the greatest multicultural counties of the world – but it always has been. Notwithstanding the effects of invasion, colonisation or settlement, Aboriginal cultural diversity remains throughout Australia.

Fig 5 Aboriginal culture: rock painting

Due to the fact that Aboriginal history was not a written history, but a verbal history, it has to be reclaimed and identified. Aboriginal culture interconnects all aspects of a person's spiritual and cultural life: their place in kinship networks, roles in ceremonies and rituals and things such as sites, stories and hunting and gathering places, and the proper use of natural resources in relationship to country. Also, the spirits of the land make up what is called 'culture'. Understanding this aspect alone leads one to an understanding of indigenous culture.

Fig 6 Aboriginal culture: shell midden

The correct interpretation of these various Aboriginal beliefs must come from the 'source' of the culture, which is held as knowledge within the various communities.

Fig 7 Australian environment: plants

Community knowledge embraces their art, their landscape and environment, their local plants and their uses, their stories. This allows them to reclaim their 'rights to their culture'.

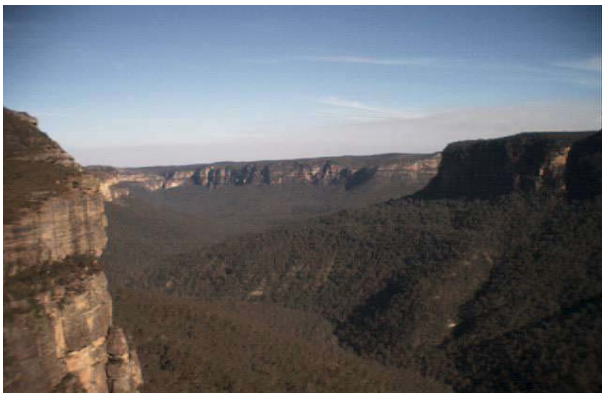


Fig 8 Australian environment: landscape

Aboriginal people have always asserted a right to continue to have their cultural rights and responsibilities recognised.

Fig 9 Cultural interpretation sites: botanic gardens

Fig 10 Cultural interpretation sites: museum

Where can this culture be interpreted? It can be done in many places, such as botanic gardens, art galleries, museums, or in the natural environment, as long as the source of *what* is being translated comes from the local community, because they 'own' their stories. If you look at indigenous cultural beliefs then you must also embrace the 'spiritual' connections as well.

Fig 11 Methods of interpretation: artworks in landscape

By assembling brochures and designing appropriate signage for self-guided tours, interpretive artwork, integrated with the landscape, can also show *how* this knowledge can be interpreted, as long as the community has input.

Fig 12 Methods of interpretation: botanic garden signage

Also, consider the composition of guided tours of a particular area of cultural interest. This is part of an ongoing education process, to get the facts from the "source of the knowledge" and only those parts, which are to "be known about", are talked about because some knowledge is only to be held by a particular person, in their culture. They take this from their spiritual beliefs.

Fig 13 Education in a botanic garden

Why are we doing this interpretation? This is an important question. The answer is, for education; this is the source of empowerment for the indigenous people of any country.

Fig 14 Re-education in a botanic garden

Through talking to school groups and addressing public forums and general public tours we are able to get through to a large percentage of the population and re-educate them. This corrected view of indigenous culture as part of the whole picture of the history of the country is then carried forward.

If we look at the indigenous history of Australia, did you know that prior to 1967 indigenous Australians were not even classed as citizens of this country – they were covered by the Flora and Fauna Act? That meant for me that I was fifteen years of age before I became a citizen of my own country?

Until that time, the truth was not revealed in the education process. Aboriginal history was just NOT talked about. Now that it is in the public domain a great deal of interest is being generated … not only amongst the young; a lot of older Australians are asking to be told the truth.

The successful application of all of the above will lead us into the most important issue of all: proper indigenous interpretation. That is, who is to do the interpretation and claim intellectual property rights.

Property rights and copyright laws cover the authors of a book or an artist or songwriters; indigenous peoples cannot claim their intellectual property rights under this system.

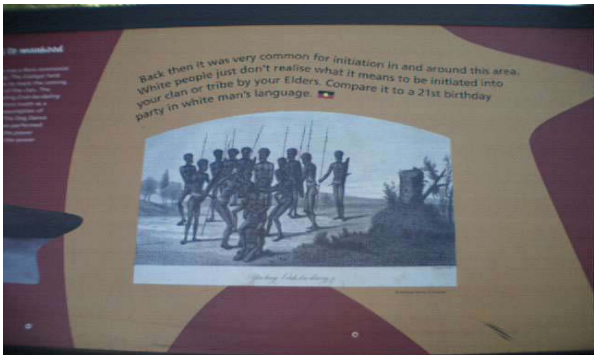


Fig 15 Initiation ceremony

To claim their rights they need to claim the ownership of the interpretation that is being done.

As one example, exploitation has already occurred in the area of the patenting of natural plant remedies originally taken from the local communities and then commercially developed. In most cases, none of the benefits of development were returned the originating communities or the source of the remedies even acknowledged.

Multicultural indigenous Australians strongly believe that the only true way to represent their culture is through 'indigenous eyes' This means that indigenous people must be engaged in all aspects of any indigenous interpretation which is done, throughout the planning, development and the implementation of an interpretation project. In any ongoing work the local indigenous community must have ownership of the cultural knowledge of what is being interpreted.

Fig 16 Cultural ownership

For example, those who are conducting tours must employ indigenous people. Would you have a rabbi conduct a baptism in a Christian church? This would be considered to be culturally inappropriate in the modern multi-cultural society of today.

So why not empower the local indigenous community to teach us their culture.

'This Dome is Your Home': using an icon facility to teach education for sustainability

Jan Ellis

Brisbane Botanic Gardens Mount Coot-tha, Brisbane, Australia

Botanic gardens are important centres for education. There are over 1,600 in the world, which between them maintain the largest collection of plants outside nature. Botanic gardens as members of the Botanic Gardens Conservation International have aligned themselves with major international strategies for biodiversity conservation and sustainable development; therefore the environmental education role of botanic gardens is significant, with over 600 million visitors worldwide every year (Murray 2000).

Botanic gardens are uniquely placed to provide learning experiences that encourage all members of the community to personally embrace the concept of living sustainably and, in particular, to recognise our dependence upon plants. Plants are the basis of all life on Earth. Plants touch every area of our lives, providing us with commodities such as food, shelter, energy, medicine, clothes, and oxygen. Botanic gardens are not just an amazing educational resource persuading us to protect plants, but they provide a place in which one can actually make contact with nature. This connection with nature, also known as education *in* the environment (Fien 1993) is an important step in educating people to care for nature. This concept is incorporated into 'connectedness to the world', one of the major strategies within the Education Queensland Curriculum (Herschell 2001).

The Brisbane Botanic Gardens at Mount Coot-tha provides a valuable outdoor learning experience for school excursions that complements and integrates Education Queensland curricula by participation in one of our 90-minute *Lessons in the Gardens* programmes. 'Biosphere 3: This Dome is your Home' is one of our programmes available for pupils aged 9–16 years that encourages investigating, understanding and communication (working scientifically) about education for sustainability. The 90-minute programme is supported with both pre and post-visit activities.

Within Biosphere 3 (years 4–7) students relate the Dome's closed ecosystem to the Earth's biosphere. They consider what resources they might require and actions they would have to take if the Dome were their life-support system. Students in years 8–10 use the Dome as an example of a miniature ecosystem. They measure significant abiotic factors and use information to evaluate the consequences of interactions on natural cycles and environmental sustainability on both local and global scales. A brief outline of 'Biosphere 3: This Dome is Your Home' for pupils aged 9–12 years is included below.

Biosphere 1

The biosphere is the thin shell that supports life on Earth. It comprises the living layer covering the surface of the Earth, from the deepest ocean to up to the rarified air. The natural systems in the biosphere are complex, self-regulating and interconnected. Physical cycles continually recycle energy and matter, making it possible to sustain a diverse range of living things. Within different ecosystems, multitudes of interdependent organisms flourish. This biodiversity results in a resilient natural system.

Biosphere 2

Biosphere 2 is a giant experimental glasshouse in the Arizona desert. It covers an area of 1.3 ha and contains five wilderness areas or miniature ecosystems (rainforest, savannah, ocean, marshland, and an arid zone) each with a range of animals and plants. There is also a habitat area as well as an agricultural area for cultivating food plants and domestic animals (e.g. chickens, goats, tilapia fish). The aim of this experiment was to increase our understanding of the processes that occur in Biosphere 1 – the Earth – and to try to establish a sustainable system.

Using a space–frame construction and made from glass and steel, Biosphere 2 is sealed so tightly that it loses only 10% of its atmosphere per year – an ordinary office block exchanges its atmosphere with the outside world about 16 times a day.

In September 1991 eight volunteers, four women and four men, who had undergone three years' intensive training, were sealed inside Biosphere 2 for two years. All air, water and waste had to be recycled and all food had to be produced within the Biosphere structure. It was however open to energy inputs and information exchange. Sunlight provided the basic energy for photosynthesis and natural gas-powered generators provided the electrical energy for the technical systems.

Mechanical devices were included to perform some functions that occur naturally on Earth, such as pumps and fans for air movement, a wave machine in the ocean and computer-controlled sprinkler systems for rainfall. Over 2000 sensors took continual readings of a range of factors such as temperature and humidity. Some 3800 different sorts of plants and animals were selected for Biosphere 2; each had to justify its inclusion by performing a useful function.

The volunteers spent approximately four hours per day in activities involved with food production and four hours undertaking scientific observations and experiments. The sealed experiment ended in 1993 but the Biosphere continues to be used for further studies.

Biosphere 3: this dome is your home

Rationale and objectives

Students will use the Tropical Dome at Mount Coot-tha Gardens as an example of a miniature planet Earth in which to explore essential life processes and our relationship with (and dependence on) our environment.

Students will have the opportunity to develop:

- an awareness of the value of botanic gardens;
- an understanding of the needs of living organisms, particularly people;
- an appreciation of complex scientific experiments;
- observation and data collection skills;
- problem-solving skills;
- an awareness of our impact on our environment and the importance of sustainability.

Elements of the programme

The programme session begins by discussing people's needs and how our environment supplies them.

The Tropical Dome is introduced to students as a possible Biosphere 3. It is however an area designed for the display of rainforest plants and not as an ecological system. Students investigate the environment and compare its structure and processes with natural ecosystems. With this understanding they discuss possible ways in which the Dome may be modified to form a sustainable environment. The students then consider human influences on the environment and the likely long-term effects on Biosphere 1 – Planet Earth.

The youth of today need to embrace sustainable living and the world ethic of sustainability (IUCN, UNEP and WWF 1990-1991); not just in their heads (as knowledge) but within their hearts (involving passion and caring) and hands (actions). 'Biosphere 3: This Dome is your Home' is an effective learning experience in which this can take place in a non-threatening manner, as they take part in a role play, in which the Brisbane Botanic Gardens icon becomes their spaceship as they leave Planet Earth to colonise Planet X.

They have learnt about how fragile and complex Planet Earth is, they have identified with the story of Biosphere 2 and how those participants became reconnected with their environment as 'everything they did had an influence'; such a cause-and-effect relationship is not as obvious in Biosphere 1. Biosphere 3 provides them with an encounter with plants and their environment that is unsustainable (it is hot and humid

within the Dome) and leaves them with a challenge to live sustainably – caring for nature and caring for people.

References

Fien, J. (1993). *Education for the environment: critical curriculum theorising and environmental education*. Deakin University, Geelong, Australia.

Herschell, P. (2001). Why aligning curriculum and assessment in new times is ultimately a pedagogy question. *The Queensland science teacher* (27) 5. Science Teachers Association of Queensland.

IUCN, UNEP WWF (1990-1991). *Caring for the earth: a strategy for sustainable living*. IUCN, Gland, Switzerland.

Murray, R. (2000). *Launch into the future 'The Dome is Your Home'. Workshop Notes* May 2000, Botanic Gardens Mt. Coot-tha, Brisbane, Australia. Unpublished.

Developing a conservation garden as a centre for the 'Every child a scientist' programme

N. Anil Kumar & V. P. Sajeev

M S Swaminathan Research Foundation, Wayanad, Kerala, India

Introduction

Article 13 of the *Convention on Biological Diversity* (CBD) emphasizes the need for public education and awareness about the importance of, and the measures required for the conservation of, biological diversity. The use of and the inclusion of biodiversity topics in educational curricula have also been highlighted. The *Global Biodiversity Strategy* (WRI IUCN, UNEP 1992) suggests the development of national biodiversity curricula to focus contributions to community food, health and livelihood welfare. These should be developed in partnership with teachers, NGOs and national ministries of education and the environment. However, even a decade after the adoption of the CBD, biodiversity education remains a challenge in several developing countries. As a result students and teachers are loosing opportunities to understand the significance of their surrounding biotic world and its various ecological, economical, physical and cultural manifestations. In India in recent years, both government and non-government agencies have made several attempts to reach directly through formal and informal approaches. While this is important, education should not be limited to school-going children alone, though they are an important audience.

At Wayanad, an agrobiodiversity hot spot situated in the Western Ghats in Kerala, India, the M S Swaminathan Research Foundation (MSSRF) has given high priority to educating tribal and rural children and youth to understand the biodiversity of this region, and to help them to become the catalysts of a community agrobiodiversity movement. The tribal and rural communities of this district retained their traditions intact until the recent past and still use a large number of species for their health and food security. Unfortunately, several such species, as well as the traditions of their use, are facing serious threats. The fundamental cause of the loss of such knowledge and the depletion of biological resources is the ignorance of the public about the value of the local natural heritage and its application in human life. The younger generation of the tribal communities and other such disadvantaged sections of society have few opportunities to gather such knowledge. Hence it is essential to create opportunities for them to understand the importance and value of biodiversity and their own conservation traditions.

MSSRF initiated a biodiversity education programme in January 2002, targeting tribal and rural school dropouts of Wayanad. Five years ago the Institution had conceptualized and developed a community-level institution known as the 'Community Agrobiodiversity Centre' (CAbC), primarily to build the capacities of village men and women through education and empowerment to use resources in a sustainable and equitable manner. The Centre has collected and collated a large amount of information on biodiversity and several hundreds of plant species of the region. This has now resulted in the establishment of a Biodiversity Knowledge Centre (BKC) with a Conservation Garden as its focal point. The Centre is designed to facilitate education and training for children and the free flow of qualitative and quantitative information on biodiversity to potential user groups.

The process

An integrated approach to education combining traditional and modern methods of teaching has been adopted for teaching children. The education course is planned for a year, classes being held for four hours a day in two sessions – from 9.30am to 11.30 am and 2 pm to 4 pm. The current strength of the student group is 100 (6 groups consisting of 17 students each), comprising 53 tribal and 47 non-tribal children. They are divided into several groups; each group consists of 5–15 members depending on the nature of project work. Field visits are scheduled for 2 days a month (totalling 24 days in a year) and nature camps once every three months.

Identification and selection of students

The first step was to identify potential students who have an interest in learning and helping to protect biodiversity. Children (school-going and drop-outs), educated unemployed youth, teachers (in-service and pre-service) and parents are the target groups of the programme. Children in the age-group 10–16 and youths below 35 years were selected in groups of 6–10 from villages and schools with the help of local leaders,

NGOs, youth clubs and village panchayats. Care was given to select students belonging to both genders in equal numbers. Youths were recruited from youth clubs that have a stake in various social activities and experience in literacy programmes. The children and youths were invited for a two-day orientation workshop to familiarize them with the concept of biodiversity conservation and its application in enhancing livelihood security and sustainable development. Experts from MSSRF and other institutions interacted with the workshop participants and conducted a field trip in 3–4 groups to nearby hills. This was followed by visits to their respective villages and schools to interact with their parents and teachers. The visits often led to joint field visits along with the children and their family members to see various biotic resources available in the locality and the manner in which they are being used. Through this approach, we have been able to identify those who have an interest and commitment to function as ambassadors of biodiversity conservation.

The resource team and resource materials

An Education Committee consisting of 10 experts has been formed under the leadership of a veteran biodiversity educationist in Kerala. Members of the resource team were drawn from different disciplines: wildlife, ecology, plant taxonomy, ornithology, horticulture and agriculture. In addition, volunteers of the Agrobiodiversity Conservation Corps (ACC), who had been trained earlier by MSSRF, extended their help in conducting field trips and introducing the children to the other stakeholders. Some traditional healers were also involved in educating children about the medicinal uses of various herbs known to them. Printed materials like magazines, booklets, and posters are being developed about different issues such as conservation of medicinal plants, endangered plants, wild food species and wild relatives of crop plants. A newsletter named *Vayal* (the vernacular name for paddy fields) has been launched to network with other partners in the region.

Curriculum development

A detailed curriculum has been developed with the aim of enabling children and neo-literates to increase their capacity for observation and to develop positive attitudes towards biodiversity conservation. Effective applications of computers in possible areas have been visualized and applied. Basic education on biodiversity, soil, air, water, rivers, mountains and their relation to subjects like biology, geography and economics has been built in the syllabus. Education through simple project works has been emphasised, in order to enable children to enhance their capacity as well as to increase and sustain their wonder and awe about the living world.

Establishment of a conservation garden

MSSRF has a living collection of many plant species of the Wayanad region. Our orchidarium contains over 150 species of wild orchids, and our arboretum contains several rare native trees, wild food plant species, and host plants of butterflies and medicinal plants, which are a major attraction for visitors. A herbarium and a seed museum have been added. Another key attraction of the Centre is the collection of 200 germplasm accessions belonging to 25 taxa of *Dioscorea*.

Shade houses, plant growth chambers and plant nurseries are placed aesthetically in the campus. The Knowledge Centre is equipped with 20 computers and accessories such as digital cameras, and scanners. Children are taught how to use of these pieces of equipment in their activities.

Education and training

Computers are used to document various outputs of projects being implemented. Using Microsoft Word and Excel, various documents have been created, such as descriptions of medicinal plants uses, articles about pollution and the environment, and field-work reports. A daily nature watch diary is maintained by each child: they enter data into an Excel worksheet for sunrise and sunset times, the number of birds and animals sighted during a particular season, and star and climate observations, and so on. A small database containing basic details about plants is under construction using Microsoft Access. Children have found PowerPoint very interesting, as they have opportunities to create slide-shows with text, photos and sound insertions. By the end of the course, it is hoped that children will know the basics of: Windows, Microsoft Word, Microsoft Excel, Microsoft PowerPoint, Microsoft Access, Microsoft Front Page and Kid Pix Studio. In addition, students are becoming efficient at handling audio-visual equipment such as televisions, video recorders, LCDs and overhead slide projectors and tape recorders. Voice recording, scanning and photography are regular part of their activities.

Plant exploration programme

Students were formed into groups and sent along with volunteers to various landscapes in the locality to observe and collect the plant species during different seasons. They are given specially designed workbooks in which they list the plants they observe by citing local names, describing the details of their habit, habitat and uses. Later, an expert examines these names and the collected material and provides the corresponding botanical names, which are then recorded by students in their notebooks. They are asked to analyze the number of species collected, their habitats and their various life forms: trees, herbs, shrubs and climbers. In addition, students are trained to prepare herbarium specimens of the more important species.

Plant morphological studies

Species belonging to the pea, mint and grass families are collected and observed. For each plant, parts are noted and the characteristics of different plant parts compared with that of other species. The importance of the above three families were highlighted in terms of their contribution to food, health and economic security. Students have been given assignments to collect details of all grass plants they gather for the purposes of fodder and for making crafts.

Ethnobotanical studies

Detailed cultural and ethnobotanical studies of 14 tree species that are sacred to the native communities has been carried out by the students. They have been given the task of collecting all available information about the species from primary and secondary sources. Children are given training to raise nurseries of these species for the purpose of planting in the school, college and temple grounds. Students are also encouraged to chronicle the uses of various plants, especially those used as food known to the elders of their family. A study by MSSRF shows that about 250 wild food species supplement the regular diet of the tribal communities of Wayanad. The forest dwelling communities depend heavily on wild foods such as yams, roots and tubers, greens, fruits and the meat of a wide range of animals. Study is focused on groups such as palms and fruit trees (with emphasis on mangoes and jack-fruit).

Genetic diversity is taught by highlighting the variability within each species.

Horticultural studies

It is planned to educate children and youth about the need for home gardens containing vegetables, roots and tubers, fruit plants and plants of medicinal and aromatic value. Such a garden has been developed on the campus of CAbC, with many kinds of legumes, cucurbits, amaranths, banana varieties, *Dioscorea*, medicinal plants and wild edible greens. Parents and girl children collect vegetable seeds from their respective villages and promote their cultivation by sharing the seeds with others. They are also asked to participate in seed fairs with their collections. Children were given seeds of some common food plants (legumes, rice and mango) and asked to observe and record different stages of germination. They have also given different fruits and asked to make cross-sections of them to understand the internal arrangement of seeds.

Fungi and algae studies

Mushrooms are an important source of food for several tribal communities. CAbC scientists have details of 33 such mushroom species. Tribal children are given opportunities to bring such species and observe their different parts and spores under the microscopes. The importance of keeping spore prints for the purpose of conservation has been highlighted. They draw pictures of several such species on computers. The importance of micro-floral studies in understanding the magnitude of biodiversity is being emphasized. Students collect water drops, rotten materials and use microscopes to observe and draw the different algae and fungi species living in them.

Habitat studies

The diversity of ecosystems, habitats, and landscapes has been emphasised in the curriculum. The role that landscapes such as paddy fields, swamps, grasslands and bamboo breaks play in daily life has been highlighted. The manner in which these landscapes are useful in maintaining the food diversity and water security of communities is also emphasized. Students are asked to observe plant and animal diversity in each habitat type and make notes in consultation with their parents.

Bird and butterfly watching

Most of the tribal children are familiar with birds, as they often trap different bird species to meet their food needs. Students are being trained to systematically observe birds known to them, record their sounds, food habits, breeding habits etc. Students have started butterfly watching by listing out the host-plants of

butterflies. The food plants used by several tribal communities have been given importance in this programme. It is important to note that tribal groups also consume several plant species which are hosts to butterflies. A total of 23 such species have been selected for a detailed study. Students have been formed into small groups and have started collecting such species. They have grown several of them in the campus as well as at home. They are being taught to observe the life-cycle pattern of butterflies.

Freshwater fish study

The tribal men and women of Wayanad know about 60 species of edible freshwater fish. Several such fish species are now becoming rare because of the drying-up of bodies of water and changes in patterns of land use. The children will be trained to observe such species in detail. For this purpose, some aquariums have been constructed in the campus.

Craftwork and leadership training

Craftwork has been included in the curriculum, in order to mould and enhance the creativity of children. It is envisaged that students will make models of different fruits, seeds, animal types and so on, using waste, clay and pulp. Leadership training is also envisaged, as most of the tribal children interact weakly with others. In order to improve their confidence and develop their leadership skills, a programme of yoga as well as leadership training courses have been incorporated into the curriculum.

Nature camps

Every three months the entire team of children has to attend a 2-day nature education camp. Two such camps have already been conducted, in which parents, teachers and Agrobiodiversity Conservation Corps members participated. Camp activities included star watching, trekking, bird watching, and butterfly watching. The progress of the programme is also reviewed during the camp.

Conclusions

Experience show s that children are a very receptive group, and a that variety of customized programmes are required to make them understand the value and importance of biodiversity in their day-to-day life. In Wayanad children, by and large, know little about the magnitude of the rich biodiversity of the region or its contributions to their welfare. It has also become evident that tribal and rural children, in spite of living in and around diverse resources, find it difficult to conserve this diversity, since their survival is often a daily issue. Most of the tribal children do not have access to schools or do not attend regularly. The relevance of education, awareness and training to such children in this context is important; it can lead to children, youth, teachers and parents getting involved in the protection and maintenance of genetic wealth. Such a committed team can also be brought in to inventory the natural diversity around them and chronicle the knowledge of their elders about biological resources. The results of such exercises can be recorded in the form of Biodiversity Registers; these would be very valuable in recognizing and rewarding the contributions of tribal and rural people to bioresource conservation (Gadgil *et al* 1993).

In this context, Biodiversity Knowledge Centres can become an important facility for teaching children about a wide range of subjects such as biodiversity, the environment, and various aspects of biology. It is hoped that the trained students and youth will be formed into a 'Bioresource Conservation Corps' and will mobilize the masses with practical information about the bioresources of their respective villages.

Reference

Gadgil M., Berkes F. and Folke C. (1993). *Indigenous knowledge for biodiversity conservation.* AMBIO 22:151.

World Resources Institute *et al*. (1992). *Global biodiversity strategy: guidelines for action to save, study and use Earth's biotic wealth sustainably and equitably*. World Resources Institute, Washington DC, USA.

Everyday choices: making sustainability accessible to visitors

Chris Millican

National Botanic Garden of Wales, Carmarthenshire, Wales[1]

The National Botanic Garden of Wales opened on 24th May 2000, and has welcomed over 500,000 visitors, including over 30,000 learners to the education programmes, in the period up to September 2002. As the first new national botanic garden to be built in the United Kingdom for over 200 years we want our visitors to learn more about plants, to understand the importance of biodiversity and to recognise that living sustainably is critical for the future of life on Earth. Visitors are able to see some of the principles of sustainability in action in the design and day to day operations of the Garden.

All of our schools programmes are linked into the Welsh National Curriculum. Recently there has been a focus on sustainability, with statements included in the Science, Geography and Personal and Social Education criteria. The National Assembly for Wales has published a strategy for education for sustainability called *Learning to Live Differently*, and it is committed to translating these principles from vision into reality.

This Congress workshop was based on the schools programme "Everyday Choices", looking at the choices we have made in designing and running the Garden, and encouraging students to examine the choices they make in their own lives. There were 3 main aims of the workshop:

- To consider how the principles of sustainability can be communicated to visitors through the design and day-to-day workings of the botanic garden
- To develop ideas about how to involve pupils in debate and decision making
- To experience a hands-on activity using solar power.

Everyday choices – a virtual tour

A slide show summarised the main points of the tour around the Garden, dealing specifically with issues of sustainability, including:

- The collection and reuse of rainwater, through innovative building design, particularly roof shape
- The use of passive solar heating in the Great Glasshouse (shape and orientation) and Double Walled Garden (orientation and radiation of heat from brick and stone walls)
- Using biomass as fuel to heat the glasshouses and many visitor facilities. The wood is harvested from the site and commercially grown in the local area, and a demonstration biomass plantation is planned in the Garden
- Sewage treatment through reed-bed technology in the Living Machine.
- Biological pest-control in the Great Glasshouse and nursery glasshouses
- Demonstration solar panel and wind-turbine, powering fountains in the Energy Zone. The height of the fountain height gives instant feedback about the energy being used
- Raising visitor awareness of complex issues such as biodiversity and species under threat, for example by using the sculpture called "Thirty three thousand seven hundred and ninety eight" – the number of endangered plant species worldwide when the Garden opened.

[1] Now at Field Studies Council, Orielton Field Centre, Pembroke, Wales, UK

Why not build it there?

Participants tried out and discussed a role-play activity and resource pack about the siting of a new out-of-town shopping centre. Within small groups, pupils took the roles of developers, local residents and council environment and planning department workers, deciding what their views are likely to be and what would be the best outcome. This activity pack had previously been used with primary pupils in schools on 'environment days', and with teachers who wanted to develop student awareness back in the classroom. An alternative version of this activity for older pupils is about the building of new housing on a waterfront site; maps, information about species protected by European legislation and local council planning regulations are provided to facilitate discussion.

I do and I remember: building a solar-powered model

Although most pupils have heard of electricity generated from solar power, few have any real understanding of this concept. Using commercially-produced kits, workshop participants built and operated a solar-powered zoetrope (a spinning cylinder which gives a visual impression of running animals; it was popular in Victorian times). This activity had previously been used with primary pupils during a programme of Science Week activities; it included constructing the cylinder, wiring the solar panel to the cylinder motor and then taking it outside into the sunshine to see it spin!

Summary of key findings from this workshop

1. Sustainability is a complex issue and there are no easy answers to the problem of communicating it. We should employ a variety of ways to communicate our messages.
2. It is not a subject you can completely deal with in one session; it can be revisited in many different contexts.
3. Role play is a good technique to help students to express their opinions.
4. A botanic garden gives strong messages about sustainability in the way it is built and operates as well as what it says.
5. Hands-on activities help students to understand difficult or abstract concepts and to make learning fun.

Planting the Earth: teaching youth by teaching their teachers

Barbara Kushner-Kurland

Brooklyn Botanic Garden, New York City, New York, USA

Growing questions: a model workshop

Growing Questions is one of the workshop sessions included in an in-service course for teachers called 'What Did a Plant Ever Do for You?' offered at the Brooklyn Botanic Garden. This lesson was chosen for the 'Linking Science with Sustainability' theme of this Congress because for our children in New York City, and for their teachers, understanding where their food comes from is an entry point for engaging their inquiry into plant life and plant ecology. Brooklyn Botanic Garden is located in the heart of one of the most densely populated boroughs of New York City; since its earliest development it has been surrounded by residential and commercial neighborhoods. For many of the children and their teachers with whom we share the Garden, we are the only green space that is open and accessible for learning about a wide variety of plants and the natural world. For many of our visitors, our Garden provides their only opportunity to see lettuce and tomatoes, roses and lilies developing on the plants that bear them, as opposed to seeing them in bins in a market or bundled with paper at the florist shop

The workshop sessions that teachers have followed before 'Growing Questions' are 'Starting with Seeds' and 'Seeds Grow Into…'; these involve hands-on exploration of seed structure and germination and reviewing plant parts and their functions, using edible plants bought in a shop as examples. Teachers therefore have some familiarity with germination requirements and a beginning understanding of how plants are designed, but have not yet begun to think about plants in the context of how the particular environmental factors common to our region affect their growth and life cycles

Our workshop begins with a challenge to our teachers: if you had only the food that you could grow yourself in New York City to depend on, what would you grow, how would you grow it, and when would you plant, tend and reap your harvest? Of course, this challenge had to be met by early European and African settlers of our part of North America; there were no markets and there were no shops when they got off the ships that brought them here. The peoples native to our area who met the settlers were hunters, gatherers, farmers, and fishermen depending upon their culture and the natural resources available to where they lived. How different is the challenge of growing food in Brooklyn today from growing it during our colonial period 300 years ago? What are the factors that guide all farmers in their cultivation of the crops that sustain human settlement?

Goals and Objectives of Growing Questions Workshop

- Identify the climatic and environmental factors that affect or limit plant growth in New York City
- Become familiar with reference sources (catalogues, books, maps, websites) that gardeners and farmers use as guides to plan viable, sustainable gardens
- Compare various climatic zones in different parts of the United States, Canada, and Mexico (the parts of North America included on the United States Department of Agriculture's *USDA Plant Hardiness Zone Map* to discover which areas have common climatic conditions and which are very different
- Apply scientific understanding (data, concepts) of climate to resolving practical issues of agriculture and horticulture i.e. which crops can be started as seeds, how often can they be sown, when is the frost date and why is that important to know?

Growing Questions workshop content and Congress modelling

At the Congress in Sydney, our participants were organized to work collaboratively, and given the same materials that our teachers are given when we do the lesson with them in Brooklyn. A description of the sequence of questions and activities will be given here, followed by a discussion of the issues and comments

raised by our model teachers in Sydney as we worked through the process of planning an urban garden in New York City

Sequence of activities and questions

1. Seed catalogues from commercial seed companies are given to teachers that describe food, herbal, and ornamental plant varieties. Teachers are asked to choose something to plant in "the garden of their dreams" that they can eat, and something to plant just for its beauty alone
2. Each teacher tells their colleagues which choices they made and why. Teachers are asked to share their choices with the entire class one at a time; they read the catalogue descriptions of the plants they desire, and we decode any symbols used in the catalogue to understand all of the information the vendor is offering the customer about the seeds or plants they are trying to sell. We record certain pieces of information from their descriptions on a board at the front so all can see them. For edible plants, we list the name of the fruit or vegetable and the number of days that were specified for that particular variety; for ornamental plants, we list the name and the "Z" number specified in the catalogue, such as Z10 or Z6-9
3. Teachers are asked what the numbers mean; what is the significance of the number of days given for an edible crop? Of the Z numbers…what does Z stand for? From our urban educators in Brooklyn, these questions generate broad speculation. Most are unfamiliar with growing plants of any kind, so almost all of this discussion provides an opportunity to learn something new
4. The *Urban Garden Planting Calendar for New York City*, a table prepared by Cornell University Cooperative Extension, is distributed to each teacher. Now that we know how many days it takes for a tomato to grow and ripen on a tomato plant, we use the *Calendar* to see how we can grow a tomato crop in Brooklyn. When can we plant? What can we plant (a seed or a transplant)? How many times can we plant the crop? When must we harvest it? Reading the *Calendar*, which is designed as a bar graph with the months of the year at the top and the names of plants (beans, lettuce, annual flowers) on the left axis, is a mathematical and analytical task. Learning about the land-grant universities of the United States, among which Cornell is one of the oldest, offers an opportunity to revisit the history of our nation. Their commitment to supporting agriculture in every state in our country continues today in the form of the cooperative extensions which provide free or low cost advisory and testing services for all the people who grow edible and ornamental plants and keep animals. One 'Big Idea' taken from our reading and understanding the *Planting Calendar* is that there is a good reason why we have to start sowing our crops and harvesting them at very particular times: the frost factor! For our part of North America, there is a relatively predictable time when we can expect a frost or freeze to come and damage tender plants like tomatoes and a time after which we can be assured that frost will not occur and we can plant the tomato plants. But in New York City, when we plant tomatoes, it must always be as transplants directly into the ground. We can raise the little plants ourselves, by buying the seeds, planning ahead, and sowing them indoors but we do not have enough time, based on our frost dates, to plant a tomato from seed in the soil and let it grow into a fully mature plant that bears fruit that we can harvest
5. Why are tomatoes so vulnerable to frost? Why, in contrast, is it that our 'salad crops' such as lettuce, spinach, and carrot can be planted by seed directly sown in the soil, not only once, but twice in the same growing season? Teachers become engaged in an investigation about where our food crops came from originally. Who were the first peoples to take tomatoes into cultivation? What does the phrase 'into cultivation' mean? In our City, tomatoes can be purchased all the year round. In our local farmer's markets, where regional growers sell their harvests in open-air markets in the City, tomatoes are only available from early July until maybe late September. Where are the tomatoes grown that we purchase in December at our big supermarket? Teachers are now assembling a clearer picture of how our seasonal climate directly affects our growing food to feed our community and ourselves here in Brooklyn
6. What does the 'Z' mean? We are now ready to figure out what our United States Department of Agriculture means by defining the 'plant hardiness zones' of North America. Each group of teachers has a large, wall-sized version of the *Plant Hardiness Zone Map of North America* (USDA 1990). (These were used in the modeling of this workshop in Sydney, but colour versions of plant hardiness zones of other continents, including Australia, were brought for display). Teachers are given an opportunity to look at the map, are asked to find New York State and New York City and to decipher the key, which is colour-coded and based on temperature. The first 'Big Idea' revealed when teachers look only at the

colours of the zones and compare New York City to other locations is that our urban area has more in common with states to our south than with states to our north and west. We are a relatively 'warmer' part of our state, surrounded by 'cooler' parts of northern New York, New Jersey, Connecticut and Pennsylvania, our neighboring states. Then they are asked to interpret the temperatures that were used to define the zones and the second 'Big Idea' emerges; plant hardiness has been defined, on this map, based on the lowest or coldest temperatures our region experiences in the course of a year. Why? For many of the farmers and gardeners of North America, the most challenging environmental factor to be considered in keeping plants alive is the cold of our winter season. The *Hardiness Zone Map* was created primarily to guide the planting of perennials, mostly ornamental plants. For each zone it defines, the U.S.D.A. provides suggested species that will endure the low winter temperatures that are average for that zone. Interestingly, not all of the plants suggested are native to that zone or to North America. This reopens discussion of how, while it is possible to bring plants from other places, we may or may not be able to expose them outdoors to the reality of our seasonal climate, unless they are native to places on Earth with environments similar to ours. And where are the places on our Earth most like ours, most different?

7. Teachers are engaged to consider what other climatic factors impact plant growth and what we can grow. They are quick to mention heat and the issue of global warming and the availability of water. New York City endured a drought emergency this past summer, a circumstance becoming more common in recent times although not an annual event yet. Cornell University now maintains a Heat Zone map for New York State, modeled on the Hardiness Zone map. We learn that for some plants, the heat of our summers is an additional challenge that our food and ornamental plants must try to meet if we wish to grow them

The discussion and comments that arose from the modeling of this lesson with our Congress participants in Sydney mostly centered on how the teachers we each work with at our various sites really differ in the life experiences they bring when they attend our classes. Many of the Congress educators remarked that teachers from their regions would never need to purchase seeds from a catalogue: they would go out and collect seeds from edible, herbal, and ornamental plants in their gardens at home, at school, or from local sources where collection would be allowed. This would imply a level of familiarity with the plants that grow around them, not to mention the ready, 'at hand' accessibility of those plants, that teachers in Australia and Asia in particular have when compared with teachers from New York City public schools. While many of our urban educators were themselves raised in rural settings, both in the United States and abroad, the realities of city life do not allow them to recreate that way of life in Brooklyn. Many of our teachers are originally from the Caribbean region, and we have educators who were raised in Central or South America, or Africa, or Asia. While they recognize the produce native to their countries in the supermarkets of Brooklyn, and they can tell us how those crops were grown 'at home', it is rare for them to make the connection that there might be a way to grow their native foods, if they had the land available, right here

Just as teachers are not necessarily aware of the connections between the food on the shelf in the store and its origins on a farm somewhere in the world, the students in their classrooms have limited experiences with where their food comes from. One of the handouts distributed to the Congress participants was a chart prepared by a Brooklyn teacher, Dr. Uju Afulezi, for his sixth grade (aged 11 and 12 years) students entitled 'African Village Subsistence Farming Chart (Eastern Nigeria)'. It illustrates the interconnectedness of the specific crops planted, agricultural practices and tools used, land and farming structures owned, and social roles followed by the people of the community in Nigeria into which he was born and in which he was raised. Dr. Afulezi prepared this lesson on his peoples' agricultural society for his Brooklyn students to teach them about how interdependent people are with the land they tend. He said that American children no longer have an example in their own country of people living off the land, in harmony with the land, in an agrarian society, although it has been a part of our culture and way of life for many Americans for much of our history. He recognized that, for many of our Brooklyn schoolchildren, food comes from the store. When Dr. Afulezi tells his students that there are boys and girls in another part of the world who work alongside their parents as a significant part of their day to grow, tend, and harvest from plants that provide them with the food that sustains their entire community, he encourages them to reflect upon how the food in the store in Brooklyn came to be upon its shelves.

As we shared examples of the knowledge and experiences the students in our respective communities have about the origins of the food they eat, it became clear that we differed in our approaches to teaching this topic. For example, one of the motivating ideas we commonly use at the Brooklyn Botanic Garden to stimulate a discussion on planting a garden of edible plants is to ask our students 'Could we plant a pizza?

Could we plant things that would grow into the ingredients that we could use to make a pizza?' We use this example because pizza is a food familiar to many of our children and it is made from ingredients that are parts of plants or that eat plants! One of our participants remarked that using pizza as an example for this purpose was a poor choice if we were encouraging sustainability. This prompted reflection from participants once again about the different experiences we find the groups of teachers and students that we teach in our gardens bring to our programs. Because our urban children have such limited experience with the growing of the food they eat, and most often see food in a highly processed form, we offer them examples, such as pizza, that are real and immediate to their daily experience, in order to begin a conversation about where food comes from. By learning about the plants that provide their favorite foods, and learning how to grow them, teachers and students begin to explore the broader context of planning and creating sustainable garden programmes in their schoolyards and community gardens and to appreciate the factors that contribute to planning and creating such gardens, even if they do not have the space to do so

In this model program, the *Hardiness Zone Map of North America* was used, as it is the one we refer to in New York in the United States. Participants in Sydney were shown examples of a variety of zone maps for each continent, including Australia, Europe, Africa, part of Asia (China) and South America. A list of the websites for viewing this international selection was distributed. We remarked on the fact that in North America, cold is the challenging condition the hardiness zones are based upon. But in many parts of the world, the differences in rainfall that are seasonal and regional present the challenge to native plants and agricultural practices. Depending upon where in the world we are trying to create sustainable gardens to support our communities, the concept of 'hardiness' takes on different meanings. We need to consider the environmental conditions that are particular to our growing region is a given for us all

Activities to extend the workshop content

- Ask participants to plan the most wonderful garden they can imagine using catalogues, books and journals. What does the garden of their dreams look like? Are there plants to eat? Plants for beauty? Are there plants that can be used for medicine, perfume, fibre or oil? Then have them consult the reference sources used in this workshop. Which of their dream plants can stay in the garden? Which cannot be grown due to limits imposed by climate?
- Design a garden of edible plants that students can plant, cultivate, and harvest in the growing season or seasons appropriate to the region while school is in session. (For our students in Brooklyn, New York, that would mean that the garden would be active between March and June, as our students leave school for holidays in July and August and would not be present to tend their plots.)
- Visit the local farmer's market where farmers from the local region bring their produce for sale. Which crops are available each week? Why are most crops only for sale at certain times of the year? Research the cultivation requirements for each of the crops to understand their seasonal appearance in the market
- Research the history of fresh produce in regional markets. For example, New York's colonial period was 200–400 years ago. If one could travel back in time to a market in the 1600s, 1700s, or 1800s, what fresh produce would be for sale? Was there a time when the only fresh food available was the food each household could grow for itself?
- What did or do the people native to the region grow to feed themselves and/or their communities? What are the farming practices they used or use today?
- Visit local community gardens in urban areas or local farms in rural areas in different seasons, if possible, to see what is growing. Interview the gardeners and farmers to learn about how they grow what they do. Do they have methods of extending their growing season? What soil and water conservation techniques do they employ? Where did they learn how to grow things (from elders, from books, from school)?

References

United States Department of Agriculture (1990). *Plant Hardiness Zone Map of North America.* [Now www.usna.usda.gov/Hardzone/index.html]

Connecting to culture

Steve Meredith

Adelaide Botanic Garden, Adelaide, South Australia, Australia

Plants, culture and environment. These words are the subtext for our new Botanic Gardens of Adelaide logo. It's great that we now publicly proclaim what we have privately known for years: that botanic gardens are more than just green refuges or works of high-art horticulture. They are also about the communities that create them reflecting local history, endeavors and future aspirations. Because many botanic gardens have plants collected from all over the world, they can also take on a more global perspective. Interpreted appropriately, this perspective can contribute to our communal sense of multiculturalism and to an understanding of how others live and view the world. With the right educational approach it can also help gardens provide a viewpoint into the lives and cultures of others, one that values similarities and differences.

Over the millennia, plants and people have been inextricably linked to each other. We have harnessed and selected plants to meet our daily needs. This has led to an extraordinary number of different uses, ranging from converting plant poisons to medicines through to plants as symbols for national pride. This makes a rich reservoir of stories that provide insights into the way that peoples' beliefs, values, customs, material possessions and behaviour have developed over time. In recent times modern urban people have lost a great deal of individual plant knowledge; however many traditional cultures have maintained their knowledge as something still woven through the fabric of their daily lives. This knowledge is still essential today for their physical health and cultural survival. It can also be a base for gardens to teach about and celebrate the diversity of others.

How then do we convert this wealth of knowledge into practical learning experiences for school students? It is easy to fall prey to the repetitive interpretive mantra of 'now this was used for…'. It is not always easy to move beyond this approach. This was highlighted recently when I was involved in a small group workshop to develop activities for students using the Pacific Cultures gallery in the South Australian Museum. The gallery has thousands of objects and artefacts relating to the traditional lives of Pacific Islanders. Exhibits include decorated canoes, weapons, religious masks, penis gourds and historical photos. This rich visual texture made it relatively easy for our team to develop themes and strategies for activities to help students interpret and use the display. We then moved to the Botanic Garden and suddenly the flow of ideas dried up. The exercise became far more difficult for the untrained eye with just trees and landscapes to look at. Teaching about culture in botanic gardens – compared with the richness of objects, artefacts and paintings found in more mainstream museums and art galleries – is far more challenging. The key to unlocking the cultural dimension of plant collections is in the stories plants tell of their relationships to people. Just as important is the way that we design the learning process beyond the provision of information. Learning activities should encourage interaction between people and plants by using sensory invitations, guided discovery, 'real life learning' and cognitive challenges. In teaching about culture in gardens the challenge is to convert the pedagogy into practical activities that provide insights, but at the same time are engaging, activity-based and have relevance to the learner's experiences and links to their prior knowledge.

Our Garden has used a number of approaches to achieve this including:

- performances and celebrations
- displays and exhibitions
- Garden-developed print resources
- information technology.

Performance and special exhibitions are often entertaining and enlightening. But they are not always sustainable over the longer term. There is no doubt that performances which are done well capture the emotions and imagination very quickly. However, if used in isolation and without relevant follow up, the learning momentum can be quickly dissipated. Two approaches that gardens might more readily sustain over the longer term are interpretive garden trails and interactive virtual visits delivered via information

technology. If well designed, both approaches can motivate and maintain the learning continuum beyond the garden.

The Adelaide Botanic Garden took up the challenge of using the Garden to connect to culture by developing three innovative resources, each with a different approach to learning. We chose Asia as our focus because it is Australia's nearest neighbour and the Garden had appropriate Asian collections. There are also increasing educational, economic and trading links, as well as increased immigration, from Asian countries to Australia. From an educational perspective, this focus on Asia is also reflected in the nationally developed programmes of Asian studies for schools.

Three resources for linking the garden displays to Asia were:

- Kehidupan sehari – hari

  A walk through a south east Asian rainforest that provides a cultural context for learning and practising Bahasa Indonesia.

- Plants and People of Asia

  An across-the-curriculum approach using analogies drawn from Asian plant stories, in order to encourage students to question and compare their own views and values with those of Asian peoples.

- Virtual Visit CD-Rom

  A virtual garden tour on CD-Rom which integrates traditional Indonesian uses of plants with self-correcting Bahasa Indonesia activities and cultural understanding.

The development of these resources has in all cases been a collaborative one. It has drawn on the expertise of practising students, classroom teachers, plant and language experts, native speakers, advisors in cultural education and staff from Indonesian botanic gardens.

Kehidupan sehari - hari

In Indonesia *Kehidupan sehari - hari* means 'daily life' and embraces the idea of living in harmony with others and nature. This concept forms the basis of an Indonesian language and cultural trail through the tropical rainforest in our Bicentennial Conservatory. Through practical language-based tasks and an emphasis on the cultural uses of plants, students are able to glimpse traditional Indonesian village life.

The dense foliage and winding paths of the Conservatory provide the atmosphere and realism of steamy tropical forest. As students walk into the forest they are encouraged to believe that they have arrived in Indonesian rainforest. Their mission is to use navigation directions in Indonesian to locate ten plants in the rainforest that are also represented on a drawing of a typical Indonesian village. Once a plant is found, students identify it on their drawing of the village scene and add its Indonesian name to the drawing. Once all ten plants have been found, students re-visit them to learn about their traditional cultural uses by reading and responding to questions, mostly in Indonesian.

Students enjoy applying their Indonesian language skills in a realistic way to accomplish the task of finding the plants in the forest. *Kehidupan sehari - hari* is designed to encourage collaborative teamwork accompanied by much discussion. It also gets students looking at and thinking about plant characteristics more closely from an ethnobotanical, rather than biological, point of view. Indonesian teachers appreciate having a practical activity outside of school and having an opportunity for language acquisition within a cultural context. The success of this programme has encouraged Garden education staff to look at broadening cultural studies in the Garden into other areas of the curriculum.

Plants and People of Asia

For many years our Garden has run popular and successful programmes based on traditional Aboriginal peoples' use of plants and the environment. Aboriginal cultural instructors deliver these programmes wherever possible. While on one level they provide straightforward information, on another level they are designed to deliver much deeper insights into Aboriginal technology, spirituality, customs, cultural beliefs

and sustainable use of the land. We expanded our cultural studies programme into Asia using this more holistic approach.

The Plants and People of Asia programme was developed for nine- to fifteen-year-olds, as a comprehensive booklet combining a visit to the Garden with numerous follow-up activities for back at school. The integration of school-based activities was done to overcome the often one-off, isolated experience of a Garden visit and to make it a more seamless part of the students learning continuum.

The learning activities are based around a Garden walk that visits eleven significant Asian plants. Cultural stories about the use of plants across Asia are provided in short punchy bursts. They are designed both to maintain the readers' attention and to highlight how plants permeate most aspects of traditional Asian life. Examples of themes included: plants as symbols of status, traditional poetry, celebrations, dance, art, colonisation, religious symbols and environmental restoration.

The accompanying student activities are designed to actively encourage students to engage with the plant displays rather than just passively listen to or read information. The activities are broken up into six areas or strands for each plant station. These cover broad curriculum areas, abilities and are inclusive of cultural and gender difference:

Use Your Senses	Encourages students to use sensory observations to look more closely at the natural environment in the Garden.
Traditional Plant Use	Broadens student understanding of Asian culture through stories of traditional plant use.
Environment	Emphasises the biology and ecology of plants, while encouraging scientific thinking on issues relating to the environment.
You & Me	Discussion starters on personal and social development issues that parallel Asian plant stories. Discussion can be followed up back at school using Asian and Australian contexts.
Place in Space	Activities to help students familiarise themselves with the geographic location of different Asian countries.
Challenge	A collation of diverse 'challenges' for students to engage with back at school. They are best done after a visit to the Garden, but can also be done as stand-alone activities. Emphasis on research and reporting back on findings in different formats. Articles and activities are included in the booklet.

Wherever possible the six areas integrate relevant Australian perspectives in order to deliberately blur the boundaries between Asia and Australia. This encourages students to question their own views and values within a combined Asian and Australian context and hopefully leads to greater cultural understanding.

By consistently packaging the learning into the six different curriculum areas, teachers have been able to 'mix and match' activities to suit different learning endpoints. This flexibility helps to ensure greater links with their pre-existing school programmes. The approach also encourages collaborative small-group work, with different groups taking on different strands and reporting back their findings to others.

The booklet has a simple clean layout that uses subtle graphics to create an understated Asian aesthetic that is both eye-catching and educationally functional. Comprehensive contextual teacher support encourages teachers to use the material with confidence.

This resource has provided many sought-after practical learning opportunities for schools looking to develop Asian cultural studies programmes outside the traditional classroom. It also has been successful in providing a way of integrating an environmental perspective across the Asian studies curriculum.

Virtual Visit

For garden educators, 'getting the message across' should be more important than a visit to our Gardens. As powerful and uplifting as our Gardens may be for learning, not all students are able to visit. Information technology provides a way of reaching a much wider audience far beyond the garden wall.

With this in mind we developed a CD-Rom based on our Indonesian cultural and language trail *Kehidupan Sehari-hari*. The CD-Rom was partly funded through the National Asian Languages and Studies in Australian Schools (NALSAS) Strategy and developed in partnership with the Open Access College, a leading deliverer of distance education and technology-based education resources. Many students, teachers, native Indonesian speakers and staff from the botanic garden in Bali supported the development of material and were involved in testing the final product.

The CD-Rom takes the form of a virtual visit to the Adelaide Botanic Garden. Students navigate the Garden paths using directional arrows. As they move around they explore the landscapes with a 'parrot' cursor. When the wings flap there is an Indonesian plant to explore in detail. One click on the plant brings up a screen with information and images relating to the different uses of Indonesian plants. Further screens provide more specific information in the areas of Environment, Food and Drink, Medicine, Daily Living and Culture. Students use the information and images to tackle a series of interactive language exercises. These exercises are self-correcting and feature a talking Indonesian parrot to help with word pronunciation.

Once the language activities for a particular plant have been successfully completed, students are rewarded with an animated Indonesian plant or animal. The CD-Rom is completed successfully once all the twenty animations have been collected to create a stylised Indonesian rainforest scene. Other features of the CD-Rom include 3D maps of the Garden to enable students to follow their progress, 360-degree views at particular stops, a self-correcting quiz on the technology behind our rainforest conservatory and snippets of pop-up information about key buildings in the Garden. Progress around the Garden is colour-coded and students can save their current progress to allow them to complete their tour over several sessions.

The CD-Rom has been well received by schools and is used in many different ways by students ranging in age from eight- to fifteen-years old. Teachers have combined it with a visit to the Garden, using it either as a pre visit warm-up or as a post visit follow-up. Some teachers use it purely for the cultural aspects of the information provided, while others use it as introductory exposure to the Indonesian language. There are suggested activities for using the CD-Rom in the classroom.

Value of Resources

Feedback from schools indicates that the resources are a valuable addition to cultural education programmes. Indicators of their value include:

- significantly increasing numbers of students now visiting and using the Garden for Asia language and cultural study programmes
- well attended Studies of Asia professional development workshops for teachers, which help to ensure that the materials is used well to its full potential
- the development of an Asian Studies support network for the Garden education service, which can be a springboard for planning the development of further culture-based programmes.

Most importantly, the resources are contributing to a wider understanding amongst the education community that the Botanic Gardens is a place for learning about people, plants and culture.

Celebrating cultural diversity: growing for healthy living

Christine Wildhaber

Park Ranger Service, London Borough of Southwark, London, UK

Project background

The Chumleigh Multicultural Gardens in Burgess Park (Southwark, south-east London) were established in 1995 and were designed to reflect the diversity of the local community. Themed areas were created, such as an Oriental garden, African and Caribbean gardens and Islamic and Mediterranean gardens. The Gardens are managed by the London Borough of Southwark's Park Ranger Service. In the year 2000 an area adjacent to the Multicultural Gardens was allocated for the growing of food and medicinal plants, to enable local community groups to take a more active role. The plots contain vegetables and herbs grown by the Vietnamese–Chinese community and the Asian Elderly group, South African medicinal plants, 'heritage' vegetables (varieties that are no longer commercially available) and an organic kitchen garden tended by the 'Heart Gardeners' group. The latter group is facilitated by the Borough of Southwark's 'Art in the Park' (artists in residence) programme and consists of people who have heart complaints or disease. The cultivation of the plots shows how growing food and medicinal plants can offer opportunities for physical exercise and social activity, as well as learning new skills, sharing knowledge and enjoying a healthy diet. Each group provides its own interpretation of their planting scheme.

The video

After describing the background to the gardens and the setting up of the community plots, a draft copy of a video in progress of production was shown at a Congress Workshop. The purpose of the video is to promote and interpret the plots. The video includes interviews with group members who use the garden plots. It enabled them to record their achievements, express the benefits of the growing project to them and to pass on information about the uses of the herbs and vegetables grown by their group. Funding for the video was granted by the SEED (Social, Economic and Environmental Development Fund) Programme; and Mickey Lee was appointed as filmmaker. Mickey has experience of oral history interviewing techniques and of working with ethnic groups.

Discussion

Points raised

The video was found to be both entertaining and useful as a model. Being able to work with such a range of different ethnic communities is only possible because London is such a cosmopolitan city. To carry out similar projects in other municipal or botanic gardens, space would need to be allocated; but this need be as little as 4–8 m^2 for a group plot. Other practicalities such as access and my role were discussed. To prevent vandalism, the plots are gated and open to the public on specific open days or when groups are present (1–3 times a week). The different groups often come to the site at different times, and do not always meet each other. Making the video was also useful for the groups to get to know each other better. In regard to my role, this is flexible according to the needs and abilities of each group. Some of the groups have a development worker, as they come from established community centres with other activities. If a group needs support, I liaise with the corresponding development worker to set up activities such as seed sowing, pricking out, planting out and providing volunteer help with site preparation. The 'All Seasons' are one of the clubs; its members come and go when they like, although the group meets regularly on a monthly basis. The 'Heart Gardeners' have a worker specifically for their garden project, and I also offer advice as required.

Summary

It is important for people, particularly those living in an inner city environment, to have the opportunity to grow plants. Food-growing projects add value to a botanic garden's education programme and the benefit the participants in several ways:

- They provide a sense of belonging to a particular ethnic group and give an opportunity to share cultural knowledge in relation to health, growing techniques and foods being grown.
- The involvement of people with horticultural projects can provide social therapy and improved mental and physical well-being.
- In poor or deprived areas, growing food can lead to improved nutrition and lifestyle.
- Including a diverse range of ethnic groups increases the value of such projects.

Forming partnerships: insights from southern Africa

Pat Irwin & Heila Lotz-Sisitka

Environmental Education Unit, Rhodes University, Grahamstown, South Africa.

Introduction

> *One of the major challenges facing the world community as it seeks to replace unsustainable development patterns with environmentally sound and sustainable development, is the need to activate a sense of common purpose on behalf of all sectors of society (Agenda 21, Chapter 27:197)*

Agenda 21 challenges all sectors of society to participate in and establish meaningful partnerships, in order to achieve, social change and sustainable development. It furthermore challenges partners in sustainable development to clarify and recognise the independent roles, responsibilities and special capacities of each.

Recent deliberations at the Johannesburg World Summit on Sustainable Development (WSSD) once again highlighted the importance of meaningful partnerships in achieving sustainable development. Educational interactions during the WSSD provided much evidence of existing and emerging partnerships, a number being established. For example, the South African Ministry of Education hosted a seminar on *Educating for a Sustainable Future* in partnership with UNESCO, the theme of which was *Action, Commitment and Partnerships*. Ironically, the seminar tended to profile the existence of partnerships, but did little to review them critically; several newly emerging partnerships were adopted with little critical debate. At another level, many smaller local-level partnerships were secured in interactions between professionals working in the environmental education and education for sustainability areas. The Rhodes University Environmental Education Unit (RUEEU), for example, has established an informal research-based partnership to work with global Earth Charter initiatives.

While networking has been the subject of much discussion in environmental education work, (e.g. Taylor, 1997), there has been relatively little attention given to the *interdependent role* and *nature* of partnerships in enabling and sustaining environmental education processes. It is within this context that we offer some tentative insights from southern Africa. This paper hopes to contribute to a 'starting conversation' on such partnerships.

An overview of partnerships at Rhodes University

Partnerships have been central to the success of the RUEEU's work over the past twelve years. They have also presented us with numerous, often complex, challenges. In reviewing these partnerships for the purposes of opening the conversation, we have identified two major issues that have shaped almost all of our partnership relationships, namely the tensions that exist within varied power relationships, and the identification and actualising of mutual benefits. We examine these two issues in the context of cases which exemplify the range of partner relationships in the RUEEU.

We have identified eight different kinds of partnerships *viz*. with corporate funders, governments, parastatals, non-governmental organisations (NGOs), international donor agencies, within our own institution, and with our local communities in Grahamstown and the Eastern Cape province. We have also identified the establishment of critical intellectual partnerships as a key element of partnerships at RUEEU.

Partnerships with corporate organisations

Environmental education at Rhodes University has been involved in partnerships with corporate organisations since the establishment of the Murray & Roberts[1] Chair of Environmental Education in 1990.

1 Murray & Roberts is southern Africa's largest civil engineering and construction company. It has funded the Chair of Environmental Education at Rhodes University since 1990, which is now its longest running corporate social investment programme. In 1997 the work of the Chair was expanded by further corporate funding from Gold Fields SA, a major mining group, which enabled Rhodes to establish the Gold Fields Environmental Education Service Centre

The partnership was founded (through the good offices of WWF-SA, an NGO) on a funder–recipient basis, with University assurances of quality delivery and accountability. But from the start of its operation it began to take on a different shape. This involved the establishment of a steering committee, which included the funder and prominent members of the local community, in which the general direction of the Chair's work was negotiated. This process has ensured continued corporate involvement and financial commitment, linked to the recognition of delivery of quality outputs. Over time, and as the Chair became integrated into the Unit, the mutually beneficial nature of this partnership has become more prominent, particularly since the corporate organisations have started to consider issues of sustainable development as part of their core business.

Of special significance to these relationships has been the RUEEU's ability to offer something of value, initially quantified in terms of a viable corporate social investment with tax relief benefits, but rapidly moving to a position of being able to offer professional support to corporate programmes for change towards sustainability. An example is that of industry course materials developed by the Unit being used in Murray & Roberts' own training programmes. We have also been able to draw on the professional resource-base of our corporate relationships in, for example, developing a module on environmental management practices in the mining industry with Gold Fields SA, one of our corporate partners. While the RUEEU has been conscious of some of the ethical dilemmas of engaging corporate partnerships from sectors such as mining and construction, we believe that our ongoing engagement with them has been environmentally beneficial.

Partnerships with governments

Since 1994 the RUEEU has been heavily involved in a variety of partnerships with government departments at both national and provincial levels. Prior to 1994, partnerships with governments were mixed and difficult to maintain, due to the dominant ideological ethos of the time. While our partnerships with government have expanded over the past eight years, and new avenues for environmental education work have opened up as a result, this work has not been easy. The complex challenges of policy development, capacity building throughout the system and the immense challenges of re-orienting society at all levels have provided many intellectual and research challenges to the work of the RUEEU (Lotz-Sisitka, 2002).

Government partnerships are often characterised by unequal power relationships, high levels of bureaucracy, and difficulties in maintaining personal relationships. In addition, largely because of bureaucratic institutional frameworks, the nuances and potential impact of research results are often lost. This is partly because research work in policy contexts tends to require and value more broad-based survey-type research, which does not necessarily provide the in-depth perspectives on contextual issues that often influence the nature of change at a local level. This gap between policy and practice has to some degree been bridged by partnership initiatives based on co-operative projects involving state–civil society relationships such as the EECI and EEPI[2]. While pinpointing mutually beneficial relationships with governments is often very difficult, the gap between policy and practice has become a catalyst for a number of research initiatives within the Unit. We believe, that through this, we are beginning to make more tangible contributions to the work of governments[3].

Partnerships with parastatals

In contrast to partnerships with government, we have found partnerships with parastatals to be more accessible and more professionally engaging. For example, we recently formed a partnership with the South African National Parks to engage in a joint professional development and research programme for the benefit of their staff. This programme has led to tangible outputs, with many members of staff developing materials,

(GFEESC). The Murray & Roberts Chair, the Service Centre, and other environmental education activities in the Department of Education at Rhodes University, constitute the Rhodes Environmental Education Unit which is located physically and administratively within the Department . It is not insignificant that Murray & Roberts have also recently made a large investment as one of the main South African funders of the World Summit on Sustainable Development.

2 The Environmental Education Curriculum Initiative (EECI) and the Environmental Education Policy Initiative (EEPI) were two state-civil society initiatives aimed at developing national policy, and implementing national curriculum (Janse van Rensburg & Lotz, 1998; Lotz-Sisitka & Ashwell, forthcoming).

3 The most tangible evidence of our research in this policy-practice arena (Janse van Rensburg & Lotz-Sisitka, 2000; Lotz-Sisitka & Raven, 2001) is the contributions the RUEEU has been able to make to the Ministry of Education's National Environmental Education Project for the General Education and Training Band (DoE, 2002), and some contribution towards the revision of the National Curriculum Statement for General Education and Training.

programmes and policy plans to support environmental learning in the South African National Parks. Of benefit to the RUEEU has been the deepening of the research terrain on environmental interpretation and education, and a clearer perspective on the relationship between professional development and institutional development. At a management level, we were able to co-manage this programme through a steering committee, and research results have been fed directly into the organisation for consideration in relation to their policy and strategy development.

On the other hand, partnerships with parastatals may also encounter bureaucratic and capacity difficulties, influenced by the less than stable financial current position of parastatals. In the programme with the South African National Parks we were able to distil diverse roles and responsibilities, and develop an understanding of the need for different power relationships in co-managing the programme in which for example, conceptual power and management power did not necessarily reside in the same place at the same time, but shifted and changed during the life of the project. Partnerships of this kind provide opportunities to optimise the potential of diverse power dynamics in practical programmes.

Partnerships with NGOs

As with parastatals, the RUEEU has found that partnerships with non-governmental organisations are more firmly located in the arena of professional exchange. While NGOs have fewer problems with bureaucratic requirements, they often experience problems with financial stability and staffing as well as competition with each other for funds, staff and influence. In the post-apartheid era, NGO groups in South Africa have experienced many such problems as a result of the channelling of funding and human capacity into government bodies. NGOs sometimes also have environmental agendas that are not necessarily compatible with each other or with those of the RUEEU.

Our partnerships with NGOs have generally been focused on projects that support professional development and capacity building, in fields as diverse as teaching ecology and conducting research. One particularly fruitful and long-running partnership has been with the Wildlife and Environment Society of South Africa (WESSA). One of our joint projects, known as the Gold Fields Participatory Course, supported by one of our corporate sponsors, draws post-graduate students to Rhodes University, broadens the impact of environmental education professional development, and through the University, enables WESSA to offer accredited professional development to their own staff and to a range of participating groups nationally. The RUEEU has also drawn heavily on the resources developed for field-based work through Share-Net, another WESSA project. Our partnerships with WESSA have extended to co-funding agreements, co-operative fundraising initiatives, and collaborative research in professional development. Such projects have enabled us to develop a mutually beneficial partnership based on professional and intellectual respect, as well as recognition of the diverse forms of expertise necessary for a professional field to flourish.

Partnerships with international donor agencies

Since 1994 there has been an influx of international development aid to support development and transformation in southern Africa. This has led to numerous donor-funded environmental education projects and programmes. This trend has brought new challenges to partnership orientations, notably issues associated with the power dynamics inherent in donor–recipient relationships, where the donor is often more powerful, and is able to 'set the agenda for change'. These agendas are often encapsulated in the form of logical framework plans, which are then more or less imposed in development situations. Such planning frameworks do not lend themselves to reflexivity, participatory evaluation or change in the life of projects. A further challenge has been the changing nature of the political economies in environmental education work, where large-scale donor-funded projects change local political economies, and often create false economies that are difficult to sustain after the project has ended. These partnerships are thus often ambivalent, as they bring these and other challenges, but also the benefits of international interaction and additional sources of funding.

Partnerships with our local community

An important dimension of environmental education practice is practising in one's own backyard with groups such as schools, municipalities or community organisations. Working within the context of one's local community provides the opportunity for grounding and interaction with 'real life' challenges. Theories can be put to the test, research results may be applied in local contexts, and a sense of community is enhanced. While it is clearly important to interact within local contexts, tangible evidence of results is often

slow to emerge, as one interacts with the multi-facetted nature of local community life, politics and bureaucracy, as well as with the varying enthusiasm of individuals.

Partnerships within institutions

In this respect, our direct experience is largely limited to Rhodes University, although we inevitably share perspectives with colleagues in other institutions. Partnerships are as varied as the institutions themselves, but a number of common factors seem to determine practice and outcome. The most important of these are scale (size of the institution), the openness of governance and management frameworks within the institution, and in somewhat more general terms, what is called 'institutional culture'. Perceptions of mutual benefit also appear to play a key role in the sustainability of intra-institutional partnerships.

At Rhodes University, which is a relatively small institution, three key factors have been an open framework and flexible approach on the part of management and governing bodies; wide accessibility to all interested groups and individuals; and personal relationships. Added to this is a strong corporate culture of 'making things happen' and making them work. Apart from the obvious example of partnerships between academic departments, good working relationships – tantamount to partnerships – have been formed between academic departments and, for example, the Estates Division. An active Senate committee on environmental programmes overviews and encourages symbiotic relationships and partnerships.

On the negative side, even good personal relationships do not necessarily transcend individual and departmental jealousies and inclinations towards 'turf protection'. Innovation is often contested by traditionally powerful groups, either to protect vested interests, or when they perceive potential benefits as a one-way flow. This is where long-term vision, well conceived and developed arguments, a track record of delivery and 'institutional culture' are often able to play a major role.

Critical intellectual partnerships

Although of a less concrete nature than the other partnerships listed, this type of partnership is arguably the most important in an educational context. In the RUEEU it is certainly the heart of the programme, not only in its own right as intellectual stimulation, but in its pervading influence nationally, regionally and even internationally. The Unit views intellectual relationships in terms of sharing and exchange of ideas, mutual critiquing of work, as well as joint research projects, as integral to all partnerships. This need is seen to be necessary not only at an individual level, but within partnerships such as AusLinks and some of the conservation agencies in South Africa. Intellectual partnerships are probably never entirely equal, but in many cases the power relationships do balance out in terms of productive outputs.

Ideological considerations, and the differences in concepts and approaches that result from them, are often very challenging, and at times are potentially debilitating. In South Africa we have at times come close to negating and even foregoing partnerships on ideological grounds and thus there is some sensitivity to the issue. A more fruitful approach is that, where differences do exist, they can also provide an interface for intellectual growth, particularly if there is a mutual willingness to engage with un-likeminded people, even when the power relationships linked to ideology are or have been patently unequal.

Conclusions

As tentative conclusions we might observe that, following twelve years of interaction within such diverse partnerships as we have described, we are able to look back and identify some of the key themes which reflect the lessons we have learned.

- A recognition of the multi-facetted, dynamic and changing nature of power relationships in partnerships, as well as the diverse political economies associated with different partnerships
- A need and a willingness to engage within different partnerships in different ways. This requires a flexibility of approach, being willing to confront and engage diverse ideological and intellectual challenges, and the recognition of the pragmatic and practical dimensions of sustaining these partnerships
- A willingness and need to be accountable and transparent in the arenas of financial management, intellectual debate, organisational requirements and social and personal interactions.

References

Department of Education (2002). *Revised National Curriculum Statement, Grades R – 9 (Schools),* Department of Education. Pretoria, South Africa.

Janse van Rensburg, E. & Lotz, H. (1998). *Enabling environmental education as a cross-curricular concern in outcomes-based learning programmes: Discussion document.* Share-Net, Howick, South Africa.

Janse van Rensburg, E. & Lotz-Sisitka, H. (2000). *Learning for sustainability.* Learning for Sustainability Project, Johannesburg, South Africa.

Lotz-Sisitka, H. & Ashwell, A. (forthcoming) *Policy and praxis: environmental education curriculum development 1992–2002.* Rhodes University Environmental Education Unit, Grahamstown, South Africa.

Lotz-Sisitka, H. & Raven, G. (2001). *Active learning in OBE: Environmental learning in South African schools: Report on the National Environmental Education Programme – GET Pilot Research Project,* Department of Education. Pretoria, South Africa.

Lotz-Sisitka, H. (2002). Curriculum patterning in environmental education: a review of developments in formal education in South Africa. In: *Environmental education, ethics & action in southern Africa,* EEASA Monograph, Environmental Education Association of Southern Africa/Human Sciences Research Council, Pretoria, South Africa.

Taylor, J. (1997). *Share-Net: a case study of environmental education resources material development in a risk society.* Unpublished Ph.D. thesis. Rhodes University, Grahamstown, South Africa.

Wynberg, R. (1993). *Exploring the Earth Summit: Findings of the Rio United Nations Conference on Environment and Development: Implications for South Africa.* University of Cape Town, Cape Town, South Africa.

Alien invaders: learning about biodiversity by monitoring environmental weeds

Gary Shadforth

Royal Botanic Gardens Melbourne, South Yarra, Victoria, Australia

Alien history

The Royal Botanic Gardens Melbourne has a long history of interest in, and scientific study of, plant biodiversity. Currently this may involve conservation botanists studying the nature of natural ecosystems and particular plant species that occupy them. Over 150 years ago biological diversity was respected in a different way. The Director and first botanist of the Botanic Gardens, Baron Ferdinand von Mueller, was a highly accomplished naturalist and botanist and had a great interest in the variety of plants in Australia. He was also very active in the local acclimatization societies. These societies were involved in the introduction to Australia of a variety of exotic plants and animals to remind people of their European heritage. Apparently the natural environments in Victoria were too wild, untidy and alien. According to contemporary botanists such as von Mueller, this extra variety from Europe was a good thing. He is said to have carried a knapsack of blackberry cuttings on his field trips through the countryside and he progressively planted them along the way. Such a useful plant, he reasoned, would be valuable for travellers through the bush. This is from somebody who had a great appreciation of the Australian bush. Von Mueller was very interested in the practical uses of plants; he helped create industries for eucalyptus oil and recommended the introduction of exotic conifers for their value as timber. This laissez-faire approach to diversity went both ways: he was also keen to advocate the value of Australian plants in other parts of the world. His advocacy has resulted in Australian plants such as eucalyptus being a significant environmental weed in other countries. Yet von Mueller had a great appreciation of the Australian bush and lamented its destruction.

Baron von Mueller was a contemporary of Charles Darwin, but he resisted Darwin's ideas of natural selection and transmutation of species. The prevailing understanding for most people was that species did not change and existed forever. The study of ecology is more of a twentieth-century phenomenon and takes into account the notion that things do change. People now acknowledge that different species of plants, animals, fungi and micro-organisms have an effect on each other. This may be positive, as a food source or in a symbiotic relationship, or negative, in such cases as disease, competition or predation. Over thousands and millions of years these impacts have altered the nature of species in the ecosystems involved. Plants may develop a chemical resistance to insect predators. Flowers may become more attractive to a certain pollinating bird. Insects may overcome the chemical disincentives that plants produce to keep from being eaten. A natural ecosystem is a very complex and intricate web where there is a ‘tug-of-war’ on each strand. Each ‘tug’ from one species is responded to by a range of other species. This results in continual evolutionary change and often a very delicate balance. A sudden drastic change that affects a few species, such as the introduction of a weed, will have ramifications on a great range of other species.

Ecosystems and the species they contain have been evolving on the Australian landmass for millions of years. Much of the flora of Australia still shows relationships to species that lived when the Continent was part of the southern supercontinent of Gondwana over fifty million years ago. While these species have managed to remain stable by existing in habitats that they adapted to all that time ago, climatic conditions have altered and newer species have arisen that have adapted to the newer regimes. Along the way species have responded by adapting to each other's presence, so that whole new floras have arisen in isolation from other continents. Isolation such as this generally leads to a high number of endemic species, species that exist nowhere else on earth. This is common on islands that are not easily accessible by animals or plant material: New Zealand and New Caledonia are such examples. While their floras show Gondwanan relationships with the other southern continents, they separated from the supercontinent even earlier than Australia. Their floras then evolved in isolation to become quite distinct from any other.

Alien traditions and biodiversity

I have frequently noted that visitors to the Royal Botanic Gardens Melbourne refer to all the English plants there. Unthinkingly, a number of people have an idea that most plants here are either Australian natives or they are from England. Perhaps this is an old-fashioned notion of the traditional English garden with its lush collection of colourful, floristic shrubs, perennials and annuals. On further reflection, especially if they read the labels, people realise that these plants come from many parts of the world. In the eighteenth and nineteenth centuries the combinations of the English interest in exploration, botany and landscape lead to a form of English garden. The English tradition in this sense, like von Mueller, is to see plants as collectibles, isolated from the environment they have adapted to over millions of years.

Britain is in fact an island with low species diversity and few endemic species. Even though as an island it has been somewhat isolated from the European continent, most of it was covered in ice as recently as eighteen thousand years ago at the end of the last Ice Age. When the ice retreated and provided new opportunities for plants and animals, it was mostly opportunistic species that took advantage. These species included plants that are quick to colonise new patches of land and remain competitive with other plants that come along – the sort of plants that might be considered `weedy'. Most of the flora of Britain is made up of these recent arrivals from continental Europe, as well as many others that have arrived even more recently from other parts of the world. Eighteen thousand years is not a long time for new species and ecosystems to develop.

When Europeans first reached Australia it was either with great fascination at the botanical novelty and variation or with contempt for its alien newness. Australia has an enormous wealth of biological history, diversity and endemism. However, since European colonisation, it seems that many Australians have retained the old European cultural inheritance that sees this flora as a collection of plants that will always be around. Many of the introduced weeds that now threaten our indigenous flora are plants that have been much loved in the Old Country: English ivy, Scotch thistle, holly, English broom and of course blackberry. The love of plant collecting has also introduced more serious concerns from places with climates and conditions similar to our own, such as South Africa, the Mediterranean, South America, California, Mexico, India and even other parts of Australia. *Pittosporum undulatum* is a garden escapee that is indigenous to East Gippsland (Victoria).

These sudden arrivals, without the original restraints that may have evolved with them such as predators, pathogens or competitors, may find they have a clear run in a new ecosystem. Such an ecosystem contains species that, over their millions of years of balanced tug-of-war, never had the opportunity to develop the means to contend with such a newcomer. These environmental weeds will limit the opportunities for indigenous species for space, light, water, nutrients and access for pollination, seed dispersal and germination. They can even change the entire nature of microclimates or fire regimes. Some weed species have the capacity to completely blanket areas of natural vegetation. While indigenous Australian people have an intimate relationship with natural habitats, non-indigenous ones have only fairly recently come to acknowledge the great natural inheritance that they have. General interest in Australian flora only became evident from about the 1960s, when Australian native gardens were becoming popular. Nowadays communities understand the significance of their local indigenous flora. Local councils commonly use indigenous plants to planting along streets and in reserves, while indigenous plant community groups are proliferating.

While weeds have always been considered a problem in agriculture and horticulture, they have been somewhat taken for granted in the natural environment. Governments have responded with such initiatives as the *National Weeds Strategy* (1997) and the *Victorian Weeds Strategy* (1998). An estimate prior to 1998 put the direct cost of weeds to Victorian agriculture at more than $360 million per year. Even when their dangerous presence has been noted, very limited scientific monitoring has been done. Monitoring is important for producing management strategies to control specific weed species, particularly when budgetary considerations are an issue. Nowadays the devastation that weeds are having on Australia's biodiversity is being taken seriously. Part of this seriousness must be in communicating it to young Australians – to increase understanding, raise awareness and develop action strategies to manage this increasing environmental issue.

What is a weed?

So far I have used the word 'weed' loosely. There are many things people might consider weeds to be. Weeds may be regarded as plants that:

- can colonise quickly and aggressively
- occur in our gardens without being put there
- are harmful to livestock
- are poisonous to people
- are aesthetically unattractive
- compete with food crops for growth
- are excessively aggressive and competitive in the garden
- grow naturally
- are introduced or escaped, and have naturalised into natural ecosystems.

A weed does not necessarily conform to all of these categories. Children (and many adults) are often likely to believe that a weed is a certain taxonomic category of plant or that all plants that are not carefully cultivated in a garden or a farm are weeds. A weed can simply be regarded as a plant out of place.

Our emphasis is on environmental weeds, those alien plants that have naturalised into natural ecosystems. One quarter of these plant species started life as garden plants, attractive ornamentals to improve our environment. As the nursery industry is continually on the look out for new, interesting and hardy horticultural specimens, the list of escapees increases. Many environmental weeds are still sold commercially as useful, hardy plants that are difficult to kill – and look very nice.

The Royal Botanic Gardens Melbourne, as part of its long established role in the study of plants, their diversity and the ecosystems they belong to, particularly in Australia, is active in studying and communicating these threats.

The 'Alien Invaders' project

The Royal Botanic Gardens Melbourne has a stated mission:

> *`To advance the knowledge, enjoyment and conservation of plants through excellence in biodiversity research and management, horticultural displays and educational programs.*

Conforming to this mission, the Royal Botanic Gardens has involved itself in a `Science Partnership' project with the Victorian Department of Education, Employment and Training. Our particular project is titled 'Alien Invaders: Identifying and Monitoring Weeds in the Environment'. Science Partnership projects are a means of linking school students and their teachers with the work of professional scientists. The project invites schools to participate in surveying local areas of natural vegetation for specific species of weeds. Students involved range from year 7 to year 11 and their schools tended to have an active environmental programme in their curriculum.

The project was initiated in October 2001 to coincide with `Weedbusters Week' when students from nine participating schools visited the National Herbarium of Victoria at the Royal Botanic Gardens Melbourne for an official induction. Our scientific staff described their work and emphasised its value and threats to our local biodiversity. Students were shown what the project entailed and the benefits that it would have. Another nine schools joined in the year 2002. The staff of the National Herbarium of Victoria work on the systematics, taxonomy and conservation of Australian flora and fungi. Together with scientific staff at the Australian Research Centre for Urban Ecology (ARCUE) and Royal Botanic Gardens Cranbourne, there is a wealth of scientific expertise to which students can be exposed.

ARCUE is a division of the Royal Botanic Gardens that was created in 1998 to research the diversity of natural ecosystems in urban environments and to work to conserve and gain knowledge of them. Its stated vision is:

> *To foster the survival of viable natural ecosystems and the preservation biodiversity in urban areas, and to help minimise future human impacts on the natural environment due to the urbanisation of the Australian landscape.*

The students focus on looking at natural environments in an urban area. These environments are likely to be disturbed by the impacts of urbanisation, including the presence of a significant suite of weeds. While the presence of weeds is now a well known threat, the precise distributions of weed species is not so clearly known and documented. Involving students in such a scientific investigation improves our knowledge, while being a very practical tool in enabling students to learn about ecology and biodiversity. As the project evolves it is hoped that further interested schools will participate.

Students are introduced to about 60 species of weeds. They are a selection of easy to identify and significant plants and will include a range of forms, habits and preferences. They include tree weed species such as Sweet Pittosporum (*Pittosporum undulatum*) which is a native of East Gippsland and is commonly found sprouting in forests in Melbourne's eastern suburbs; or the herbaceous Paterson's Curse (*Echium plantagineum*) which can be seen blanketing areas of the northern suburbs of Melbourne. Each of the areas represented by the schools will contain a number of these selected species.

To help their monitoring in the field, schools are given booklets that contain information about each weed species, including spotting characteristics, photographs, line drawings, descriptions, distribution maps and identification keys. This information comes mainly from the four volumes of *Flora of Victoria*, produced by the Royal Botanic Gardens Melbourne. They will also receive monitoring manuals that will include instructions on surveying, collecting and identifying plants and sheets for recording and reporting. Scientific and education staff will develop a procedure for recording and monitoring populations of environmental weeds that is appropriate to upper secondary school students.

Students can enter their data directly into a RBG database through the Internet. Feedback on their data, including that of significant collections such as new weeds and range extensions, is made available via the Internet. Schools are also provided with kits that will allow students to press and mount their own herbarium collection of weed species. These kits will include a plant press with cardboard and instructions for proper preparation and mounting of the specimens. Selected specimens (especially of new or significant records) may be lodged at the National Herbarium of Victoria to become part of a significant national botanical collection. To supplement these scientific activities, teachers are provided with educational resources generated by the RBG Education Service that will help them communicate the concepts of biodiversity, conservation and environmental threats such as weeds.

Principles of environmental education

This project can be viewed as a multidisciplinary activity that can cover all subject areas of the school curriculum. It generates an awareness of the natural environments close to where students live and of the impacts that people are having on them. This leads to a wider awareness of national and global issues. There are obviously questions that may be raised and debated in the course of the project. For example, why should a rather dull indigenous grass be better that a very colourful introduced plant that grows profusely on riverbanks? The underlying values that we want to instil include respect for and understanding of the natural diversity and an appreciation of the interdependence of species and how they can be destroyed by human impacts for short-term interests.

The content of the project covers not only what the local environment consists of, but also how ecosystems work and what their interrelationships are. This leads to an appreciation of how they may be affected by outside impacts. Students will learn and develop skills that are used by scientists in the field to monitor threats to ecosystems in order to make assessments on what damage has been done and what the potential dangers are. With this awareness, values, knowledge and skills, young people will be equipped to make

decisions and take actions. This work will make an important contribution to the preservation of our natural and global inheritance, ensuring it is treated respectfully now and into the future.

From the teacher's perspective, concentrating on what initially seems like an unappealing topic in weeds (hence the Alien Invaders package), is a very neat way of allowing students to learn in a very hands- on and practical manner. While weeds as a threat are the project's focus, students can also become familiar with the indigenous vegetation of their own environments. The weeds receive rough hands-on treatment, while the indigenous flora can be observed more respectfully. It is important that they can personally identify with the value of the project and see their input as an important contribution.

Surveying and studying the impact of weeds is an approach that any teacher can take with their class in teaching about ecology and the environment. While becoming familiar with local ecosystems, students can do something practical and valuable and also learn about some of the intricacies of interspecies relationships and the complex dynamics of sudden changes in an ecosystem. This is all with the classic 'good guy - bad guy' theme. We look forward to a happy ending.

References

Adair, R.J. and Groves, R.H. (1998). *Impact of Environmental Weeds on Biodiversity: A Review and Development of a Methodology*. The Director of the National Parks and Wildlife, Biodiversity Group, Environment Australia. Canberra, Australia.

Carr, G.W., Yugovic, J.V. and Robinson K.E. (1992). *Environmental weed invasions in Victoria*. Department of Conservation and Environment, Melbourne, Australia.

Foreman D.B., Walsh N.G. and Entwistle T.J. (1993). *Flora of Victoria Volumes 1–4*. Royal Botanic Gardens Melbourne, National Herbarium of Victoria. Inkata Press, Melbourne, Australia.

National Weeds Strategy: a strategic approach to weed problems of national significance (1997). Canberra: Agricultural and Resource Management Council of Australia and New Zealand, Australian and New Zealand Environment and Conservation Council and Forestry Ministers, Commonwealth of Australia. Canberra, Australia.

Victorian Weed Strategy (1998). Melbourne: Department of Natural Resources and Environment, Government of Victoria. Melbourne, Australia.

Linking with schools for joint interpretive processes

Abel Barasa Atiti

Nairobi Botanic Garden, National Museums of Kenya, Nairobi, Kenya

Introduction

This paper draws on some recent research that I carried out in collaboration with a group of teachers from two Kenyan schools, in a review and development of interpretation resources and materials. In addition to being used to meet the requirements for a postgraduate course at Rhodes University in South Africa, the research has laid a strong foundation for a new outreach programme at the National Museums of Kenya (NMK) Nairobi Botanic Garden. Through the programme, NMK is forming partnerships with schools to help them to transform their grounds into sites for environmental learning. This is being undertaken within a critical perspective in which teachers are developing skills and motivation that are needed to bring about changes in the way environmental education is taught in schools.

The theme of this paper is the formation of non-formal and formal education partnerships as a better way of combining environmental interpretation and environmental education efforts, in order to promote environmental literacy and action competency in schools. The concept of 'environmental interpretation and education processes' is introduced here as a departure from viewing interpretation and environmental education as separate fields. To this end, some educational ideas are suggested that can be drawn on by teachers and non-formal educators in order to understand interpretation as a process of meaning-making and critical reflection.

To enable teachers to become 'transformative intellectuals' (Huckle 1996), a critical form of educational inquiry that enables them to investigate their own practice is required (Robottom 1987). Such an approach entails developing interpretation resources and materials *with* teachers and not *for* them. The important thing is to help teachers help themselves by sharing with them ways of developing the tools and skills of interpretation (Uzzell 1989); these may then be drawn on in educational processes. I describe how I engaged teachers in a process of *mobilising* 'interpretive capital' within the non-formal education organisations, through a participatory action research approach. The mobilised interpretive capital was made available for the development of interpretation resources and materials in two schools. A case study of the development of a school-based botanic garden and of interpretive materials, in order to foster environmental learning in one of the schools, is presented. This case study highlights the potential role of teachers as transformative intellectuals in schools.

Sharing the tools and skills of interpretation with teachers

Non-formal education organisations in Kenya play a crucial role in enhancing interpretation and environmental education within schools. These organisations include non-governmental environmental education centres and government conservation organisations such as the National Museums of Kenya where I work. A variety of interpretation resources and materials have been developed in these organisations. The development and use of these resources requires skills and knowledge of interpretation. These tools and skills of interpretation are referred to as *interpretive capital*. At the moment, this interpretive capital is mainly found in the non-formal education sector. My argument is that the time has come for us non-formal educators and interpreters to start sharing this capital with teachers in ways that enable them to design their own interpretive experiences for schools. However, this should not imply imposing our agenda and mission on schools. Rather, it requires the formation of genuine partnerships between schools and non-formal education organisations. This will ensure the creation of professional competencies that can support sustained materials development in schools. It is on this premise that I engaged a group of teachers from two schools in a process of *mobilising interpretive capital* within five non-formal education organisations. Non-formal educators from NMK, Kenya Wildlife Services, the Wildlife Clubs of Kenya, the Giraffe Centre and the Butterfly Centre shared their interpretive capital with teachers. By drawing on features of participatory action research, I created forums for teachers and non-formal educators to meet and collectively understand

how interpretation resources and materials can be developed and used. These forums provided opportunities for partnerships to develop between the two schools and the other involved organisations.

Through a series of workshops, focus groups, guided tours and critical reviews of textual interpretive materials, non-formal educators engaged teachers in examining their understanding, skills and values relating to interpretation resources and materials. The practical methods and educational perspectives underlying interpretive practice in the non-formal organisations visited were explored. In this way interpretive capital was *mobilised* and then made available for actual development of resources and materials in the two schools (as discussed later in this paper). The review visits revealed the existence of a number of interpretation resources that had the potential to foster environmental learning amongst school groups. These were nature trails, live exhibits on animals, a national park, a botanic garden and a museum. A variety of interpretive materials – interpretive signage, worksheets, trail booklets, interactive displays, teachers' packs, exhibitions and interpretive brochures – were used to support environmental learning. A review of how these materials were developed and used provided useful insights on the role of interpretation in enhancing and enabling environmental education. The relationship between interpretation and environmental education became evident. In addition to the development of partnerships between schools and non-formal organisations, an active partnership between environmental education and interpretation (Ballantyne 1998) is needed to address the often perceived differences between the two fields.

Environmental interpretation and education partnerships

Traditionally, environmental interpretation and environmental education have been viewed as separate fields, with many differences between them (Ballantyne and Uzzell 1994, Ballantyne 1998). For example, environmental interpretation is often associated with informal learning experiences for a wide range of visitors within a recreational setting. Such visitors are usually referred to as a 'non-captive audience' and are seeking an informative and entertaining experience at interpretive sites. On the other hand, environmental educational processes have been mainly directed towards school groups in diverse areas such as classrooms, outdoors and at interpretive sites. The school groups are expected to acquire environmental literacy, action competency and at the same time realise the needs of the school curriculum. Unfortunately, theoretical arguments that focus on the differences in design, content, audience, purpose and educational setting, have continued to separate environmental interpretation from environmental education.

Notably, both interpreters and environmental educators apply education ideas associated with how people socially construct meanings during informal interpretive experiences and formal environmental education processes. There is therefore a need to act on this commonalty rather than on the perceived differences. However, this requires creating active partnerships between environmental interpretation and environmental education processes. Through such partnerships, an understanding of interpretation as an environmental education process can be explored to help bridge the theoretical gap that exists between the two fields. Broadening the theoretical base of interpretation as an education process would enable interpreters and teachers to design interpretive experiences for school groups.

The collaborative research I undertook with teachers focussed on the relationship between interpretation and its potential for fostering critical and action-oriented environmental education processes. I have used the concept *environmental interpretation and education* in discussing this relationship. In this regard, environmental interpretation and education processes become acts of mobilising learners' cultural capital; this enables them to engage in investigation, social critiques, information finding, action-taking and reporting in order to participate in social change. Shedding light on this relationship requires consideration of theoretical perspectives on interpretation (Uzzell 1998) and environmental education processes. Very few interpreters have attempted to inform their practice with educational theories. I have drawn on educational theory and social theory to provide a theoretical basis for clarifying the relationship between interpretation and socially constructed environmental learning experiences. I did this by engaging teachers in a critically reflective inquiry process to explore our understanding of interpretation as an environmental education process. To this end, a number of education ideas that can be drawn on to provide further insights on interpretation and environmental education processes through meaning-making and critical reflexive educational processes have been explored.

Education ideas that deal with how learners socially construct meaning can be applied within theoretical frames drawn from symbolic interactionism (Charon 2001), social constructionism (Schutz 1967),

Vygotskian social constructivism (Vygotyky 1981) and critical pedagogy (Fien 1993). Teachers and non-formal educators can draw on these theoretical frameworks to design interpretive materials and experiences that engage learners in critical reflexive processes of learning. Structuring and enabling such interpretive learning experiences required partnerships between schools and non-formal education organisations. We drew on these education ideas and applied the tools and skills of interpretation acquired from the non-formal education organisations to develop interpretation resources and materials to foster environmental learning in two schools. This development process followed a teacher-centred approach that challenged conventional top-down approaches that create a hierarchy of 'developers' and 'technicians' (Robottom 1987, O'Donoghue and Taylor 1988). This approach further strengthened the developed partnerships between NMK and the two schools.

Developing resources through a teacher-centred approach

Those who work in the non-formal education sector are faced with the challenge of ensuring the availability of environmental learning support materials that can engage learners in critical reflection and action to respond to environmental problems. More often than not, the tendency has been for us to produce glossy materials that only emphasise conservation of the biophysical environment. These materials are usually intended to create awareness and change learners' behaviour. In many cases, these materials are developed without the active involvement of teachers who form the majority of the end users. This reflects a top-down approach in which teachers are merely viewed as technicians expected to implement the materials for environmental learning in their schools. In contrast, the NMK–Nairobi Botanic Garden outreach programme is helping teachers to develop interpretation resources and materials on their school grounds. This shift from the top-down approach towards a teacher-centred one recently took place in the two schools that NMK and Nairobi Botanic Garden supported to develop interpretation resources on their grounds. Central to this shift was the formation of partnerships between NMK and three other non-formal education organisations. These partnerships created an enabling environment in which teachers were empowered to change and improve on their own practice of interpretation resource and materials development in order to overcome constraints to the teaching of environmental education processes in their schools. I will now focus on the actual development of a botanic garden and materials in one of the schools.

Case study: developing a school-based botanic garden and interpretive materials

Many botanic gardens professionals would frown at the idea of developing a botanic garden in a school. In November 2000, two teachers and a group of Science Club students from a private school in Nairobi visited the NMK and Nairobi Botanic Garden for a guided tour with a focus on medicinal plants. What was a normal school visit became different when, after the guided tour, the teachers sought our assistance in developing a botanic garden in their school grounds as a club project. Previous similar requests had only focussed on support for creating teaching trails in school grounds. At the time of this request, I was still designing my research for a postgraduate course that focussed on resource development. After careful consideration, I decided to involve the school in my research project but within a framework of an outreach programme for NMK–Nairobi Botanic Garden. The idea was then recast within a collaborative participatory research framework to fulfil the objectives of my research, the NMK outreach programme and the Samaj School project.

The status of environmental education at Samaj School

Samaj School is a private school managed by a charitable trust. It is situated in the western suburbs of the City of Nairobi and has some 800 students, from nursery to sixth form, with fifty members of staff. An inquiry into the status of environmental education at the School revealed an emphasis on both teacher-centred and discipline-centred approaches to teaching and learning. There were no guidelines for implementing environmental education processes across the curriculum. To a great extent environmental education was dependent on initiatives from the non-formal education sector, from environmental clubs whose support originated elsewhere. None of the five teachers on the project team had received any form of in-service training on environmental education. Also, the teachers claimed that the pre-service training they had received in environmental education was inadequate for their teaching contexts. Hence the development of a school-based botanic garden aimed at raising the profile of environmental education at Samaj. The

development followed a participatory action research model that involved a series of self-reflective cycles of planning, acting and reflecting.

Formulating resource development plans

A team of five teachers was selected to work with NMK–Nairobi Botanic Garden to develop the School botanic garden and environmental learning materials. This was after the school management had adopted the idea that had initially been conceived at a club level. In collaboration with NMK, the teachers first formulated broad plans outlining project goals, subject themes envisaged, methods and financial implications of the project. Eight subject themes that reflected those at NMK–Nairobi Botanic Garden were proposed: medicinal plants, succulents, wetlands, a rare plants area, a memorial area, a recreation corner, a butterfly corner and an orchard. Plans for specific materials that would support environmental learning at the School botanic garden were also collaboratively formulated: a publicity brochure, a trail leaflet, two worksheets, interpretive signage and interpretive labels were planned for. Throughout this phase, teachers contributed to the generation of plans. The plans were then approved by the School Board and later implemented in collaboration with NMK and other organisations.

Implementing the formulated plans through critical reflection

Drawing on teachers' theory and practice, and also the interpretive capital mobilised as discussed earlier in this paper, the formulated plans were implemented through a series of focus group meetings in the School. The teachers were engaged in a self-reflective process of examining the relationship between the 'mobilised' interpretive capital and the development of interpretation resources and materials for environmental learning, thus 'mobilising' further interpretive capital in the context of the school grounds project. The development of the School botanic garden entailed transforming an under-utilised area within the school grounds into a site for environmental learning. To do this, one of the teachers designed the area on paper to indicate the proposed themes and pathways. The area was then dug up, filled with forest soil and then landscaped. The availability of a qualified gardener and a member of the School's Board of Trustees who had some landscaping skills made this exercise easier. In addition, NMK botanic garden staff provided useful inputs to this initial landscaping. Later a professional horticulturalist was invited to review and complete the landscaping of the site. As a result of existing partnerships, NMK–Nairobi Botanic Garden, commercial nurseries and other non-formal education organisations provided plants.

Conclusions

Through partnerships with schools and other non-formal education organisations, the NMK–Nairobi Botanic Garden has started working with teachers to transform school grounds into sites for critical environmental interpretation and education. What began as a one-off project with two schools has turned into a reflexive process of learning by doing and learning with teachers, by changing the ways school grounds are used for environmental learning and the way materials are developed. By involving schools in collaborative research to investigate their own practices, the potential role of botanic gardens in enabling teachers to become transformative intellectuals has been highlighted. The participatory action research model that was applied during the NMK–Nairobi Botanic Garden pilot outreach programme has proven to be a powerful form of professional development, because it grew out of the teachers' own specific contexts. Professional development was not done on the teachers. Rather, teachers were allowed to be in control of the process of developing interpretation resources and materials by their collective planning, action and reflection. The role teachers can play as researchers, reflective practitioners, interpreters and materials developers through genuine partnerships became evident. Fundamentally, botanic gardens need to start viewing teachers as reflective practitioners with a significant contribution to make to environmental interpretation and education, instead of merely regarding them as 'target groups'.

References

Ballantyne, R. (1998). Interpreting 'Visions': Addressing environmental education goals through interpretation. In: Uzzell D. and Ballantyne R. (Eds.), *Contemporary issues in heritage and environmental interpretati*on. The Stationery Office, London, UK.

Ballantyne, R. and Uzzell, D**. (**1994). A checklist for the critical valuation of informal environmental learning experiences., *International Journal of Environmental Education and Information, 13 (2)*, p111–124.

Charon, J. (2001). *Symbolic interactionism: an introduction, interpretation, an integration*. 7th edn. Prentice Hall, New Jersey, USA.

Fien, J. (1993). *Education for the environment: critical curriculum theorising and environmental education*. Deakin University Press, Geelong, Victoria, Australia.

Huckle, J. (1996). Teacher Education. In: Huckle J. and Sterling S. (eds.), *Education for sustainability*. Earthscan, London, UK.

O'Donoghue, R. and Taylor, J. (1988). Towards participant-centred resource development for environmental education. *Southern African Journal of Environmental Education, 7* p. 3–6.

Robottom, I. (Ed.) (1987). Towards inquiry-based professional development in environmental education. In: *Environmental education: practice and possibility.* Deakin University Press, Geelong, Victoria, Australia.

Schutz, A **(**1967). *The phenomenology of the social world*. Northwestern University Press, Evanston, Illinois, USA.

Tilden, F. (1977). *Interpreting our heritage.* 3rd edn, The University of North Carolina Press, Chapel Hill, North Carolina, USA.

Uzzell, D. (1989). Introduction: The Natural and built environment. In: Uzzell D. (ed.), *Heritage interpretation: Volume 1: The Natural and Built Environment*, Belhaven Press, London, UK.

Uzzell, D. (1998). Interpreting our heritage: a theoretical interpretation. In: Uzzell D. and Ballantyne R. (Eds.), *Contemporary issues in heritage and environmental interpretation,* The Stationery Office, London, UK.

Vygotsky, L.S. (1981). The genesis of higher mental functions. In: Wertsch J.V. (Ed.), *The concept of activity in Soviet psychology*. Sharpe, New York, USA.

Encounters with naturalists

Catherine Ducatillion[1] & Steve Meredith[2]

[1]Institut National de la Recherche Agronomique, Jardin botanique de la Villa Thuret, Antibes, France

[2]Botanic Gardens of Adelaide, Adelaide, South Australia, Australia

Many botanic garden education programmes are no doubt a little like ours – they have a relatively small budget, minimal staff, but lots of ideas waiting for a chance to be converted into reality. One way to get around these frustrating roadblocks is to piggyback onto the large number of local and national events and celebrations that fill our calendars. Such opportunities not only provide smaller gardens with ready made community, government and corporate partners but they can also provide a supportive infrastructure for outreach community programmes that are normally beyond the limited resources of most gardens.

Encounter 2002

Encounter 2002 was one such opportunity not to be missed. It was a 3-month series of community events celebrating the chance meeting 200 years ago of the British ship *Investigator* commanded by Matthew Flinders and the French ship *Geographe* commanded by Nicholas Baudin. At the time of the encounter, both ships were involved in the first European exploration and charting of the coastline of South Australia. Though their countries were officially at war, the captains exchanged important scientific and navigational information gathered on their voyages.

On board both ships were naturalists, gardeners and illustrators who were collecting and documenting the diversity of Australian plants and animals that were both strange and new to Europeans. Some of the plant material collected on the voyages was dried and sent back to herbaria in France and Britain for scientific study, while living plant material and seeds were sent back to Kew Gardens in Britain and the Paris Botanic Gardens. Some material collected in the region was also sent to Malmaison, home of Napoleon and Empress Josephine in France. From here it was subsequently sent to gardens in the south of France for display and acclimatisation trials.

This botanical and historic connection between France and Australia enabled a joint international project to be developed by botanic gardens in each country. The collaboration ultimately involved gardens, herbaria, schools, community organisations and national parks.

'Encounters with Naturalists'

In Australia

The Botanic Gardens of Adelaide and the State Herbarium of South Australia set up a 'living history' project called 'Encounters with Naturalists' in association with the Penneshaw Area School and the Landcare group on Kangaroo Island. The project aimed to help students gain a greater understanding and appreciation of the local flora of their region by re-creating the activities of the naturalists, gardeners and illustrators who visited their shores nearly 200 years before.

Penneshaw is a small rural coastal country town on Kangaroo Island in South Australia. It was chosen for the project because both ships had anchored in the area. The British had visited and explored the area twice, just before the encounter, on 21-23 March and then on 1-7 April 1802. One of the pieces of information passed on to the French at the time of the encounter was the presence of fresh water, as well as a safe harbour. However, it was not to be until the following year that the French visited the Island, from January 7 to February 1. As a consequence of these visits the naturalists and gardeners from both ships made plant collections and the illustrators drew the plants and animals they saw. The gardeners planted European seeds on the Island, none of which appear to have survived. The French released a rooster, two hens and a boar and a sow in the hope that they would multiply and provide food for the next visitors (the bay where they were

released is now known as Hog Bay!). Here the respective crews from both ships also took on board much needed food, water and firewood.

The other French connection to the area dates back to Empress Josephine, who sent some of the living material collected in the region on to the south of France to assess its suitability for local horticulture. Unfortunately some of these plants were a little too successful and have shown the potential to become weeds. The Jardin Botanique de la Villa Thuret near Nice has significant southern Australia plant displays. The Garden joined the project and worked with local students at the Jean Moulin School and the Antibes Horticultural College to mirror aspects of shared history, Mediterranean climate and flora.

One of the main aims of the project was to act as a trigger for a range of environmentally-related practical projects for local school students in Penneshaw and France. Through this process we hoped to develop long-term positive values toward local environmental issues. Both schools were highly supportive, as were the managements of all the organisations involved.

In Australia our project team was made up of nine staff from scientific, horticultural and education services from both the Garden and the Herbarium. Penneshaw Area School had a number of dedicated staff, parents and Landcare volunteers who managed the project from their end. Valuable support was also received from the Kangaroo Island National Parks and Wildlife Office and a local island plant expert.

The project began with our first field trip to Penneshaw in early in 2001, a year before the major Encounter 2002 celebrations. This trip began by setting the historical context for the whole School. The early challenge was how to develop manageable field activities for later in the year when we would be working with eighty students, aged between five and fifteen. The solution was to have students work in mixed-age teams, with older trained students mentoring younger students. A continuous 12-month series of events was developed, aimed at reach a climax during the official Encounter 2002 celebrations. Our first field work was with older students in the late summer of 2001, with the emphasis on collecting seed and cutting material for propagation. The accompanying collection of voucher specimens for this material served as an introduction to the making of herbarium specimens for the following phases of the project.

Later in the year the same older students visited both the Adelaide Botanic Gardens and the State Herbarium of South Australia to learn about their work. In the Herbarium they were shown how to mount the specimens they had collected and were then introduced to some aspects of the work of the Herbarium through the Kangaroo Island collector's quiz. The quiz asked questions whose answers were all to be found on herbarium sheets associated with Kangaroo Island. In this way they were introduced to:

- the oldest collections from the Island
- rare and endangered species
- potential and actual weed invaders
- useful plants on the Island
- the concept of a 'type' species
- voucher specimens
- the concept of the changing names of plants as our knowledge about them increases
- the use of microscopes to study plant structure
- the changing vegetation on the Island, reflected through herbarium collections.

Garden scientific staff provided students with an insight into their work, with presentations on tissue-culture propagation techniques and the value of computer technology in managing plant information. In the Garden, students were introduced to the 'prior knowledge' of our flora held by indigenous Aboriginal people long before it was discovered by Europeans.

The main stage of the project occurred in spring during flowering time on the Island. It involved the whole school rotating through different activities: plant hunters' workshops, field collection work, botanical illustration and seed collection. The school prepared a wonderfully detailed timetable to manage small teams

working on these different phases at the same time. For the fieldwork we identified three different localities within a ten-minute drive of the School as collection sites. All of the localities were in areas which the Flinders or Baudin expeditions may well have visited from their anchorages in the Eastern Cove area of the Island. The older experienced students assisted younger students with making the collections and filling in modified data sheets.

These collections were to be used in a number of ways. Some were to begin the students own personal herbarium, some were for events involving official Encounter 2002 celebrations, some were to contribute to a local reference herbarium, and some were for a special exchange with students in the south of France. A duplicate of each collection was deposited in the State Herbarium.

While in the field, it was interesting to reflect with students on how different our activities were, compared to the earlier naturalists. We had mobile phones at the ready to communicate with just about anywhere in the world, GPS satellite navigation to pinpoint our position and rapid vehicle transport. Fortunately for us we did not have to experience the explorers' personal hardships of hunger, fatigue, disease, cramped living quarters and the ever-present dangers that inevitably arise from sailing into uncharted waters and landing on unknown territory.

Two hundred years ago the work of botanical illustrators was essential in conveying to people back in Europe just what was encountered on the voyages of exploration. Both the French and the British expeditions had illustrators who were to earn some renown from their depiction of Australian flora and fauna. During the two field-trip days each student received tuition on botanical illustration from the State Herbarium illustrator. Students were soon using pencil and watercolour sketches to record their collections. It quickly became evident that there were many budding young illustrators in their ranks. Their work was later displayed in the local Easter Art Exhibition.

The proposed opening of the new Baudin Conservation Park near Penneshaw during the Encounter 2002 celebrations provided a perfect opportunity to include a replanting component in the project. Working alongside our staff, students learnt how to collect, record and store seed from those native plants still present in the area. With the guidance of the local Landcare volunteers, students have now propagated and raised seedlings for replanting areas of the Park invaded by weeds and overgrazed by the local wallaby population. This has been done with support from the local National Parks and Wildlife office.

In France

In France, the Villa de Thuret Botanic Garden chose a mixture of art and science to make the historical connections to Baudin's voyage to Australia. The Garden, created in 1857 primarily as an acclimatisation garden by the scientist Gustave Thuret, has a long history of working with Australian plants. The first director, Charles Naudin, worked with Australian botanists and published the first great papers on Australian eucalypts. Encounter 2002 provided an opportunity to raise local awareness of our Garden's Australian flora and the historical connections of the encounter.

The project started at the beginning of the French school year in September 2001. Two programmes were developed:

- A series of outdoor sculptural installations entitled 'Regards Croisés' ('Crossing Views') by Antibes Horticulture College landscape students were constructed. Space in the Garden was offered to the students to create installations that depicted aspects of Australia's unique landscapes and indigenous culture as encountered by Nicolas Baudin.

  Students had the freedom of the Garden to create their works as they wished, there were virtually no constraints. They worked alongside an environmental artist who showed the students a completely new way of seeing and interpreting the landscape. His guidance helped them to transform their imaginative ideas into reality. They used the Garden with imagination and poetry but also with intellectual rigour. Many of them discovered a new culture and a new flora. A formal opening celebration gave a social value to their work. Students showed their creations and explained their works to official guests, and also to Jean Moulin schoolchildren who expressed their delight through many spontaneous questions. It was a great moment.

- A specific programme to sensitize children to the Australian environment was developed with teachers from the Jean Moulin Primary School. This included visits by Garden staff to explain the history of French exploration, the uniqueness of the Australian flora and hands-on sessions sowing seeds for the Australian plant displays in the Villa Thuret Garden.

  The students also visited Villa Thuret to learn about the Australian flora. One of the outcomes of this work was that students developed a much better understanding of the differences between indigenous French plants and the introduced Australian ones.

The joint programme with Penneshaw School helped to open the eyes of students to Australia, and to Kangaroo Island in particular. The learning process also extended into geography, history and English studies. The project has been received enthusiastically and both the School and College want to extend the collaboration with Australian students through the internet, school gardens and environmental projects.

Celebrations

The official Encounter 2002 celebrations in Australia in early 2002 brought many aspects of the project to fruition. The Penneshaw students' work formed a major part of the town's official commemorative event programme. With a backdrop of historic sailing ships and representatives of both the French and Australian navies, students presented their mounted plant specimens and botanical illustrations to French officials, local dignitaries, politicians and VIPs, including relatives of both Baudin and Flinders. This welcoming ceremony held at historically significant Frenchman's Rock, the site of the water source used 200 years ago, was a special occasion for the whole community to acknowledge the student's re-creation of their botanical history. One Penneshaw teacher commented "… it really was a once-in-a-lifetime experience for our students". Guests were delighted with the uniqueness of their gifts and the historical relevance of the specimens and illustrations.

Just as the gardeners on board the ships sent plants back to botanic gardens in England and France, the material collected on student field trips was also sent 'back' – to Adelaide's Wittunga Botanic Garden which has displays of Kangaroo Island's distinctive vegetation. Students assisted Garden staff in planting out the material they had collected a year before into the Kangaroo Island beds. A commemorative plaque was also unveiled to acknowledge the project and the students' contribution to the plant displays.

Other benefits from the project include the donation of a complete set of identified student-collected specimens to start a regional community herbarium, to be housed in the School library. Since the specimens are duplicated in the State Herbarium, any changes in the names of these plants in the future can be easily checked.

Conclusion

Encounters with Naturalists was an exciting way of bringing history alive and leaving a legacy of environmental understanding. It provided a unique way for plant-based institutions to support a regional community that cannot normally access such services easily. The partnerships developed enabled the Gardens and Herbarium to project a greater understanding of their less public role, while within the organisations it encouraged cross-department collaboration, team-building opportunities and an appreciation of the value of education. This international partnership has provided opportunities for ongoing learning opportunities beyond plants.

Most importantly, the project provided a chance for students to re-live their history in a practical way, which gave them insights not normally achievable with a traditional garden- or classroom-based approach. We hope that in at least some of the students we instilled a long-term passion for plants and the natural environment.

Acknowledgements

This article has been written with the assistance of Robyn Barker (Honorary Research Associate, Plant Biodiversity Centre), Libby Barios, (chairperson, Penneshaw School and Community Landcare Group), Frederique Bellanger (teacher, LEGTA Antibes), Janice Nicholson-Taylor (a teacher at Penneshaw Area

School), Henri Olivier (sculptor, artist, DRAC, Nice) and members of the Encounters with Naturalists project team.

Making contact

Fabienne Virago[1]& Kathy Stewart[2]

[1]Museum of Sydney, Sydney, NSW, Australia

[2]Royal Botanic Gardens Sydney, Sydney, NSW, Australia

Workshop aims

1. To assess the usefulness and suitability of partnership programmes between botanic gardens and other institutions.
2. To establish a set of criteria for good partnership programmes.
3. To identify both the benefits and the drawbacks of partnership programmes.
4. To formulate a generic plan for making partnership programmes happen.

Criteria for a good partnership programme

As a result of discussion the workshop group agreed that the following criteria could determine the success of partnership programmes between botanic gardens and museums and galleries:

- There is common ground in terms of subject matter or curriculum areas that each institution addresses in their work, resulting in a programme that is relevant both to the institutions and the target audience.
- The institutions have common aims for the partnership programmes.
- The partnership programme offers an educational experience that cannot be replicated in the classroom.
- The partnership programme has the support of management.
- The education staffs involved have shared views and similar approaches to education programming.
- There is good communication between staff at the institutions – both internally and externally. For example, email is used rather than the telephone to ensure that communication happens.
- There are stable, permanent staffs involved in the partnership programme. Because partnership programmes can take a number of years to develop and require consistent work, staff turnover can derail a programme.
- Each institution is equally committed to the programme and contributes equally to it.
- There is mutual professional respect between the staffs involved.
- The partnership programme is effectively marketed and promoted.
- The institutions involved are in (relatively) close proximity.

A plan of action

The workshop group formulated a plan of action that could be followed by botanic gardens wishing to develop partnership programmes.

Firstly, the staff of the botanic garden must clearly identify what they hope to gain from a partnership programme. In other words what are the aims or goals of the botanic garden in developing the programme?

Secondly, it is important to approach management with the 'in principle' idea for a partnership programme with a museum or gallery. Once management has agreed to the idea in principle, further steps can be taken.

Making contact with the education staff of the museum or gallery in question is the next step. This is an opportunity to "test the waters". An informal, wide-ranging discussion that canvasses possible projects and establishes levels of enthusiasm should be the aim of this meeting. This is also an opportunity to assess how compatible the education programming styles of the two institutions are.

If an agreement is reached to proceed with a partnership programme (see the Criteria section above) a follow-up meeting should identify common aims for the programme and focus on the curriculum area for which the programme will cater. Outcomes should be decided on and the rough shape of the programme agreed upon.

A tentative programme outline can now be developed. Once this is complete it is time to return to management to present a more detailed proposal. At this stage an agreement should be reached whereby management approves the project and resources are allocated to it.

Following the go-ahead from management the project team must be set up. Key staff are identified and allocated to the project. A schedule of meeting dates is agreed upon and a timeframe for the project established. The marketing and promotion of the partnership programme should be discussed early in the meeting schedule to allow for lead-time and the development of printed materials if necessary.

A pilot programme should be run towards the end of the timeframe for the project in order to trial it and make any adjustments that might be needed. This is an opportunity to get valuable feedback from the target audience and act on it to improve the programme.

The next step is to run the programme and maintain it if it is to be long-term. Evaluation of the programme should be carried out continuously.

Finally, the project team should complete a thorough evaluation of the programme and its outcomes, for their own archives. This evaluation could also be presented to management.

Collaborating for conservation: how can botanic gardens staff in developed and developing countries work together to promote education and conservation in the botanical hotspots of the world?

Didik Widyatmoko[1] & Lorraine Perrins[2]

[1]Center for Plant Conservation, Bogor Botanic Gardens, Bogor, Indonesia

[2]Royal Botanic Gardens Sydney, Australia

Introduction

The success of any biodiversity conservation efforts will depend on people's concern and awareness. Thus conservation education becomes the key factor in achieving successful conservation programmes. Environmental education is now incorporated in all the major international strategies for biodiversity conservation and sustainable development.

The need for *a template approach* to biodiversity conservation education is identified, in which different actual, relevant examples are provided. Specific examples and emphasis can then be inserted in programmes for particular levels of education. Such methods allow people to relate to particular things (e.g. plants, forests, animals, environmental problems, and household objects) with which they are familiar. Through this technique, biodiversity conservation can become a hands-on matter that can be related to everyday life and be easily understood. Botanic gardens can be the best places to do such activity.

The role of Indonesian botanic gardens in conservation education

The four Indonesian botanic gardens are visited by more than 2 million people annually. They are situated at very strategic sites, and accommodate not less than 70,000 living specimens belonging to more than 6,000 flowering plant species. Thus they have a potential role in biodiversity and conservation education programmes and are highly suitable places for conducting public education and promoting biodiversity conservation. Their aim is to make environmental education accessible to everyone. People's awareness can be stimulated and encouraged through various conservation education programmes (both demonstrations and interpretation) within the gardens, by using enjoyable and efficient methods. Current conservation issues, such as the depletion of tropical forests and the loss of genetic resources, can also be dealt with in these programmes. The resources and facilities in the botanic gardens can enable visitors to:

- learn about the diversity of the Plant Kingdom
- acknowledge the economic, cultural and aesthetic importance of plants in our lives, including the links between plants and local peoples
- understand the major threats that face the world's flora
- learn about the work being carried out by gardens to save and conserve the world's flora
- appreciate plants and nature as a whole
- learn about the practical skill and theoretical aspects of plant conservation, propagation, and landscaping
- develop the attitudes, behaviour, and skills necessary to solve environmental problems.

In line with Chapter 16 of *Agenda 21 Indonesia* (Indonesian State Ministry of Environment, 1996), this programme specifically identifies the need for establishing biodiversity education centres to promote multiculturalism and indigenous issues and to link science with the sustainable use of plant resources. In the period 1998–2003, the *Agenda* proposes the development of at least one botanic garden in each province as a priority activity, thus strengthening and building the capacity of Indonesian botanic gardens institutions and their staffs. The Indonesian Decentralized Environmental and Natural Resource Management Programme also prioritise programmes that promote public awareness of sustainable use and biodiversity conservation. The need for public education and awareness is also emphasised in the *Indonesian Biodiversity Action Plan*

(1993); this need has also been identified as a crucial element in biodiversity conservation by the World Bank's Environment and Development Report on Indonesia.

Project results, objectives and outcomes

Project results

The project result will be the development of a system to educate people and enable them to learn about and appreciate nature and biodiversity conservation, by means of demonstrations, displays and interpretation.

Project objectives

The project objectives are:

- to strengthen organizational capacity in conducting and promoting public conservation education and environmental awareness.
- to develop a standard mechanism to encourage and enable people to appreciate nature and biodiversity conservation through demonstrations and interpretations.
- to foster public awareness of, and concern about, the conservation of nature and natural resources through education and interpretation.
- to provide information, opportunities, advice, and encouragement to the public to enable them to assist and participate in conservation programmes.

Project outcomes

Project outcomes will include:

- transformed or new patterns of thinking or behaviour of individuals, groups and society towards the importance of biodiversity and nature conservation (particularly of plants) for life.
- a balance between classroom-based and outdoor teaching and learning, particularly for school groups and students, as our future and planet rests with youth.
- a better-informed public able to express concerns about the conservation of nature and natural resources to decision makers and public and political leaders.
- the raising of public awareness of, concern about, and the establishment of, a public ethical standpoint on, biodiversity and nature conservation.
- the exploration of links between biodiversity conservation, poverty reduction and sustainable living.

Indicators of the project outcomes

Indicators of the project outcomes have been determined. They include:

- the introduction of new ways of looking at a range of conservation and environmental subjects and the establishment of attractive and innovative demonstrations, displays, and interpretations (including audiovisual techniques and non-verbal communication) to meet the needs of people.
- the availability of different packages and formats of conservation education for various target levels (kindergarten, primary, secondary, tertiary schools and the public), and of well-planned and fruitful visits.
- the ability of members of the public at all levels (including students) to be well informed and to be able to express their concerns about biodiversity and nature conservation to decision makers and public and political leaders, through public and private institutions and the mass media.
- the enrichment of public ways of thinking about nature and natural resource conservation, which may be changed through effective demonstrations and interpretations.

Project activities

Project activities will include:

- Surveys of people's perceptions, opinions, and attitudes related to biodiversity conservation and the sustainable use of natural resources, conducted before and after project activities.
- The development of an integrated audiovisual system and theatre to promote biodiversity and nature conservation.
- The design and construction of appropriate packages for different levels of users (both public and students). These will contain substantial information about biodiversity conservation and the sustainable use of natural resources, focusing on the importance of plants in life.
- The strengthening of staff capacity to teach biodiversity conservation and environmental education, through formal and informal education and training.
- The publication, dissemination, and advertising of planned biodiversity and conservation education activities.

Indonesian botanic gardens and the United Nations Development Programme (UNDP) have jointly begun the establishment of a regional network of biodiversity education centres for promoting multiculturalism, indigenous issues, and decentralization. The resulting Regional Biodiversity Education Programme must be regionally owned and entail the commitment of local human and financial resources, along with external resources from international communities. Bogor Botanic Gardens (as the headquarters of the Indonesian botanic gardens) is also working with the Royal Botanic Gardens Sydney on a project to protect *Amorphophallus titanum*, and promote it as a flagship species for plant conservation in Sumatra. This project focuses on building the capacity of Bogor Botanic Gardens to undertake further *ex situ* conservation, via the upgrading of nursery facilities and the training of staff in a range of plant propagation techniques. Educational tools in the form of bilingual brochures, stickers, and schools' information sessions are also being produced.

The four Indonesian botanic gardens will coordinate and use the 'programme approach', since it offers the best guarantee of ownership, commitment, and the sustainability of results after the completion of project activities. Sustainability means that local individuals, institutions, and systems that were assisted by the programme continue to function effectively after external support ceases and that they have the capacity to continuously improve their ways of working. The development of local capacity is the fundamental aim of the programme, and is accordingly a topic that must be addressed at all stages of project design. Capacity development is the process by which local individuals, groups, organizations, and communities develop their abilities to perform functions, solve problems, and set and reach objectives. Capacity assessment is the first activity to be conducted; it is participatory. Problem-solving techniques are used to determine the capacity constraints that affect project design and implementation and how they may be overcome.

The programme approach facilitates intervention of an interdisciplinary nature that addresses the multi-sector character of most education problems. The approach permits interventions to be made in the context of a broad policy dialogue. An essential objective of the programme will be to engage key educators and bodies, government officials, and other stakeholders, in a dialogue about the proper framework needed to raise awareness of the sustainable use and conservation of biodiversity. The purpose of this dialogue will be to analyse problems, encourage the articulation of biodiversity education programmes, and identify the consultative processes that will need to be followed in order to decide what support the programme should provide to the various provinces of Indonesia.

The need for partnership

Partnerships between a wide range of stakeholders, including target groups of primary, secondary and tertiary schools, teachers, local governments, civil society organizations involved in public and environmental education, private companies, the State Ministry for Environment, international organizations like UNDP and BGCI, and other donors, are strongly encouraged. These partnerships ensure that potential opportunities and risks, as well as previous experience, are taken into account in the design of the programme. This participation will promote stakeholder ownership and commitment, without which projects

are unlikely to be successful. Participation in all phases of project development promotes respect for the rights of all individuals, including those belonging to indigenous groups, encouraging them to participate in the design as a local activity. Women's participation will be ensured throughout the project's development.

Education programmes offered

Conservation education programmes will be conducted in the four Indonesian gardens. Their subject areas will include:

- teacher training: reforming educational techniques, science teaching and learning practices, and enhancing the quality of science education.
- garden exploration and inquiry-based science: encouraging science discovery, and programmes including "Plants and their environment", "From root to leaf", "Learning tastes, shapes, and smells", and "Natural painting competition".
- plant exploration techniques: understanding the links between *ex situ* and *in situ* conservation and the work of a botanic garden, and introducing plant biodiversity.
- school environmental programmes: to tell children and students that we really face a serious environmental crisis and thus attitudes toward natural resources and nature have to change to have a safer future; that the future of humankind rests with youth. These, programmes include "School gardens' planting", "Slide and video shows", and "Nature club formation".
- interpreting garden designs and systematics: developing a system of guide panels to interpret the gardens, particularly offered for university students.
- the need for interpretation: leaving messages to public that all life depends on plants; programmes include guided tours, exhibitions, printed materials, information labels, and site specific interpretation.
- training of guides: staff and volunteers' training, extending the reach of conservation education efforts.
- plants in danger: introducing threatened plants, informing people that biodiversity loss is a real danger, and stimulating them to participate in conservation actions.
- nature appreciation through conservation education: acknowledging that the success of any conservation efforts will depend on people's concern and awareness. Programmes include "The reforestation project".

Summary

Bogor Botanic Gardens, in collaboration with the UNDP, have started to establish biodiversity education centres in Indonesia. Bogor is also working with the Royal Botanic Gardens Sydney on a project to protect *Amorphophallus titanum* and use it as a flagship for promoting conservation in Sumatra. In order to be successful, a wide range of stakeholders, both nationally and internationally, are needed to participate in the development and implementation of the programme. Education in botanic gardens will be used as the 'programme approach' since it offers the best guarantee of ownership, commitment, and the sustainability of results after completion of activities. We believe that together we can do something better.

Acknowledgements

Funding from the United Nations Development Programme enabled Didik Widyatmoko to attend the Congress. Thanks to Mr. Kishan Khoday for assistance and support.

References

Botanic Gardens Conservation International (1995). *Roots* . Issue 10 'Exhibitions'. BGCI, Kew, UK.

Botanic Gardens Conservation International (1994). *Environmental education in botanic gardens guidelines for developing individual strategies*. BGCI, Kew, U.K.

Botanic Gardens Conservation International (1996). *Roots*. Issue 13 'Science'. BGCI, Kew, UK.

Indonesian State Ministry of Environment (1996). *Agenda 21 Ifsent*. Indonesian State Ministry of Environment, Jakarta, Indonesia.

Children's gardens: an international partnership using the Internet

Loïc Ruellan

Conservatoire Botanique National de Brest, Brest, France

Introduction

From October 2000 to June 2001, the Programme 'Jardins d'enfants' (Children's Gardens Programme) brought together 350 children from the French city of Brest and its ten twinned towns from all over the world. The aim of this programme, which focused primarily on urban green spaces, was to raise schoolchildren's awareness of biodiversity and urban ecology, as well as to widen their cultural outlook and stimulate their imaginations, their observational abilities and aesthetic awareness.

The Internet proved the best available tool to communicate from one continent to another, to make acquaintances and to exchange views. During the course of the school year, the children constructed a model of their ideal garden, and then got together in Brest in June 2001 to set up the plan of the twinned garden.

The roots of the project

In the previous year (2000), a similar venture involving a partnership between the Conservatoire Botanique National de Brest, an artist (Gaëlle Kéroullé), environmental staff from wildlife societies and City Environmental Services, had been undertaken with two primary schools from Brest. This first effort was so successful that Gaëlle Kéroullé decided to develop the scheme on an international level. The aim of the scheme was to involve schoolchildren from Brest and from the 10 towns twinned with Brest.

Supported by the City Council member responsible for twinning, the education team set up an association entitled 'Jardins d'enfants'. This enabled us to obtain funding specifically for the programme and to employ Gaëlle Kéroullé as coordinator for a full year. Once every month or so, the Brest education team met to assess the progress of the programme.

Children living in towns often have limited access to, and limited knowledge of, the environment. This was why we focussed on urban green spaces as the framework for this initiative, since all towns have their own open spaces, which often offer the only bit of nature in the neighbourhood where children can play and express themselves freely. The idea was to show the children that this place they regularly go to can prove a stimulating place for discoveries, once conditions are provided for doing so.

The scheme started by asking the children to illustrate their best memory of nature. This enabled their teachers and educators to get an idea of the way the children perceived the natural world as compared to their urban environment, as well as how to assess their achievements at the end of the programme. In Brest as well as in the ten twinned towns, the principle was to have each one of the classes concerned work throughout the year on one particular urban green space near their school, studying it successively from different angles, under the supervision of educators with different specialities. For instance, the two classes from Brest tackled the following themes:

- The creation and maintenance of an urban green space, with the gardening staff of the city.
- Wildlife, with an educator from a local wildlife trust.
- Plant biology, with an educator from a scientific society.
- Native and exotic trees and plant threatened by extinction, with an educator from the Conservatoire Botanique.
- Energy sources (e.g. photosynthesis, wind and hydraulic power), with a science teacher.
- The artistic and amusement approach to green spaces, with an artist.

In the course of these sessions, the children were able to grasp the concept of urban green areas, and their understanding of these was broadened and diversified. About the middle of the year, it was possible to ask them to prepare a plan for a recreation and play ground.

Children join in the game

Having grasped various concepts relevant to urban green spaces, the children could then draw up the maps for their ideal garden. The conception of these gardens by them, and most importantly, for them, drew on their unlimited imagination. In this way, urban spaces gradually appeared on paper under various names: "prehistoric corner", "the colour garden", "the tentacle garden"; playgrounds such as "the bouncy hills", "the orientation garden" or "the live plant labyrinth"; and also some poetical spaces such as "the beautiful grove", "water reflections" and "the peaceful garden".

In order to conceive these gardens, children searched by themselves for information about the building materials, the objects, the plants and the animals which they wished to have in their spaces. They could also ask their various educators for more information via the Internet. For instance, Audrey wanted a prehistoric corner with owls, The Conservatoire Botanique provided her with a list of plants, which have for long existed on the earth such as ferns, conifers, magnolias, and amazing plants such as gunneras. The wildlife educator gave her hints as to how to attract owls and have them nesting in her garden. From these suggestions, the children picked out species which they preferred, and which were also compatible with each another.

When their garden spaces were clearly defined, the children joined together to assemble these in a common plan and thus create the class garden. With the help of the artist and their teacher, the pupils built a small-scale model of their ideal garden. The classes of the ten twinned towns worked along the same lines as the two Brest forms.

Internet: communication and exchanges

The classes were told about the Children's Gardens scheme in October 2000. They sent their applications to enter the scheme and presented their class and their town. This information was put on the Children's Gardens web site and the text translated into French and English.

In November, a first 'cyber-meeting' took place to enable the children to exchange ideas and this proved a success. Every two months or so a news-letter entitled *Turdus News* was sent to all partners involved in the programme, recounting what was being done and how things were progressing in the eleven towns. A second "cyber-meeting" took place in May 2001 so as to prepare for the June meeting in Brest between the twinned towns.

The Internet proved the ideal tool for the children to exchange information and, as the web site developed, to follow the progress of the project, and to maintain the interest of the participants.

The Brest meetings

The meetings that took place in Brest between the child ambassadors involved all the other people concerned as well.

Although these meetings were an opportunity for amusement, the children had an important target before the end of their stay: to design the plan of the twinning garden which may one day be set up in Brest.

A whole day was needed to achieve this result:

- In the morning, the children from each twinned town chose the elements they preferred from the different plans drawn up by their comrades from the other towns, and which they wished to retain in their working draft (Fig 5).
- In the afternoon, each one of the groups presented their proposal and a wide debate was organised in order to select the elements to draw up the final model. This step was particularly arduous since the discussion had to be simultaneously translated into five different languages so that everyone could

understand what was going on and express their own view. But we were not building a tower of Babel and we did manage to accomplish this step and design the final model for the twinned garden.

The next day, the children coloured the map of the twinned garden and displayed their model in the town hall of Brest (Figs 3 and 4). At the end of the day, the city councillors opened the exhibition, presenting the different twinned towns and the models built by the children. There, the children officially offered the plan for the twinned garden to the city councillor responsible for twinning. The wish that everyone expressed was that one day the map may serve as the basis for the creation of a real garden in Brest.

But the children were not in Brest only to work! This was above all a wonderful opportunity for children aged from 10 to 15 from strikingly different cultural backgrounds, to meet, play together and discover our town and our way of life. Amongst other lively events in the course of that week, they will remember

- A big discovery trail in a wooded park (Fig 2).
- The unveiling of the models and the official opening at the Town Hall (Fig 4).
- The meeting with the city councillors.
- The evening party, in a youth hostel.
- The twinned garden celebration party itself.

The twinned garden party

On the eve of the children's departure, a big party was organised in a public park close to the Town Hall, in order to open this twinning project to the whole population of Brest.

This pleasant afternoon ended with the child ambassadors planting a young oak to celebrate the meeting and to consolidate the twinned garden project. Oak acorns were offered to the authorities of the twinned towns so they could plant them in their respective countries. These acorns were to be the living symbol of the generous sharing that marked this scheme, and the duration of the relations it established between children of different cultures.

Whether for the children from Denver or those from Saponé, this twinning focussing on environment education enabled children and educators to exchange and develop ideas about and deepen understanding of nature, and of ways to enjoy and acquire these notions through an approach, which was both scientific and imaginative. The Internet made this possible and proved fruitful for all.

This experience also showed that it was possible to bring together children from different origins, cultures and mother tongues and to have them work on a common project, stimulating a desire both to discover and to share with others. The games, the exchanges, and the debates raised by this meeting in Brest will certainly leave their marks, as the smiles, the laughter and the bright eyes clearly indicated.

Today, the Internet site and the oak planted by these emissaries in the heart of Brest bear witness to the wonderful scientific and cultural success that the meeting produced. Let us hope that this simple and generous action may inspire new initiatives and nurse the desire to bring people together and discover more about each other and the natural world, which surrounds them.

Acknowledgements

I would like to thank Gaëlle Kéroullé for the initial proof-reading, and Frantz Hopkins for the translation of this text.

Fig 1 Visit to the Brest Conservatory

Fig 2 Discovery trail

Fig 3 Plymouth's garden model

Fig 4 Exhibition at the Town Hall (Constanza's model in foreground)

Fig 5 Creation of the collective plan

Setting up a new education department – developing strategies and forming partnerships

Chris Millican

National Botanic Garden of Wales, Llanarthne, Carmarthenshire, Wales, UK[1]

The National Botanic Garden of Wales opened on 24th May 2000, and has welcomed over 500,000 visitors, including over 30,000 learners to the education programmes. It is a £43.6 million project, built with funding from the Millennium Commission; £21.8m was raised from private and public sources in order to draw down an equal sum from the Millennium Commission. Now open, the Garden receives no grant in aid, and must raise revenue to cover all aspects of its operation. It is situated in rural West Wales about one hour's drive from the capital city of Cardiff.

The Education Department provides programmes for three main groups of learners – school pupils, students of further and higher education and adults (accredited and non-accredited courses). We have built a variety of partnerships in the years prior to and since opening, to enable us to offer a wide range of courses to a large number of learners.

Partners include county councils, through the local education authorities, Education Business Partnerships, local schools (in both the state and private sector), other educational establishments (further education colleges and universities), charities, environmental education groups, museums and private sponsors.

Putting a strategy in place

When planning any new provision, there are three critical issues to consider: the audience you wish to target, your unique selling points and how to publicise your activities.

Who is the audience?

My remit on this was clear – the Garden was committed to provide plant and sustainability-based education for schools, colleges and universities and adult learners.

From discussion with other educational providers, it was clear that it is reasonably easy to attract large numbers of primary school children (aged 7–11), but harder to bring in other ages, particularly older students, and that most want to visit in the summer term. It was therefore necessary to develop strategies to attract older pupils and to spread visits over the year.

A year before opening there had already been interest from universities who had brought students to see the estate and the ongoing building work. Without additional marketing there were regular requests for guided tours, talks and lectures on a variety of topics – ecology, botany, sustainable development, architecture, landscape architecture and engineering. The only group targeted directly were students in teacher training, as I felt that these would be a good source of return visits with pupils.

In lifelong learning it was clear that there were many providers seeking funding from a relatively limited pool. The situation was made more difficult, since funding for further and higher education in Wales was undergoing a major reorganisation. From a pragmatic point of view it made sense to work with existing providers to offer accredited courses – allowing us to use their accreditation procedures, administration and marketing systems, whilst setting up courses purpose-made for the Garden.

In addition to formal education, I planned informal learning opportunities – holiday activities for children and families and Family Fun Weekends based on seasonal themes.

What unique features do you have to offer?

The most obvious answer is plants, but I also wanted to attract groups for whom this would not be an initial selling point, so it was important to think of the wider advantages of a visit to the Garden. These included:

[1] Now at Field Studies Council, Orielton Field Centre, Pembroke, Wales, UK

- an inspirational environment, both natural and man-made, which could act as a stimulus for work across the curriculum
- national curriculum-linked programmes taught by Garden staff for early year groups (3–5 years), primary pupils (5-11 years), secondary pupils (11–16 years), and post-16 students (A-level and GNVQ)
- plant collections from around the world and guides who could bring these alive for students. This could support the teaching of an area of the syllabus they found difficult
- a variety of buildings and landscapes: some dating from the eighteenth century, others using the latest technology in their design and construction
- a distinctively Welsh experience, including bilingual teaching and materials as required
- a safe, enclosed site with good teaching facilities, suitable for all-year-round visits.

What is the most effective way to tell them what you have?

Without doubt the most effective marketing tool for schools was a teacher-training day, focusing on a particular school programme. This attracted teachers who may have heard of the Garden, or even visited before, but usually had very little idea of the educational facilities on offer. A high percentage of teachers attending training days went on to book visits for their pupils – this worked equally well with class teachers and head teachers. During the first two years, over 1000 teachers attended training days like this.

Before we opened in May 2000, I sent a booklet to all schools in Wales which set out the curriculum-linked programmes available and detailed the bookings procedure. This ensured that when the general publicity surrounding the opening of the Garden was at its height, schools had the information they needed to plan a visit. An updated version of this booklet has been sent to all schools, and to named teachers who have brought pupils on visits or attended training days with us, each year at Easter time.

The yearly mailing of the booklet was supplemented by brochures sent to local schools (within a one-hour travelling distance), to remind them of seasonal events e.g. Science Week activities, Japanese Week. This normally resulted in a flurry of last-minute bookings.

In addition to this, I wrote articles for newsletters, for company magazines e.g. those of the Garden's sponsors and for specialist magazines such as *Primary Geographer* and the *Times Education Supplement*. Wherever possible we publicised our activities through the local media, making sure that there was enough topical information to make it useful to them.

Lifelong learning courses were publicised via leaflets produced three times a year. These were sent directly to members, made available to visitors and distributed via libraries, partner educational establishments etc. In a reciprocal arrangement, the National Museum of Wales sent our leaflets directly to all of its members. Whenever possible an editorial piece in the local press would give information about the range of new courses on offer.

First steps– setting up the schools programme

It seemed most sensible to concentrate on a small number of areas at first, and to build on these once we had feedback from schools. I initially decided to work with three topics:

- Plants in Action – plants in the science syllabus
- Wonderful Water – habitats and ecology, making use of the Water Discovery Centre
- Everyday Choices – a sustainability trail on the site, linked to science and geography.

Carmarthen and Ceredigion Local Education Authority had committed £20,000 per year for the development of programmes and in-service training of teachers; this was to be taken as staff time and costs associated with development of materials. In total, they funded advisor time, the costs associated with releasing teachers from school (for meetings, to prepare work, and to bring pupils for trialling), transport costs for trialling and the translation of materials. There were several benefits for the Authority: the opportunity to influence

programmes, teacher development, free visits for pupils, and reduced charges for teachers coming on subsequent teacher-training days.

Once materials were prepared we planned teacher-training days based on each of the programmes. All of our training days followed the same format, based on three sessions:

- A tour of the Garden for teaching staff – this familiarised them with the resources on site, and helped them to plan how to use their free half-day with pupils
- A pupils eye view of the visit – teachers would spend 2 hours following the same programme that their pupils would experience when they visited
- Pre-visit and follow-up work: a two-hour session helping teachers to put the visit into context. This included suggestions for prior knowledge needed and consolidation work for pupils back in school, as well as cross-curricular links and ideas for resources.

These teacher-training days were advertised in the Local Education Authority training list sent to all schools. There were several advantages to this: the courses had the approval of the LEA and were endorsed by advisors; schools could transfer the cost from their training budget rather than having to pay cash; and the cost of the course was reduced to schools as part of the deal with the LEA. These factors ensured a healthy take-up of courses, resulting in subsequent school visits. The major benefit was that teachers were well prepared for the visit, and had planned the work as part of an extended teaching period, not a single day.

Following the same planning format, provision for schools has been extended to include:

- Plants and Health – using the Physicians of Myddfai exhibition
- Paths to Maths – a teacher-led pack for primary and secondary levels
- Step Back in Time – exploring the 18th century heritage of the Garden
- A Very Special Tree – focusing on literacy and the Japanese Garden
- Art at the Garden – a teacher-led pack of activities for primary and secondary pupils
- Building the Garden – technology-based visits for secondary pupils
- Genetics at the Garden – using the plant collection in the Wallace Garden
- In addition to this all-year-round programme, there are seasonal activities designed to spread visits across the year.

Lifelong learning – reaching out

A botanic garden should provide a stimulating environment for people of all ages to extend their learning. We sought to offer a variety of formal and informal learning opportunities to increase inclusion, and to attract a wider range of participants.

Initially we focused on working with existing providers who wanted to offer courses at the Garden. These were accredited courses lasting up to 30 weeks and likely to attract learners already involved in formal education. We have now run accredited courses in three subject areas and have a group of over 70 students regularly attending.

In addition to this we planned a number of independent, non-accredited courses, mostly lasting one or two days. The main aim of these courses was to appeal to new learners, with some providing access into longer courses. Many were skills rather than knowledge-based, and all were designed to be fun. The take-up of these courses was very strong, with some being repeated to meet demand. Examples of the most successful include Herbal Medicine, Willow Weaving, Local History, Practical Gardening and Ikebana.

In order to meet the needs of family groups and more casual visitors to the Garden, we developed a number of informal learning activities throughout the year. These included hands-on science sessions during school holidays, rainforest workshops, links to national events e.g. Big Garden Birdwatch with the Royal Society for the Protection of Birds, Family Fun for Science Week, and a themed Japanese Weekend. Since opening, over 2000 visitors have taken part in workshops, and many more have been involved in drop-in activities.

Working together – benefits for all

For a partnership to work in the long term, there must be benefits to both sides. Through careful negotiation we were able to set up a range of partnerships, resulting in successful ongoing relationships. Although the key to agreement included funding, it was more often important to establish what outcomes both sides wanted from the partnership, and to retain as much flexibility as possible in the early stages. This section gives a flavour of some of the partnerships established over the last three years.

Educational partners

These included:

- Local education authorities in programme development and teacher training courses
- Education Business Partnerships – funding teachers to come on training days, organising teacher placements at the Garden to complete specified pieces of work e.g. planning and delivering A-level technology day and GNVQ Leisure and Tourism day
- General Teaching Council – funding the secondment of a bilingual secondary science teacher for 12 weeks for teacher development
- Local schools – free entry for pupils trialling or involved in publicity for new programmes; opportunities for pupils to carry out work experience or voluntary work in a variety of departments e.g. horticulture, education, visitor services
- Special needs students at a local college involved in long-term work e.g. woodland area cleared and replanted, leading to cross-curricular work in languages, numeracy, art, technology. This resulted in a national award for the college involved
- Tertiary colleges and universities delivering accredited courses on site e.g. botany, botanical Illustration, flower painting. Most of these are unique to the Garden and take advantage of the special resources of the site
- Royal Society of Chemistry funds 'Science and Energy Days' twice yearly. Primary pupils have a lecture locally, and spend half a day on site in hands-on activities
- Science Week funding to pay for the development of a new programme 'Energy for Everyone' and the launch event for Wales Science Week 2002.

Commercial partners

These included:

- The Principality Building Society provided money for the renovation of the Lifelong Learning Centre; Welsh Water funded the building of the Welsh Water Discovery Centre. These are the main teaching areas for education activities on site
- Companies donated IT equipment and scientific equipment for schools' use
- Companies sponsored Family Fun Days and the development of new school programmes
- Science and Plants for Schools (SAPS) paid to train the Education team to deliver their training days. The resulting teacher in-service training days at the Garden have been very popular, and raised awareness of how plants can be used more effectively in school teaching.

Partners offering indirect advantages

These included:

- A university-based distance-learning module in Welsh about the Garden. We benefited from a superb teaching resource accessible to large numbers of students
- The Welsh Curriculum Authority commissioned a teaching resource for primary school geography, partially based on the Garden. We provided background information for the finished materials, which were provided free to every school in Wales. This raised awareness amongst pupils and teachers, and has resulted in a number of visits from schools who have used the case-study in class

- Participants taking the Duke of Edinburgh Gold Award can opt to carry out the residential component at the Garden. They volunteer for a week in various departments across the Garden. This has generated very positive publicity across the UK
- The Youth Hostel Association offers pre-booked packages to their visiting schools – this helps to publicise our programmes across the UK with schools who are visiting Wales, but might not have considered a visit to the Garden.

The Garden has succeeded in its main aim of attracting the three major groups of learners (Table 1).

Table 1 Learner groups

Periods	School pupils	Other educational groups	Teacher-training	Lifelong learners	Total
May 2000 – Mar 2001	6260	963	534	1283	9040
Apr 2001 – Mar 2002	9671	1546	550	3413	15180
Apr 2002 – Aug 2002	5116	922	62	338	6438
	21047	3431	1146	5034	30658

Further to this, we have spread groups across the year using a variety of special events and seasonal activities (Table 2).

Table 2 Percentage distribution of learner group visits

Period	School pupils	Other ed groups	Teacher training	Lifelong learners
April – July	39.6	21.5	45.7	26.9
Aug – Nov	22.3	40.6	53.1	38.6
Dec – March	37.1	37.8	1.2	34.5

Collaboration has reduced the duplication of programmes and resources, and has helped to fund our unique programmes. We have 18 curriculum-linked schools programmes, have run 60 teacher-training days and over 50 courses for adults. This breadth and variety would not have been possible without successful partnerships with others in the education sector and beyond.

Partnership project on environmental education for primary school teachers and children at the Kodaikanal Botanic Garden, India

S. Seeni[1], Lucy Sutherland[2], Julia Willison[2] & V.S. Manickam[1]

[1]St. Xavier's College, Palayamkottai, Tamil Nadu, India.

[2]Botanic Gardens Conservation International, Kew, UK

introduction and rationale

That India is a land of teeming millions is known to many; but it is also a land that of vast resources, the conservation and utilization of resources being closely linked to the social and cultural diversity of the people. The country ranks tenth among the plant-rich countries of the world and fourth among the countries of Asia. Nearly 70% of the population live in over 576,000 villages and the villages are mostly located close to the known centres of biodiversity–the Himalayas in the north and the Western Ghats in the south. In the post-independent period in particular, the rich bioresources of the country were injudiciously exploited and depleted at an alarming rate, due to such compounding factors as uncontrolled population increase (current rate 2.3% per annum), illiteracy, poverty, increases in the income and material needs of the people and a lack of awareness and trained manpower for reap maximum benefits through value addition. The current deforestation rate is in the order of 27000 hectares a year, while forest-degrading activities such as grazing, fires, wood collection, tree-felling, human habitation and the over-collection of minor forest produce continue unabated. All the elements of nature, namely land, water and air, are polluted to various extents and the greatest challenge ahead is providing access to safe drinking water. The cost of environmental degradation in India is estimated as US$ 10.0 billions of which the loss of groundwater and the degradation of water quality alone accounts for US$ 5.7 billions and soil erosion due to forest depredation for US$ 2.7 billions. India figures among 28 countries that are steadily losing biodiversity and face severe environmental imbalance unless conservation measures are taken on a war footing.

Among the various biogeographic zones of India, the Western Ghats in peninsular India are unique. A 1600 km- long unbroken chain of hills extends along the west coast from Kanyakumari in the southern Tamil Nadu to the Tapti river in Gujarat. As a mega-endemic centre, they comprise a number of hotspots of endemic species and are a home to at least 4000 species, of which 1500 (37.5%) are endemic. These totals represent nearly 75% of the total number of species endemic to the whole of peninsular India.

The southern ranges of the Western Ghats, comprising the Nilgiris, Palnis, Anamallais and Agasthiamalai, consist of certain unique evergreen forests called 'shola'. They play a distinct ecological role and their species find many uses. Both the Nilgiris and Palnis, being important tourist destinations, are under severe pressure from human settlements, commercial plantations, power projects, fuelwood collection and other tourism-related developments. The landscape of the Nilgiris has changed vastly due to human activities; the forests of the Palnis, although they still retain partially the glory of the past, have recently been subjected to all sorts of theats. Despite the widespread recognition of these changes, awareness of the importance and value of the native flora and natural vegetation is still limited at the local level. Nearly 50% of the people in Tamil Nadu State are illiterate and most illiterate dwellers inhabiting the fringes of the forests make a living by the injudicious collection and sale of forest products, including firewood, medicinal plants, wild edibles and fruits, and by the rearing of domestic cattle which gaze on the forest land. Fortunately, largely due to free education and midday meal schemes introduced by the local government, the children of these rural dwellers attend primary and middle schools. An opportunity therefore exists to influence the stake holders – the schoolchildren and their parents – about conservation and the sustainable use of natural resources through environmental education programmes at primary level.

The Darwin project *People and Plants: Training Darwin Mentors*, a collaborative venture between BGCI and the Kodaikanal Botanic Garden (KBG), was launched in June 2001 in five districts of Tamil Nadu (Fig.1) which border the Western Ghats. It aims to impart environmental education to the masses through the primary school teachers and children and through the latter their parents. The two-year project is expected to

create and strengthen grassroots support for efforts to protect the remarkably diverse flora and vegetation of the Western Ghats region in general and of Palni Hills in particular.

The main target group of the project is schoolchildren via their teachers. It is based on the premise that children in the age group 5–12 are most receptive to newer ideas and easily motivated to develop concern for others and to lead an environment-friendly life in the future. The primary and middle level teachers, otherwise equipped with training and newly gained knowledge of environmental education through the project, will certainly influence the children to adopt new life skills and awareness and this will no doubt have an influence on their parents. As such, the project will contribute to developing a younger generation which will refrain from an exploitative mode of life and look upon plants as precious resources of immense wealth which need to be preserved and judiciously and scientifically utilised for the very survival and prosperity of their fellow-countrymen. Thus the project will have a real and lasting impact on the capacity of India to meet its obligations under the provisions of the CBD.

Objectives

The main objectives of the project are:

- to train teachers in environmental education and for them to use the KBG as a teaching resource.
- to promote the KBG as a model for the development of community and school botanic gardens throughout Tamil Nadu.
- to develop an educational and interpretation strategy for the KBG.
- to highlight the value of native flora and habitats for supporting sustainable development, for example, by drawing particular attention to plants valuable as fuelwood, medicine, timber, wild foods and fruits, fodder, tourism, and by promoting models and practices for the wise and sustainable management of such plant species.
- to organise a number of workshops and training courses.
- to develop teachers' kits and posters useful in environmental education and training.

The need for partnership and networking

The Kodaikanal Botanic Garden is a two-year-old private conservatory garden started with lofty ideas and limited resources in a 100-acre area at Eettippallam (1500 m^2) 10 km from Kodaikanal town in the Palni Hills. The Government of India's Ministry of Environment and Forests extended financial assistance to fence the area and also to establish a living collection of over 200 ferns, palms and orchids. Previously the site had been a barren plantation area infested with *Pteridium aquilinum* and *Lantana camara,* together with a disturbed area of natural forest harbouring more than 40 medicinal plants and trees of ethnobotanical importance.

The idea of organising a series of environmental education training courses for capacity-building for teachers was first proposed in July 2001, but there was no response. The local school groups, as well as those from the plains, largely ignored the Garden as they had better alternative tourist attractions in and around Kodaikanal town. Advertisements in the local newspapers of the project area (Coimbatore, Dindigul, Theni, Madurai, Tirunelveli districts) for prospective teachers interested in participating in the courses proposed for early 2002, evoked a poor response. Less than 20 out of the 200 teachers needed responded. Then it was decided to approach the Christian school managements known for imparting quality education in the region to release the teachers from their schools. Although the managers of the schools were impressed with the Darwin project and the proposed training courses, the school teachers were less enthusiastic about their participation without duty leave granted by the State Elementary Education Department. None was interested in participating in the courses during weekends. Ladies, who formed the majority of the teaching staff in the primary schools, showed no interest at all, as they would be separated from their families during the training period. Interestingly though, the teachers from 18 schools which the Project officer visited cooperated with him in completing a questionnaire meant for testing their aptitude and knowledge in biodiversity-related matters. They were all of the opinion that this was the first time that a well structured

course had been offered to them. We had to tread cautiously to mobilise 200 teachers for the environmental training courses, and considered that an order from the government was essential.

Obtaining permission from the education authorities to release the teachers from the public and government-aided private schools was not even considered at the beginning. As the authorities were entangled in bureaucratic bottlenecks we were afraid that a request from us would be very time-consuming and annoying. But there was no alternative. It was a bit of learning and experience for us in the corridors of power. At least five visits had to be made to the office of the Director of Elementary Education at Chennai to pursue the matter and finally, the order to release the teachers from the five districts was issued in January 2002. The District Elementary Education officers acted immediately on the copies of the order personally handed over to them by the Project Officer. However, the selection of the teachers by the Assistant Elementary Education Officers (AEEOs) in nearly 50 school unions of different districts was somewhat slow and the training courses scheduled for February 2002 had to be postponed for a month. The selection of fairly large number of teachers from the Palni Hills area in Theni and Dindigul districts was assisted by such NGOs as Literates Welfare Society, Theni, Ideal Trust, Genguvarpatti, Palni Hills Conservation Council, Kodaikanal and Primary School Teachers Society, Dindigul. The Sacred Heart College at Shenbaganoor was also a helpful partner and acted as a host to the training courses. Since the training course included visits to forest sections, the State Forest Department had to be contacted for the necessary permission and assistance from forest guards. Eventually what was initially conceived as a simple selection of teachers from Christian schools proved to be a ccomplex operation that involved the education authorities, school managers, school teachers, NGOs and the State Forest Department. The Project officer played a major role in establishing contacts and networking. Given the conditions, but for the networking of the various partners needed at different stages of the process, the fruition of our efforts into a series of training courses organised in March would never have been realised.

The much needed support extended by these institutions and welfare groups included the provision of classrooms, accommodation and boarding facilities, facilitating visits to various forests segments in the Palni Hills, the selection and release of teachers and on-site demonstrations. The Palni Hills Conservation Council briefed the participants of the training course about the work that they had done in seed propagation and multiplication of endemic and economically-important trees of the shola forests. It need not be said that at least some of the NGOs and other self-help groups who worked in tandem with the Project were expected to play a significant facilitative role in taking the message down the line to the village communities. For many of these partner organisations, this kind of training, which they had not previously used, helped to broaden their knowledge and enabled them to modify their existing methodologies in tune with the needs and aspirations of the students and communities at large. Their role in organising participatory programmes and awareness campaigns in the villages, establishing school gardens and generating a 'green wave' for the future planting of trees in the rural panchayats, was crucial in realising the objectives of the Project.

Environmental education and training for capacity building

The series of three-day environmental education training courses took place in March 2002; 180 out of the 200 teachers selected from the five districts participated (Table 1). As expected, men outnumbered women teachers. Altogether there were 8 training courses, each offered to a batch of 20-30 teachers. The course programme was tight scheduled and consisted of presentations on global and regional environmental problems, environmental education definitions, areas and types of environmental education, the role of botanic gardens in furthering the cause of environmental education, interactive discussions, explorative and creative components, activities and games and self-evaluation of the course. The role of botanic gardens in the conservation of rare plant species, the promotion of community education and sustainable horticultural practices and the development of plant based activities were subjects practically new to the Indian school teachers. So also were the types of environmental education dealing with human activities, human capacity and the creative and social aspects of sustainable living (education for sustainability), biodiversity conservation and management Other new topics were sustainable utilization (biodiversity education), the nature and quality of human developmental activities including the power centres and provision of skill and different thinking (Development Education) and inducing the students to explore alternative causes of their future (Futures Education).

Course no.	Teachers' originating district	Male teachers	Female teachers	Total
1	Tirunelveli	17	9	26
2	Theni	18	-	18
3	Theni	15	5	20
4	Dindigul	24	2	26
5	Dindigul	20	8	28
6	Coimbatore + Dindigul	11	20	31
7	Madurai + Dindigul	18	7	25
8	Kodaikanal	1	5	6
Totals:		124	56	180

Table 1. Numbers and origin of participating teachers in March 20002 courses.

The teachers found the objectives of environmental education in generating awareness, knowledge, skill, attitude and participatory tendency very instructive. Although the existing curricula for primary- and middle-schools touch upon some environmental problems and aspects of biodiversity, there is no doubt that they do not emphasise the functional interdependencies within ecosystems, and do not motivate the teachers or the students to get involved in problem-solving. At the end of the courses the participant teachers were obviously convinced of the need for renovating the present education process to provide a broader understanding of current environmental problems and socio-economic and developmental needs. Establishing a link between the past and present-day activities of man and the consequences of his current actions for tomorrow, should sensitize young minds to think differently and take environmentally-responsible decisions to build a better tomorrow. As against the major problems of the environment in the contemporary world, environmental education helps individuals to develop a shared vision for biodiversity protection and sustainable living.

All the activities and games used in the training courses were enjoyed. It was a rewarding experience for the teachers to work in groups to understand hitherto unfamiliar concepts and to debate issues in order to arrive at a consensus. Unlike the stereotypic one-way flow of bookish information currently in practice, these activities and games by their very nature helped the teachers and children learn through participation and interactive discussions. The games used included 'The photosynthesis game', 'Indicators of successful city', 'Seed survival race', 'Island biodiversity game' and 'Food web and Food chain'). They enabled the participants to understand the natural sequence of events in a process and human-induced irreversible changes, including the extinction of species and sustainable living. The activities ('Botanical bazaar', 'Global tramlines', 'Compass Rose' Sambar making and 'How may plants have you used today? greatly helped them to understand the structure, function and value of biodiversity and to stimulate their creativity in discussion.

The activities and games were an eye-opener to the teachers, as the examples used were all local and few resources were needed to use them. This makes them suitable for schools in developing countries like India. At the end of the courses, both teachers and children invariably takes home a message as well. For example, the teachers were astonished when they learned that the ingredients used in the South Indian Sambar preparation were essentially of plant origin from different parts of the world. In yet another activity, the teachers were given options to prepare layouts for herbal, ornamental and rock gardens and select the types of bed and plant species to suit them. All these activities eventually help the children to develop a positive and scientific frame of mind towards others, mould their personality and character at a tender age and probably prepare them to find solutions to challenging and chronic environmental problems of the day.

Follow up of training in capacity building

A distinctive feature of the Kodaikanal environmental education training courses was the assured follow up. This comprised training of the fellow teachers back in the schools by the Darwin mentors already trained at KBG and other associated activities, such as the organisation of school visits to KBG and natural forest segments, the establishment of school gardens, participation in remediation efforts in polluted environments, afforestation and other environmentally-friendly activities. This second-level training and associated activities, as our experience shows, have truly galvanised the support of the public for the environmental education related activities of the teachers and the school children in various unions of the districts. These localised efforts were organised under the guidance of the respective AEEOs; they attracted the attention of prominent members of the local communities including municipal chairmen and presidents of the village panchayat, vaidyas, forest range officers, NGOs and Devaswom Board members. They contributed to the strengthening of the networking and grassroot-level partnerships. A rapport already established by the Darwin mentors with all those who matter in certain unions truly reflects the massive changes that are taking place slowly but steadily.

So far 48 Darwin mentors have trained 371 fellow teachers in their own and nearby schools in 9 unions in Tirunelveli, Madurai, Dindigul and Coimbatore districts (Table 2). It should be noted that a single lady teacher from Vasudevanalloor union in Tirunelveli district has organised training for 16 other teachers; 6 teachers from Palni union in Dindigul offered training to 150 teachers of the union. Each training session lasted for 1 or 2 days, and comprised lectures by the mentors and project staff, activities and games. The expenses for organising the training including meals or refreshments were met from contributions of local individuals, businessmen and NGOs. In order to encourage school groups to establish herbal gardens, medicinal plants were freely distributed by the Project staff during all the second-level training programmes (Table 2).

Districts	Unions	No.of Darwin trainers (mentors)	No. of teachers trained
Tirunelveli	Tenksi	9	41
	Vasudevanalloor	1	16
Madurai	Tirupparankunram	5	23
	Vadipatti	8	39
Dindigul	Chanarpatti	4	25
	Natham	5	23
	Reddiar Chatram	5	32
	Palni	6	150
Coimbatore	Udamalpet	5	22
	Total:	48	371

Table 2. Second-level training courses.

Apart from the training courses, the mentors had also started several other related activities to spread the environmental message to the public. Both the ICC Convent and St. Andrews School at Coimbatore and Roman Catholic school at Tenkasi have now established school gardens with the help of their schoolchildren. quipped with the training he received in early March, Mr. Chellappa, a headmaster and

manager of a Hindu Middle School at Thirukkurungudi in Tirunelveli district, organised a visit of his schoolchildren to the Kodaikanal Botanic Garden. The children replayed the environmental games on the lawns of the Sacred Heart College. He had also provided a plant to each house in his village and these plants are being watered and reared by students from his school. This has motivated the public to plant over the vacant plots in the village. Mrs. Sivakami of the S.M.M. Middle School in Vasudevanalloor union had not only planted trees in the school yard but also organised school visits to the nearby Sivagiri forests. She had also organised an Environmental Campaign on World Environment Day on June 5 when the schoolchildren went in procession carrying placards and shouting slogans through the streets of the village. Another lady teacher,Mrs. Santhakala, along with other mentors from Palni town had successfully influenced the AEEOs, municipal authorities and Devaswom Board officials to organise meetings, debates and cultural events to impress upon them, the need for curbing the use of plastics in this pilgrimage centre. Henceforth plastic is banned in the town and the shop owners and hotelkeepers now pack up articles sold in used newspaper. In response to their repeated appeals, the municipal authorities have also arranged trucks to clean the rubbish collected in all the schools of the town every day.

Mention should also be made of the excellent work done by Mr. Veerapathra Babu of Chanarpatti union and Mr. Dhanapal of Reddiar Chatram union, both in Dindigul district. On 14th March, Mr. Babu organised a tree planting programme in association with the Malappuram Cricket Club; the Panchayat President, Mrs. Dhanajayarani, school students and village communities participated and 225 tree saplings were planted in barren areas of Guziliamparai village with the help of the students (Fig.4). On this occasion the Panchayat President liberally donated Rs.1000 towards providing an irrigation facility for the planted area. Regular maintenance is being looked after by his students. Mr. Babu is overflowing with infectious interest and confidence in to pursue his personal tree planting activity in other parts of the union, using saplings provided free of cost by the State Forest Department and the Palni Hills Conservation Council. On Independence Day (August 14) he organised another function in which two tree saplings were supplied for each school in the union. He was largely responsible for organising the second-level training for 25 teachers in his union. Apart from developing a herbal garden in his school, he is currently preparing a book on environmental education, with details of water harvesting, organic farming, ozone generation and environmental games for distribution to other schools. Mr. Dhanapal of the Panchayat Primary School at Gurusanapatti is similarly enthusiastic; he not only organised a school visit to the Kodaikanal Botanic Garden but also brought environmental education to his school children through cultural events including dance, songs and drama. In one such dance organised in the presence of BGCI's Education Officer Lucy Sutherland, his children worshipped a tree with devotional songs. In addition, with the help of his fellow teachers, the headmaster and the students, he has planted 30 saplings of gooseberry, *Pongamia* and neem in the school yard, for which barbed-wire fencing has been provided with the assistance of the local AEEOs and an youth club. Enthused with the support received from the Community, he is optimistic that within 2–3 years the saplings will develop into a shady area for schoolchildren and village folk alike.

Best of all, the mentors from Tenkasi union organised a meeting in August at Kattu Bava School, Tenkasi, where a decision to register a Darwin Environmental Education Society was unanimously taken. The Society's objectives are to network with school groups in all the five districts, organise model genetic gardens for medicinal plants for demonstration and training and promoting organic farming and sustainable health. The mentors from Palni, Natham, Udamalpet and Reddiar Chatram unions have already lent support to this idea, with the initial establishment of the societies in their own unions, before starting to networking with all the societies of the unions in different districts.

The last of these training camps was organised at the Panchayat Middle School in the Pannaipatti village at the foothills of the Palnis by the mentors of Reddiar Chatram union in Dindigul district, where partnership was displayed at its best. The mentors, together with the school headmaster and teachers, had worked for at least two weeks to give a facelift to the school and prepare beds and planting materials for a small garden in the school premises before the one-day training for fellow teachers could be held in September 2002. This camp was qualitatively different from others, as the local village community leaders, Panchayat President, the chairman of a welfare group (Annai Trust), and the AEEOs not only contributed to organise the training but also participated in a opening ceremony and a tree planting programme where the need for environmental preservation and sustainable uses of plant resources of the Palni Hills were emphasized again and again. It was a grand event by any standard as 37 participating teachers, including the mentors, community leaders, officials from the Education Department and about 300 schoolchildren, took an oath that they will preserve forests and trees and never resort to injudicious exploitation of the Palni Hill flora. A mark of respect for Mother Nature and a shining example of partnership indeed! And inspiring a younger generation to play a

responsible role in building a better tomorrow. Besides, grassroots support was readily available or asking! On this occasion the children themselves had prepared placards bearing messages on environmental preservation including the importance of the ozone layer and topsoil, tree planting, hygiene and sanitation in the villages and the need for using local medicinal plants for primary health care. A headmaster from the nearby village read out the songs he had composed in appreciation of the diverse uses of easily available medicinal plants. The mentors had also organised a poster presentation with newspaper clippings on local environmental problems, the eradication of illiteracy in the area; the relationship between local people and plants and the strengthening of local health traditions. There were also writings on a blackboard projecting the importance of Palni hills and the local trees and herbs. Both the Project Coordinator and Project Officer participated in the tree planting event and distributed tree saplings and medicinal plants donated by the State Forest Department to the villagers andschool children. They also addressed the audience assembled in the school on global environmental problems against the background of the recently-concluded Earth Summit at Johannesburg.

The above-mentioned efforts were only some of the shining examples of work done by the 180 teachers trained at Kodaikanal.

Human beings being the most diverse beings of all, and the circumstances being different in each district and even in the unions within each district, it was only natural that not all the mentors gave the same kind of dedication and commitment to organising training for fellow teachers. This was expected, as the project managers had not had any say on their selection for training and their selection by the local AEEOs, which was not based on any quality criteria. Therefore their participation and the absorbing interest shown in capacity building notwithstanding, not all of them could organise formal training for the benefit of their fellow teachers back in the schools. However, at an informal level, as part of subject teaching in school or through chats over cups of tea or during travel in the bus on their way to the school or back home, most of them had passed on the contents and relevance of environmental education to other teachers and the students. Some mentors, including Mr. Chellappa, were school headmasters and were very busy conducting examinations and the admission of the increased number of children to be enrolled as part of the new education policy (Sarva Shiksha Abhayan) introduced during the current academic year. It was not surprising therefore that they cited the short period of time available as a reason for not organising the training programmes, although they had done other things at informal or formal levels. The teachers of Theni district in particular, were less responsive than others, despite several contacts made by the Project officer. In certain cases the mentors were well prepared, with the list of interested teachers to be trained, but the local AEEOs could not release them for reasons best known to themselves. At the other extreme, the school managements in Coimbatore would not permit their teachers even to talk to the local AEEOs and work out a suitable strategy for training. Even official correspondence and personal meetings with the AEEOs and the headmistress in this regard did not help change their minds. It is only hoped that minor problems, albeit irritants if any, will be sorted out in the coming weeks and sound training programmes will be organised to generate overall awareness and activities in all the unions as originally proposed.

Evaluation and resource workshops

The success of the environmental education training in capacity building held in March 2002was evaluated through a second series of workshops in the following August. Altogether 99 teachers, comprising 22 mentors and their trainees, with more women than men, participated in four workshops of two days each. A questionnaire-based evaluation revealed that the impact of the environmental education training at school level was shown in activities such as the maintenance of cleanliness in the classrooms and school premises, planting activity within the school campuses, the transfer of newly acquired knowledge to the students, new knowledge about local plant resources and the exhibition of native plant species of medicinal and economic importance. In certain cases it was a two-way learning process, as teachers found new uses for local plants with the help of the children and their parents. However, by and large, the impact of the training at community level was only marginal, considering the period of examinations, summer vacation and new school admissions that followed the training courses and the relatively longer period needed for interaction with local communities.

The teachers of these workshops also evaluated the contents of a proposed resource book on medicinal plants. Each batch of teachers was divided into 4–5 groups and each group discussed and evaluated certain activities in the draft resource book. The objective was to improve the quality of the presentation of each

activity in order to make the book suitable for primary and middle-school-level teaching. Since most of the teacher participants in the March courses had shown interest in medicinal plants, it was only natural that a resource book on medicinal plants containing lessons, activities and role plays was compiled in the local language and be evaluated, keeping in mind the needs of the school children. Most of the teachers are now busy with the ensuing quarterly examinations and therefore additional evaluation workshops could not be organised in September 2002.

What does it hold for the future?

After the series of workshops and second-level training back at the schools, we are now in 2002 halfway through the later half of the two year project, having made significant contacts with the public school system, with appropriate partnerships and networking of teachers. Projects of this kind are seldom implemented with the blessings of the government. Therefore the singular advantage of this project is that it addresses environmental education issues to the poorest sections of society and generates awareness and actions at the grass-roots. The implementation of the project in an otherwise underdeveloped area at the foothills of the Western Ghats, that is very close to the ecologically sensitive Palni Hills, has made it all the more relevant and important to sensitize the stakeholders. With the stated support from the Department of Elementary Education today and the public at large tomorrow, we are bound to scale new heights and fully realise the objectives of the Project, perhaps with an extended period of monitoring and evaluation beyond its expiry in March 2003.

Volunteering in focus: the panoramic view

Janelle Hatherly

Royal Botanic Gardens Sydney, Sydney, NSW, Australia

Introduction

The success of the volunteer programme at the 2000 Sydney Olympic Games and the celebration of the International Year of Volunteers in 2001 have brought volunteering into sharp focus. Volunteering is no longer viewed as the domain of the middle-aged upper classes, engaged in informal charitable acts as some sort of noblesse oblige. Instead, modern volunteering attracts both males and females, of all ages and from all walks of life, who are likely to be in full-time employment and committed to an interest. The changes in volunteering have come about to a large extent through changes to society. This paper examines the reasons for some of these changes and the challenges faced by organisations wishing to build volunteer support groups.

A volunteering past

Volunteering has a long history. As far back as the 1800s volunteers from the emerging social classes of Western Europe and North America engaged in charitable activities. Social boundaries were defined by grouping individuals into those who provided assistance and support to those who were needy. The next two hundred years saw a progressive evolution towards more established volunteer programmes, providing a social context where volunteers got together to serve a common good. For example, Australia has a long and distinguished history of volunteering organisations. A number of these, such as Rural Fire Service and Surf Lifesaving, are up to one hundred years old and have iconic status. There are also many 'unsung heroes' such as the Smith Family (78 years old), Meals on Wheels (established 1957), the New South Wales State Emergency Service (45 years old), and the Parents and Citizens' Federation of New South Wales (79 years old). Botanic gardens also have a long association with volunteering. Many regional botanic gardens were founded by volunteers united as 'Friends of the Garden'; and volunteer guides have been interpreting living collections to visitors for many years. Volunteer guiding began at the Royal Botanic Gardens Sydney as far back as 1978.

Traditionally, volunteer groups were perceived to be made up of older retired members of society or the non-working partners in single-income families (that is, females).

Today's volunteers

The Sydney Olympic experience in 2000 brought volunteering 'top of mind'. Volunteers were vital to the Olympic and Paralympic Games; over 62,000 people contributed service in this way. These events, the biggest peacetime projects on Earth, provided a contemporary snapshot of who volunteers are and what is involved in recruiting, training, managing and retaining them. This was followed in 2001 by the International Year of Volunteers, which made society at large even more aware of the extraordinary contribution volunteers make. Volunteering gained formal recognition as a social identity.

On reflection:

- Today's volunteers are males and females, aged between 15 and 80 plus, are likely to be in full-time employment and are generally committed to an interest or worthwhile cause.
- Regarding recruitment, if expectations are aligned with reality, attrition is low.
- Although volunteers, by definition, are unpaid, they are not free. All costs need to be properly assessed before launching new schemes to use them.
- Formal volunteer programmes require sound management structures and established policies, guidelines and procedures.

- Volunteers are entitled to expect and deserve to be given good management, clarity about what they are being asked to do, training and support.
- Recognition is an extraordinarily powerful motivational force that ensures continuing commitment.

Far from purely 'doing good', today's volunteers are motivated to rally together for a common cause, often for a short duration, for the satisfaction of working with others and to have a sense of contributing to the bigger scheme of things. They also embrace an opportunity for work experience and skills acquisition.

So why have these changes come about? We live in rapidly changing times. Social, cultural, economic and technological changes have led to an erosion of traditional forms of workplace and community. There used to be a clear distinction between work and home; males found their identity as breadwinners and females as nurturers. Nowadays equal numbers of women and men are in the workforce and both share family responsibilities. Adolescence is prolonged and there is an increasing ageing population. People are retiring earlier and for longer. Also, work practices have gone from 'jobs for life' to more flexible 'serial careers'. Learning has become an ongoing pursuit and flexible working arrangements are becoming the norm. It is increasingly difficult to separate work time from learning and leisure time.

As societal groupings are eroded, many more people are living alone or in isolated family units. They look to volunteering as a meaningful way of sharing activities and creating a sense of belonging. The boundaries between play and work are blurring as skilled people look for ways to connect with each other. This may be through their children's activities, common interests or in support of a worthy cause.

Volunteers of tomorrow

It seems likely that tomorrow's volunteers will be of all ages, will be available to contribute at various times of the day and for varying periods of time. They will come from all walks of life, from both the community and the corporate world. They are likely to be highly skilled and will seek meaningful involvement.

So, what does this mean for botanic gardens and the volunteer programmes they currently run and might run in the future? The challenge will be to 'fit the job to the volunteer' rather than 'the volunteer to the job'. Unless receptive to the changing motivations of volunteers, botanic gardens risk losing dedicated contributors to existing programmes as well as not attracting new ones.

The mission statement of many botanic gardens involves raising community awareness and appreciation of plants and the natural environments. How better to achieve this than by directly involving the community in mutually beneficial activities? Volunteering is an ideal way for botanic gardens to become an accepted voice in the community rather than being perceived as irrelevant institutions separated from people's daily lives.To stay in step with worldwide societal trends, botanic gardens must encourage community input into organisational decision making and service delivery. This may require swinging existing organisational cultures around from ones that view volunteers as an additional workforce to ones that value volunteers as audience advocates and active citizens. It needs to be understood that volunteers are vital links between the organisation and the community and therefore need to be integrated fully into organisational structures. Only then will paid staff not feel threatened by volunteers 'taking over their jobs' but will appreciate that volunteers create opportunities.

In the end, the winner is a healthy civil society.

List of further reading

Australia. Bureau of Statistics (1997)**.** *Australian Social Trends Work – Unpaid Work: Voluntary Work* Canberra, Australia.

Hollway, Sandy (Chair, NSW Advisory Committee for the International Year of Volunteers) (2001) *Speech to Volunteering NSW Dinner* to launch IYV.

http://www.communitybuilders.nsw.gov.au/builder/volunteering/holloway.html

3. **CVS report in association with Demos** *Giving Time: Volunteering in the 21st Century,* http://www.csv.org.uk June 2000

Henry, **Elaine** (2001). *IYV Forum: Volunteering - The Olympic Legacy "Applying the Lessons" (2).*

http://www.communitybuilders.nsw.gov.au/builder/volunteering/vol_social_ent.html

A guide to good guiding – in 12 easy lessons

Barbara Boyle

Royal Botanic Gardens Kew, Surrey, UK

Introduction

I am the Volunteer Guides Co-ordinator at the Royal Botanic Gardens, Kew. I would like to talk about a project which the guides initiated this year: they produced a video called 'A Guide to Good Guiding - in 12 Easy Lessons'. I had hoped to bring it with me to show at the Congress but unfortunately it is still in the 'post-production' stage. However, as I believe that the process itself is as important as the result and as it illustrates the very special group of guides we have at Kew – their commitment, energy and talent – I will describe it briefly, explain why it was made, what the guides have already achieved and what they still expect to achieve. Finally I will put the project in the context of the volunteer guiding programme at Kew.

Most of the Kew guides were involved in the production. One of the guides who worked in TV production before he retired was the scriptwriter, producer, director and chief cameraman. The rest of the film crew and cast were all volunteer guides. They got together on a number of occasions in August and September 2002 and completed the filming. We had a budget of £20 for the whole project – not vast in Hollywood terms. There was no problem securing the cast and crew. The volunteer guides were delighted to participate and there was, in fact, considerable competition for the starring roles.

What is it about?

It's about guiding skills. Each of the following 12 headings introduces a brief scenario. Each scenario illustrates a simple but important message. All together they illustrate the pleasures of guiding at Kew, such is the rich and fascinating history of Kew and its unsurpassed collections. They also illustrate the pitfalls of guiding at Kew – such as the planes passing overhead every minute on their descent to Heathrow – and, of course, the unpredictable British weather!

1. Be prepared
2. Assess your group
3. Structure you tour
4. Take account of the weather
5. Signpost your tour
6. Take control of your group
7. Face your group
8. Speak clearly
9. Address the entire group
10. Not too much detail
11. Be prepared for the unexpected
12. Keep to the facts.

The video starts on a serious note, moves into comedy and ends in farce. It is meant not only to instruct but also to entertain. And that is, after all, what good guiding is all about.

Why was it made?

For a number of reasons. Firstly as part of the Kew Guides anniversary celebrations, which have been taking place throughout 2002, the 10th anniversary of guiding at Kew.

10th anniversary celebrations

These include:

- A celebration lunch
- A presentation to the Kew Mutual Improvement Society (an educational organisation run by students on the Kew Diploma in Horticulture course and staff from the Gardens)
- Themed 'Personality' tours
- A Grand Charity Tour.

In July 2002 it was hoped to stage a Grand Charity Tour – a 'tourathon' – or guiding relay around the entire 300-acre site, but it became bogged down in a logistic quagmire and the project was abandoned. I sensed the guides' disappointment and suggested that, instead, they make a video. I knew they were capable of this as they had produced a video nine years previously.

At present (2002), there are 35 volunteer guides at Kew. Since the volunteer guiding programme began 10 years previously, there have been 3 intakes of guides to replace those who have dropped out along the way and also to increase the size of the team. Remarkably, 11 of the original group are still guiding, 10 years on.

The first year of volunteer guiding at Kew was such a success that the Education Department decided to increase the team. The original guides felt that, although their induction training had been excellent on the history, science and collections of Kew, it was somewhat lacking on guiding skills. So when the recruitment process began for the second intake of guides, the first group produced a video based on their experiences, and presented it as a training tool for the second group When, 10 years later, it came to making a new video, the guides decided to redo and improve the original video, using guides from all three intakes.

The video was made for the following reasons:

- To keep the guides happy
- To celebrate their 10th anniversary of guiding
- As a training tool for the next intake of guides
- To present to the 5th Education Congress in Sydney.

What has already been achieved?

I think, in this particular case, the proof of the pudding is as much in the making as it is in the eating. Without even having the video ready to show, much has been achieved by its production:

- A way of promoting the solidarity of the 3 intakes of guides
- An exercise in team building
- A social occasion
- The incorporation of new ideas about good guiding l learned over the years
- An opportunity to use and appreciate the talents of others in the guiding team
- A learning experience.

What has yet to be achieved?

When the video is finally ready to be shown, it will have achieved the following:

- It will be a memento of the team's 10th anniversary
- It will be a welcoming gift for the new batch of guides
- It will act as an internal training tool
- It will be a training video for a wider audience.

How does the video fit into the guiding programme at Kew?

The answer is that it doesn't really. It is not a component of the guiding programme. However, it is a very important component of the *volunteer* programme. Where there is no monetary remuneration there has to be some other form of reward and recognition. The making of the video fits into something broadly defined as 'pastoral care'.

Guiding programme at Kew

All this extra activity, not only for the production of a video but also for the 10th anniversary, was in addition to a very full guiding programme, which included.

- Gate tours
- Booked tours
- Themed tours
- Festival tours
- Handling sessions
- Discovery Bus tours

The Kew Guides also do 'roving' sessions in the great glasshouses, write special 'tour'-style articles for the *Kew Magazine*, maintain their own library and slide collection, give lectures both in and outside the Gardens and organise their own Guides mutual meetings where they exchange information to improve their tours and develop new ones.

Conclusion

I hope that my talk has illustrated what I said at the beginning, and what I particularly wanted to bring to this Education Congress, and that is that I am fortunate indeed to lead a very special team of Volunteer Guides. They happily put much more into their volunteering than is required of them and consequently we have been able to develop a rich and complex guiding programme. I have worked in the voluntary sector for 15 years and I have never met anything quite like them. The Kew Guides are passionate about Kew, passionate about guiding and passionate about 'connecting with plants'.

Volunteering in focus: the broad picture

Carolann Walach Baldyga

Fairchild Tropical Garden, Miami, Florida, USA.

Overview

At Fairchild Tropical Garden, volunteers provide more than 35,000 hours of service each year. Volunteers can be found across the Garden supporting staff by doing a range of work including skilled and unskilled duties. More than 400 individuals participate on a regular basis each year. When the people who volunteer only at our annual Garden festival are included, we can add 900 more to that number.

The Volunteer Services Program at Fairchild had its beginnings more than 17 years ago. But the earliest members of the Garden, which was established in 1938, considered themselves to be volunteers. Their membership and donations funded Garden operations. They organized a Garden festival, called the Ramble, to raise funds by selling plants, old books, antiques, and other items to members of the community. This tradition has continued for 64 years, and funds raised help to support Garden operations.

Volunteers support paid staff but do not replace them. The volume of work required of a volunteer is less than would be needed to create a paid job, or the demand for the type of work they do may be infrequent. However, sometimes the volume of work assigned to a volunteer increases to the level that it is necessary to develop a paid position to provide constant and consistent support.

The Fairchild school field trip program began as an ambitious volunteer project 22 years ago. Known as the Fairchild Explorer Program, it was created and taught by three women who were members of the Garden. The plan was straightforward. They wanted to share with children the love and interest they had in plants. These women were parents, and one of them had some teaching experience. After creating a field trip program with advice from teachers, they marketed it to school officials, teachers and neighbours. As the demand for the program increased, a staff position was created to manage and expand it in cooperation with local schools. Today, two staff members manage and teach the field trip program with assistance from 35 volunteers. From this beginning, the Education Department has grown to include programs for students of K -12 grade, teacher training and adult education.

As a non-profit charitable organization, Fairchild Tropical Garden would not be able to conduct the variety of activities and provide service to its visitors without the combined work of staff and volunteers. Their assistance ranges from leading school field trips, driving the tram, answering phones, greeting visitors at special events, assisting at plant sales, working in the nursery, the herbarium, the library and archives, assisting in the cafe and gift shop, and designing posters and brochures. Fairchild volunteers contribute their many skills and experiences to the Garden. Their reasons for volunteering vary. Some just like to be outdoors, or want to learn about plants. Others want to work with our science staff. Some volunteers find that in a botanical garden they are likely to meet new friends. Still others just enjoy the satisfaction of doing something worthwhile.

Organization

The Volunteer Services Program established 17 years ago has five components: recruitment, selection, training, management, and reward. The program has benefited from having the leadership of a dedicated staff member. Oversight of a volunteer program requires responsiveness to volunteer interests and needs, mediation of difficulties that may arise, and maintenance of volunteer records for service recognition. Attention to the volunteer program increases as the number of volunteers increases. Staff members who supervise volunteers benefit from the support of a full-time Program Director who can focus on finding the best volunteer to fill a specific need.

Recruitment

The Volunteer Services Director is responsible for recruitment, which takes several forms. The Director attends community events such as Earth Day, garden club meetings and community events where persons interested in the natural environment are likely to participate. Presentations are made to civic organizations. Invitations are extended to corporations, secondary schools and universities that encourage community service among their employees or students. These volunteers can be more difficult to accommodate because employees often want to work as a group, and students have less time to volunteer than adults. Informal recruitment takes place in social settings and whenever there is an opportunity to tell people about volunteer opportunities. We do not urge too strongly. If an individual is interested in committing time as a volunteer once they are aware of the program, they will take the next step and contact the Garden.

Recruitment also occurs throughout the year as a scheduled Fairchild activity. At least twice each year, announcements in the *Miami Herald* and other local community newspapers invite residents to volunteer at the Garden. Throughout the year the press highlights volunteers who make significant service contributions to the Garden and to hospitals, museums, children's sports clubs, and other charitable organizations, so residents are aware of this activity. Volunteering is an accepted and encouraged form of community service, though not everyone does it. Staff members who seek volunteers must prepare a job description that the Volunteer Services Director uses to interview applicants. Developing the job description helps staff focus their needs and plan the training, the scheduling of volunteer work hours, and to determine appropriate evaluation measures.

At a Volunteer Open House prospective volunteers meet staff, learn about their needs for volunteers, and tour the Garden and Research Center facilities. Typically about 75–100 people attend. There is a slide presentation of volunteers at work in several Garden locations. Garden staff members who seek volunteers make brief and enthusiastic presentations to promote the benefits of volunteering with them. Training opportunities and other benefits of volunteering are explained. Garden membership is urged. There are displays with information and photos of volunteers enjoying their assignments or participating in a social event. Seasoned volunteers may also attend the recruitment events to assist in delivering the message that volunteering can be both enjoyable and satisfying. A schedule of training and special volunteer events is distributed. Then, volunteers are encouraged to speak to staff and sign up.

All volunteers must complete an application form. Volunteer applications resemble job applications in that they ask about work experience, education, special skills and emergency contact information, in addition to name, address and phone number.

Selection

The Volunteer Services Director interviews all applicants to determine their interests, skills, likes, dislikes, and preferences. A volunteer may then be matched with an available job. There is great diversity among applicants. Some wish to learn a new skill and others hope to apply what they are already able to do. Some can only volunteer one morning each month, others can volunteer one day each week or are available only on weekends. Sometimes an applicant wants to do a job for which they are not suited. We try to find an appropriate match between the applicant and staff needs. When that is not possible, the applicant may be encouraged to try us again in the future. The staff person who will supervise them, and who will make the final decision about the assignment also interviews applicants. This is the person who created the job and will have a close working relationship with the volunteer. We do not create jobs just because a person wants to volunteer. That would be too taxing for staff. Sometimes it is difficult to turn a volunteer away, but if we cannot match their requirements and skills to a job that needs to be done, the best option is to thank them for their interest, encourage them to participate in Garden activities, and perhaps return in the future.

Ultimately, the selection of a volunteer and decisions about the schedule and duties are the responsibility of the staff supervisor to whom the volunteer will report. The supervisor records the hours worked by the volunteer. The Director of Volunteer Services maintains the annual record of volunteer service hours. Volunteers who have accumulated 100 hours of work in one year are eligible for free or reduced admission into an adult education class. Each year volunteers are honoured at special events at the Garden.

Fairchild volunteers come from all walks of life. We strive to make the volunteers representative of the demographics of our community. Volunteers are retired professionals, businesspersons, teachers, winter

residents, housewives, skilled workers, plant enthusiasts, and students (Jacobson, 2001). Our more difficult task remains to attract as volunteers people who speak fluent Spanish or French/Creole and Portuguese. These languages are spoken by an increasing number of residents of our community. Indeed, more than 50% of our local population and many of our visitors speak Spanish. Fairchild has in recent years added staff members who speak several of the languages that are spoken locally, and we do have speakers of Spanish, French and other languages among our volunteers. We are addressing the challenge of recruiting African Americans to our volunteer program. African Americans are not as attracted to volunteering at the botanical garden, though they are very active in other cultural institutions in our community (Falk, 1993), so we anticipate that we will be successful. Our Volunteer Services Director meets with members of all community groups to communicate about available opportunities and to learn about how best to make volunteering at Fairchild attractive to them.

Training

At Fairchild Tropical Garden, we invest in training for all volunteers. They are informal Fairchild ambassadors, and we know that they will speak to others about the Garden. We want them to have accurate information and to feel confident representing the Garden.

The *Volunteer Handbook* is distributed to each volunteer. This document is modelled on our employee handbook. It provides clear and updated information on the opportunities, expectations, rights and restrictions that pertain to volunteers. It covers absences, policy regarding persons with disabilities, use of computers, dress code, drug use, visitor relations, horticulture and collection policies, safety, sexual harassment, smoking, emergency procedures, insurance and other topics.

All volunteers are required to take four Core Courses. Instructors for these 2-3 hour sessions include the Garden Director, the Director of Horticulture, university faculty and other experts. Core courses are central to understanding the history and operations of the Garden and the environment of the South Florida region. Topics include the history and governance of the Garden, its collections, its landscape design, the plants and environments of South Florida, and the focus of Fairchild's conservation and research activities.

Each new volunteer also receives on-the-job training. Depending on their service assignment, they may learn about propagation techniques, how to weed, vouchering herbarium specimens, entering data on the Fairchild Virtual Herbarium website, providing membership and visitor services information, maintaining library collections, assisting with sales in the gift shop or providing support in an office.

Volunteers also serve as interpretive guides on the tram tours for school field trips and for walking tours. They also assist instructors in our adult classes and help with office duties. Education assignments require content knowledge, gained through courses such as basic botany. Many guides begin with only a limited knowledge of plants. Some who have recently moved to South Florida know nothing about tropical and subtropical species.

Volunteers who become interpretive guides may serve in the Fairchild Explorer Program for students in kindergarten 5th grade. There are four curricula offered and each guide is trained in one curriculum and encouraged to cross-train in at least two others. Cross-training allows a guide to fill in for someone who is temporally unavailable. Each year 9,000 students and their teachers participate in hands-on, inquiry-based programs. They come in busloads of 40–60 students with their teachers and chaperones. Interpretive guides divide them into manageable groups of 10 or less, so we need 5–7 guides each day. Volunteers also assist staff in outreach to schools and community groups, travelling on the Plant Mobile. Guides drive the tram and provide an interpretive tour of the 83-acre Garden. Tram tours are conducted daily every hour from 10:00 a.m. to 4:00 p.m. every day except Christmas Day. Tram guides also offer tours for special groups. Other interpretive guides provide in-depth walking tours of the Fairchild collections during our busy winter season. Three education staff manage these volunteers and two staff members (one full-time and one half-time) are responsible for the school tour interpretive guides; a half-time coordinator manages the tram tour and walking tour guides.

Peer training is very significant in the success of interpretive guides. All guides receive a guide manual, printed resource materials and teaching aids to study in preparation for conducting interpretive tours. Their success is positively influenced by observation of experienced guides who serve as role models (Mortan 2001). Each guide begins by shadowing other guides. This is followed by conducting part of a tour or

activity, and progressing as skill and confidence are gained. Messages about the importance of plants in our lives, the fragility of the natural environment and the importance of conservation need to be communicated by botanical gardens; training the volunteers who deliver those messages is a very important responsibility. On-going assessment of guide performance is accomplished through peer review, staff observations and visitor reports. Focus groups are conducted with guides to evaluate effectiveness of our programs and to contribute to the development of new programs and activities (Grinder, 1985).

Management

A successful volunteer program requires effective and sensitive management. Many gardens cannot devote a staff position to management of volunteers, but whenever possible it is recommended. This staff position can focus on recruitment, placement, and helping other garden staff to work successfully with volunteers. Staff members who supervise volunteers benefit from the support and leadership of a colleague who develops policies, conducts recruitment and who has the broad view of volunteer service through participation in professional associations. Staff supervisors need to focus on the work the volunteer performs. They also need to be effective in everyday interpersonal relations with the volunteer and the commitment to work with volunteers takes time. A simple gesture, like asking about the volunteer's family, remembering a birthday, or bringing fruit or baked goods to share is appreciated. Listening to stories about the volunteer's life and sharing our own stories can be as important to a volunteer as conversations about plants, garden activities and conservation issues. Volunteers want to feel that they are included in the Garden community. Working with volunteers can be a mutually rewarding experience.

Reward

The Friends of Fairchild is a volunteer organization that promotes social events among volunteers and staff. Each year, a lunch is held for which volunteers prepare their favourite foods for staff. At a Volunteer Appreciation event, we recognize their individual accomplishments, attendance records and longevity of service. Together we dine on culinary specialties prepared by staff. At other Garden events, such as our annual meeting, the service of volunteers is acknowledged to the larger Garden community. The Friends of Fairchild have undertaken to raise funds for design and installation of an Italian mosaic at the Fairchild Visitor Center, an initiative that will give Fairchild volunteers prominent recognition for all visitors to see. Volunteers are invited to attend Garden lectures and seminars and they offer suggestions for Garden activities and invite their friends and neighbours to become members. They also identify businesses that can provide services or contributions to the Garden. And volunteers communicate with others about conservation and environmental issues. They are an invaluable resource.

Summary

When we reflect that volunteers contribute more than 35,000 hours of work at Fairchild Tropical Garden each year, we realize that without them it would be financially extremely difficult to accomplish many things that are important to us and which are recognized and appreciated by members and visitors. Volunteering enriches the lives of those who volunteer and volunteers make significant and valued contributions to the Garden.

References

Falk, John H. (1993). *Leisure decisions influencing African American use of museums.* American Association of Museums, Washington DC, USA.

Grinder, Alison L., McCoy, E. Sue (1985). *The good guide: a sourcebook for interpreters, docents and tour guides*. Ironwood Publishing, Tucson, Arizona, USA.

Jacobson, Debra (2001). Playing on the TAG team: how local experts enrich our science center's offering. *ASTC Dimension*. July 2001 issue.

Mortan, Simone (2001). Meaningful contributions: the role of training in the volunteer experience, *ASTC Dimensions*. July 2001 issue.

What learning? What theory?

Katherine Stewart

Royal Botanic Gardens Sydney, Sydney, Australia.

Introduction

One of the questions we ask ourselves as botanical garden educators is: what is the impact on school students of an excursion to a botanical garden? There are many factors that compete for the attention of students during the short length of time they spend visiting our venues. The social aspect of being with their friends and the myriad possibilities of incidents that may take place on the journey to and from the venue are two areas that could be uppermost in students' recollections of their excursion. What place does learning have in students' recollections and what is the nature of learning that happens in a botanical garden?

Research tells us that the learning of factual information – like the learning that would take place for a test, does not appear to be a major component of students' learning in museums and science centres (e.g. MacKenzie & White 1982) or in natural environments (e.g. Knapp 2000; Knapp & Poff 2001). Indeed the literature clearly demonstrates that if students do recall factual information after their visit to these venues then this information is often incorrect. However research literature is conclusive about the idea that excursion experiences form long-lasting memories, as summarised in the findings of a study of by Falk and Dierking (1997):

> *"These findings strongly suggest that museum field trips – regardless of type, subject matter, or nature of the lessons presented – result in highly salient and indelible memories. These memories represented evidence of learning across a wide array of diverse topics."*
>
> *(Falk & Dierking 1997) p.216*

Falk and Dierking's research methodology was unable to determine how closely these long-term recollections related to the original intention of the teachers organising the excursions. Hence it is difficult to explore the relationship between a memory of an event and intended learning. As the authors point out: "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" (p212).

This paper presents research findings that uncover relationships between the learning intentions of teachers organising excursions to the Royal Botanic Gardens Sydney (RBGS) and students' long-term recollections of their excursion. We explore these relationships to build a description of the nature of the learning that can happen in a botanical garden. This work can then be compared to learning theory that has been applied to learning in museums.

This research has resulted in a set of guiding principles for school education programmes in botanical gardens; they will be discussed elsewhere. A number of implications for the design, presentation and maintenance of plant displays and environments in botanical gardens used specifically for educational purposes will also be explored in the Conclusions section.

The study

The methodological approach adopted in the study was to seek a wide range of descriptive accounts of the excursion experiences of teachers and their students who visited the RBGS. From this data would emerge generalisations and from these generalisations theory relevant to the study could be generated. This methodological orientation was informed by the grounded theory approaches put forward by Glaser and Strauss (1967).

A range of both qualitative and quantitative techniques contributed to the building of a description of the event for both teachers and students. Approximately 60 teachers and over 400 students from primary and

secondary schools were interviewed and/or surveyed, either at the RBGS and/or at their school. Case studies of one infant, three primary and three secondary schools that had visited the RBGS on excursion were conducted. The infants class and two of the primary schools were visited seven months after their excursion.

One of the secondary schools included in the study had a long history of excursions to the RBGS and provided an opportunity to interview students up to two years after their excursion – as well as to interview students before and after their excursion. A junior secondary boys school was involved in surveys on the day of their excursion and a co-educational secondary school yielded interviews with teachers and students two weeks after their excursion to the RBGS.

Results and Discussion

Teachers' expectations for their excursion to the RBGS

The expectations held by classroom teachers organising the excursion to the RBGS were investigated by asking them the reasons for their excursion and the learning outcomes they held for the event. Table 1 shows the results of a survey item asking teachers why they chose to bring their students to the RBGS.

Table 1 Teacher response to written survey question: 'Why did you choose to bring your students to the RBGS?'

Response theme*	**Total = 42**
Excursion relevant to classwork	69%
RBGS as the excursion venue	57%
Excursion as a teaching tool	40%
Student experience	26%

* Denotes multiple responses to this survey item.

The results indicate that over two-thirds of the teachers responding to the survey item were concerned that that the excursion be relevant to the unit of work that they are studying with their students. Griffin and Symington (1997) promote the use of a museum visit as part of a group of teaching strategies associated with a unit of work currently being studied by school students. They cite studies that report that "students who have done work on a topic at school before visiting a museum and who have prepared for their visit, learn most from their experience" (p.765). Furthermore, other researchers conclude that specific learning outcomes can be achieved on excursions when classwork is linked to the excursion experience (Orion, Hofstein, Tamir & Giddings 1997). It appears that teachers visiting the RBGS are concerned with learning and specifically learning that is relevant to their current classwork.

A further survey item canvassed teachers' opinion of how far the excursion to the RBGS could achieve the learning outcome that they desired from it. Teachers' responses to this item demonstrated that they were concerned with content – or what their students would learn – and with the learning processes that their students would experience at the RBGS. Table 2 illustrates the content of the learning outcomes stated by the teachers involved in the survey.

Table 2. Content focus of teachers' outcomes for their excursion to the RBGS

Content focus*	TOTAL
Plants	48%
Aboriginal people & their use of plants	27%
Environments at the RBGS	18%
Other aspects of the RBGS	18%
Develop & practise skills	10%
General outcomes (no statement of content)	11%

Learning outcomes relating to the scientific study of plants were required by the majority of teachers responding to this survey. Close inspection of these plant-related outcomes (Table 3) indicates that they form a clear, well-articulated 'syllabus' for the study of plants in a botanical garden. The results indicate a clear association between the RBGS and study of plants.

Table 3. A teachers syllabus of plant-related outcomes

Kindergarten – Year Two	Year Three – Year Six	Year Seven – Year Ten
At the RBGS students will be able to:	At the RBGS students will be able to:	At the RBGS students will be able to:
See, touch a variety of plants and plant parts	See and feel plant first hand the plants they have been studying	See and have hands on experiences with a wide variety of plants from different groups
Identify different plant types	Look at and discuss varieties of cactus plants and their adaptations	Explore plant diversity
Recognise and show parts of plants	Identify plants native to our local area	Use microscopes
Find out how seeds germinate	Have a better understanding of rainforest plants	Observe and study adaptations of plants
Explain what a plant is	Be aware of some Australian plants	Identify plant types
Be aware of how plants grow and how to care for them	On their return to school students will be able to:	Complete a unit of work on plants
Enjoy their first look at plants	Use their understandings to establish a native garden	Understand diversity and structure of plants
		Better understand plant classification
		Better understand structure and function of plants

Interestingly, the same cannot be said for outcomes relating to the Aboriginal study of plants and to environment-related themes. Both these areas of study are recommended to teachers in relevant school documents. However the outcomes required by teachers involved in this study indicate that they do not take educational advantage of the RBGS in these areas. Outcomes relating to Aboriginal use of plants require student consideration of these plants without consideration of the cultural significance of plants in an Aboriginal life-style. Those outcomes relating the environmental considerations focus student attention on information about environments rather than learning for environments – not for the attitudinal and behavioural change outcomes embedded in environmental education.

Approximately half of the teachers involved in this survey focussed on the hands-on nature of the excursion where their students could see and touch the plants they had been studying at school. Almost one quarter of teachers wanted their students involved in investigative activities involving making and recording observations

Table 4 Process-focussed outcomes for the RBGS excursions

Process focus (multiple responses)	**TOTAL (n = 44)**
Experience-based	48%
Investigation-based	23%
Demonstrate understandings	27%
General (no statement of process)	39%

Student recollections of their excursion

The first question in the student survey asked students to write their recollections of the day. Their responses have been considered in the following two tables. Firstly, Table 5 organises the responses according to whether or not they include the outcomes required by their teachers.

Table 5. Comparison of teacher outcomes and student recollections

	School A (70 pupils)	**School B (25 students)**	**School C (17 students)**	**Totals (112 students)**
Theme related	87%	68%	100%	85%
Not theme related	11%	32%	0%	14%
Not theme related – talking about plants	9% (6 students)	16% (4 students)	???	9% (10 students)
Nil response	1% (1 student)	???	???	1% (1 student)

The results clearly demonstrate that, for the three primary schools involved in this survey, student recollections correspond to the learning outcomes required by their teachers. Furthermore, for two of these schools, students' long-term recollections relate to their teachers' learning expectations.

Table 6 Primary students' responses to the survey item: Write down what you remember about your visit to the Royal Botanic Gardens Sydney.

Responses *	School A 2 weeks later Rainforests (70 students)	School B 7 months later Rare & endangered plants (25 students)	School C 7 months later Rainforests (17 students)
Session	93%	68%	94%
Plants	63%	92%	65%
Places	69%	68%	100%
Sensory	44%	24%	76%
Animals	24%	0.4%	24%

*Denotes multiple responses

Table 6 demonstrates the nature of students' long-term recollections. The responses demonstrated that students have clear and persistent memories of their excursion to the RBGS. These recollections relate to the more traditional content-related aspects of the event. Students recalled the plants and places they had visited at the RBGS. For some students specific plants such as the Dragon's Blood Tree and the Queensland Bottle Tree were memorable, for others the lush, green plants of the Rainforest Garden remained in their memories. The Tropical Centre and Succulent Garden formed indelible memories of places at the RBGS for some students. Another aspect of these results is the students' resilient and persistent memory of their sensory experiences at the RBGS.

It is an interesting exercise to consider the aspects of the day of the visit that did not form part of students' recollections. These included other aspects of the day outside the RBGS such as details of the trip. There are no recollections about the weather – which for Schools C and A was extremely hot. Furthermore there were very few recollections of people accompanying the groups – neither parents of students nor the RBGS educator who accompanied the class.

Comparing these findings with other research, we find that students have not recalled situations of teacher-talk, but have tended to recall practical-based activities (Knapp & Poff 2000; Orion, Hofstein, Tamir and Giddings 1997; Wolins *et al* 1992). The findings also agree with those of Orion (1993) which concluded that the main role of the field trip in the learning process is to provide students with direct experience of concrete phenomena and materials.

Relating findings to theory

Definitions of learning

The results of this study demonstrate that students have learning experiences when they are on excursions to the RBGS. This learning can be described as 'experience-based' learning. This type of learning is that referred to by Dewey (1938) and by Piaget (1937). It is the result of direct, sensory interaction with real, living things. It is not the sort of learning that is required for short-term recall of factual information.

Experience-based learning involves consideration of the interactive processes of learning as well as of content. Definitions provided by the literature that best fit these findings include the following:

> *"Learning: process through which experience causes permanent change in knowledge or behaviour"*
>
> *(McInerney & McInerney 2002 p.57)*

> *"Learning is 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."*
>
> *(Falk & Dierking 1997, p216)*

The first definition is taken from a general text on educational psychology and the second is taken from the work of museum researchers John Falk & Lynne Dierking. These latter authors have added considerations of place as well as the social and emotional aspects of learning to the definition of learning provided by McInerney & McInerney. Clearly the results of this study indicate that the physical context of learning (i.e. in a botanical garden) is critical to the long-term nature of students' recollections and could be added to the first definition. The research reported in this study has not shed light on the social and emotional aspects of Falk and Dierkings' definition of learning.

Both definitions refer to learning as an active process and infer that the learner comes to the situation with prior understandings. These definitions can be said to relate to a constructivist view of learning where the learner actively constructs their own understandings, rather than a more transmission-type view where the learner is there to be filled with information. In this instance a constructivist view of learning provides a useful theory to approach conceptualising the learning process.

Constructivism

Hein (1998) proposes a framework for museum educators to consider a 'theory of education' that incorporates an exploration of the nature of knowledge (epistemology) and theories of learning. Hein proposes the 'constructivist museum' which acknowledges the requirement for learners in museums to select and create experiences that are personally meaningful. However Hein's theoretical model requires the museum educator to adopt the perceived epistemological roots of constructivism which hold the idealist position that the true nature of the world cannot be known by people. This position may not be appropriate for a scientific institution such as a botanical garden which seems to take a more realist epistemology that we 'find out' about the world rather than 'make sense' of the world.

Furthermore, Hein's model does not provide an insight into how a museum can view its own content. Indeed the dilemma of the relationship between the learner and a body of content does not appear to be addressed in a constructivist framework. Science educators, adopting a constructivist view of learning (e.g. Driver 1988) continually face the difficulty of expecting students to construct for themselves the body of knowledge that is the domain of science. However constructivism has provided educators with an orientation towards consideration of the requirements of the learner and of the understandings they bring to the learning situation.

It seems apparent that educational theory that is relevant to botanical gardens needs to involve the following:

- ways of viewing and organising content – i.e. curriculum theory
- learning theory that is relevant to the experience-based learning processes found in botanic gardens – i.e. a theory of experience
- the influence of place, which includes consideration of access to real, living plants – i.e. a theory of place
- the influence of the social context of the botanical garden and its educational purposes – i.e. social theory.

At present there appears to be no such relevant theoretical perspective. However the work of Falk and Dierking (1997) and Hein has initiated theory-building for museum education and it seems that this area may be developed over the next decade.

Conclusion

This study indicates that the plant displays of a botanical garden used for educational purposes need to be able to enhance the learning experiences of students by having the following features:

- be physically accessible to groups of students
- be robust enough to allow handling by groups of students
- have a wide range of sensory aspects such as different textures, colours, forms, fragrances
- include charismatic plants such as bottle trees, very tall trees, insect-eating plants and cacti
- use special locations for the plant display such as glasshouses.

This study also demonstrates that even the youngest students associate the RBGS with learning about plants. This clarity of association provides a focussed educational message. However when this focus changes to other educational aspects of botanical gardens, particularly plant conservation, then this change of focus needs to be made clear to learners.

The findings of this study indicate that there is a unique out-of-school learning experience for students on excursion to a botanical garden. Students are actively engaged in interacting with plants – experiences that can result in long-term memories of plants and specific places at the RBGS. These long-term memories are influenced by the visiting teacher's educational requirements and the locations and activities selected by the educator in the botanical garden.

References

Dewey, J. (1938). *Experience and Education*, Macmillan, New York, USA.

Driver, R. (1988). Theory into practice II: a constructivist approach to curriculum development in science. In Fensham, P. (ed) *Development and dilemmas in science education.* The Falmer Press, Philadelphia, USA.

Falk, J.H. & Dierking, L.D. (1997). School field trips: assessing their long-term impact, *Curator*, 40(3): p.211-218.

Glaser, B.G. & Strauss, A.L. (1967). *The Discovery of Grounded Theory*. Aldine Publishing Company, New York, USA.

Griffin, J. & Symington, D. (1997). Moving from task-oriented strategies to learning-oriented strategies on school excursions to museums. *Science Education*, 81(6): p.765-779.

Hein, G. (1998). *Learning in the museum*. Routledge, London, UK.

Knapp, D. 2000, Memorable experiences of a science field trip, *School Science and Mathematics*, 100(2) p.65-71.

Knapp, D. & Poff, R. (2001). A qualitative analysis of the immediate and short-term impact of an environmental interpretive program, *Environmental Education Research*, 7(1) p.55-65.

McInerney, D. M. & McInerney, V. (2002). *Educational Psychology*, 3rd edn. Pearson Education Australia, French's Forest, NSW, Australia.

MacKenzie, A. & White, R. (1982). Fieldwork in geography and long-term memory structure, *American Educational Research Journal*, 19(4) p.623-632.

Orion, N. (1993). A model for the development and implementation of field trips as an integral part of the science curriculum. *School Science and Mathematics*, 93(6) p.325-331.

Orion, N., Hofstein, A., Tamir, P. & Giddings, G.J. (1997). Development and validation of an instrument for assessing the learning environment of outdoor science activities. *Science Education*, 81(2): p.161-171.

Piaget, J. (1937). *The Construction of Reality in the Child*., Basic Books, New York, USA.

Wolins, I., Jensen, N. & Ulzheimer, R. (1992). Children's memories of museum field trips: a qualitative study. *Journal of Museum Education*, 17(2) p.17-27.

Changing the face of a botanic garden by tackling the concept of sustainability head on: the Cambridge University Botanic Garden and our learning curve

Robert Brett

Cambridge University Botanic Garden, Cambridge, UK

Introduction

The purpose of this paper is to give an insight into what we at Cambridge University Botanic Garden are doing to help foster an awareness of the concept of sustainability. It is, of course, not a simple straightforward task to achieve, and I find it interesting to read back over my Congress abstract to see what I initially wrote. What was I thinking when I put the title of "*Changing the face of a Botanic Garden by Tackling the concept of Sustainability Head on*." Was I crazy? Is it as easy as the title suggests? No of course not. It presents a huge responsibility and extremely difficult challenge, and it begs many questions personally and collectively as an institution. What do we mean by sustainability? How can this be achieved? And for the sceptics, can it even be achieved at all?

This paper is a presentation of our process and the constraints, difficulties and challenges that we face, particularly in our experiences in wanting to reflect and promote an ethos of sustainability at Cambridge University Botanic Garden. These experiences and our learning curve are based on the development of a Green Audit. The object of the Audit is to assess what steps the Botanic Garden has already taken to minimize negative environmental impacts and whether they are effective, and to also identify where and how we could do better.

The context

Cambridge is approximately 50 miles north of London, and although there is a huge diversity of activities in the city today, its main focus is still based upon it being a University town, the first college of which was established in 1284. Although there are writings to suggest that a garden for teaching be included in the University as early as the late 1500s, it was not until 1762 that the Garden was established in the city centre as a physic garden for teaching medical students. In 1846 Cambridge University Botanic Garden was moved to its present site of 40 acres (16 hectares) about a mile south of the city centre. Its collections now boast some 8000 different species that can give visitors an insight into the diversity of the plant kingdom. Our scientific and amenity remits involve the cultivation, curation, interpretation and display of plant diversity – the basis of all life on Earth. Over the past 156 years the Garden has functioned primarily as a garden for teaching and education; this is reflected in many of its plantings and displays. Educational plantings have been developed; they include displays that represent environmental concern such as the Dry Garden (Cambridge has the lowest rainfall in the UK). This encourages local residents to grow plants adapted to low rainfall Another display is the Arable Weed Display, which shows the connection between the increased use of herbicide sprays and the decline of arable weeds.

Why we should undertake change?

It can be seen that the Garden values a concern and interest in the environment and has demonstrated an obligation towards it over a long period of its history. We also know that our pursuit of environmental concern has to be compatible with the way we develop and the impacts that development has. We have to look towards balancing our development with our impact on the environment: in a nutshell we have to think more 'sustain-ably'.

However, the buzzword 'sustainability' represents a concept that is not simple or straightforward. We have to present many ways of tackling it. At its heart is us, people, and I believe it has to be tackled and presented in ways that are primarily of relevance to us in our local situation. Why? Well, in tackling such a concept

you are going to be faced with many questions. What relevance and meaning does this have for me personally? What will this mean for us collectively as an institution? And why should we even bother? In my opinion if you bring in the local you therefore bring in local meaning and relevance. I suppose this is somewhat a valued personal perspective, brought about from studying for a degree in Environmental and Development Education, but as I found, it is a perspective that is also commonly shared by many of my colleagues.

Finally, it is simply a view that if we wish to provide a face for the Garden that exemplifies environmental concerns, then we ought to practice what we preach. *Changing the Face of the Botanic Garden by Tackling the Concept of Sustainability head on* is fundamentally about providing a basis for change. Change from within. An environmental audit is really a useful mechanism and a starting point to look at what we do and what we can change.

The Green Audit

At the beginning of 2001 the Gardens decided to undertake a Green Audit as a way of assessing where we were environmentally. In mid-2002 (six weeks before the Congress) we started work on it! I can thank this Congress for making sure that at least that happened. We, too, have other work pressures, but what follows is an outline of the process we undertook to get the Audit started.

Our simple strategy for implementation

In order to achieve results, we really felt a need to keep things simple. We decided to first look internally at the core of the Botanic Garden. Of uppermost importance was that a strategy for implementation was needed to provide participation for all of the 46 staff across all departments, from administration to horticulture to our custodians. The inclusion of views, opinions and ideas was vital, but we also had to appoint someone as coordinator, someone who would be keen to take the task under their wing but who would also have a basic understanding of the wider issues.

It also was about looking for ideas on what others have been doing. Let's not re-invent the wheel! We initially started by collating data from other sources, such as local government audits and other useful documents. One of these was the Green Audit Kit, which was developed collaboratively between the Countryside Agency and the English Tourism Council. Although aimed at the tourist industry, it helped us to in structure our Audit and gave us useful ideas for inclusion. As we are linked to the University, of real value is the University's own Environmental Policy. This provides an all-important support mechanism. For example, the fact that the University has developed a purchasing policy gives us the ability to get help from the University and develop a purchasing policy of our own.

We then announced our intentions through a memo to all Garden staff and gave an overview of the Audit. Why? What? How? Questions. We combined the memo with a questionnaire aimed at getting a view of staff perceptions, interest and input in environmental concerns and to provide a basis for first-step evaluation. The importance here was that a memo was sent out that could then be returned – the recycle philosophy. (Copies of the questionnaire can be obtained upon request).

The questionnaire included tick box questions; for example, do you know what a Green Audit is? Yes – No, Do you recycle any of the following? Yes – No – Sometimes and do you practice at work any of the following, for example printing using both sides of paper. Comment boxes were also included, along with broader and more direct questions such as would you participate in the Green Audit? And whether staff felt that they considered environmental aspects in the work that they do?

The questionnaire provided a means for evaluation; 60% of them were returned. What we found from this simple questionnaire was that 70% of staff were generally motivated and positive towards the idea of recycling, wished to participate in the Green Audit and felt that they did consider environmental aspects of their work.

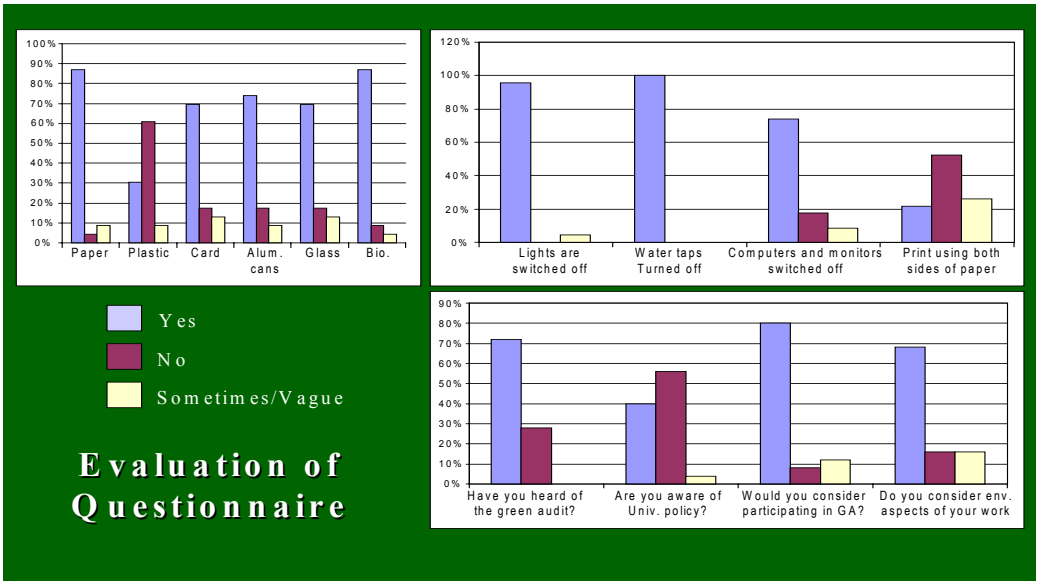


Table 1 – Evaluation of staff replies from the questionnaires

We could also see where areas for future improvement could be identified. For example, over 60% of staff do not recycle plastics, why is this? And how can this be changed? We also found that not all biodegradable material was being recycled and that over 50% of staff do not print using both sides of paper? These may seem insignificant results, but they enabled us to highlight where we are missing areas of concern and perhaps serve as starting points for future actions.

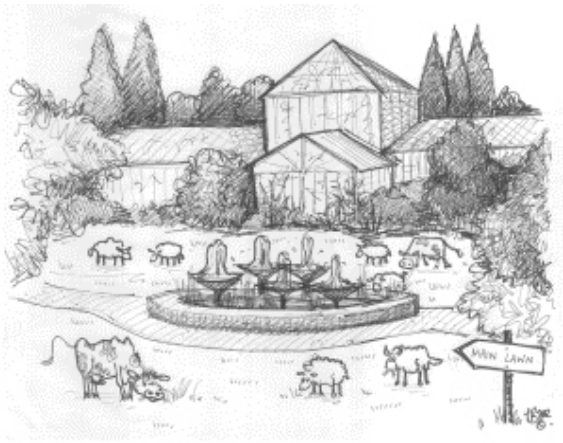


Figure 1 – Green Ideas?[1]

The questionnaire also provided a means for staff to give their ideas and say what they would like to see included in the Audit. Of course there were some laughable suggestions: for example, in order to reduce energy consumption, animals should graze the main lawn and our Tropical Palm House should be converted into an Alpine House. But there were also had good suggestions, ranging from waste minimization and reducing consumption, to providing greater educational awareness and educative displays for the visitor. It provided a useful tool to see what ideas staff actually had.

Interestingly, staff had similar views and concerns. Admittedly, some of the suggestions and questions could be viewed as 'political' and difficult to achieve, due to existing internal and external influences. For example, should the University invest ethically in its pension scheme? But these suggestions are valid and in my opinion should be incorporated into the Audit. This would provide an interesting debate.

[1] Figure 1 shows a visual conceptualisation of ideas discussed in this article by CBG staff member Yvonne Barnett.

In conjunction with the memo and questionnaire, few interviews were carried out, mainly with heads of departments and the Director. The interviews were really a means of discovering what the management understanding of the Audit would be and of gauging the level of support that could be provided by them for future developments. Of importance was the inclusion of their top ten personal issues that they would like to see achieved. The lists also provided a useful comparison between the ideas of management and of staff. Were they similar? In a nutshell: yes.

This all provided a useful basis for the next stage in the Green Audit's development, the running of workshops. The workshops are aimed at all staff and to date we have carried out achieved two sessions, each lasting approximately 1½ hours. The workshops were a means of enabling further participation and input by staff, with feedback, discussion and time to focus in on the issues at hand.

The workshop also allowed opportunity for further clarification and ensuring that staff had a clearer idea about questions such as what Green Audit was. What are we trying to achieve? Who has responsibility? Who is involved? And what have we achieved so far? For example, did staff know that over the past five years the Garden has reduced the amount of green waste going to landfill and recycles all green waste on site? That they have improved Garden management practices for increasing wildlife? And that the Garden takes into account environmental factors when purchasing machinery and other equipment?

The workshop was split into three main sections:

- An introduction, including feedback from the questionnaires
- Ideas and thoughts to date, including what the Garden is already achieving
- Three Activities. Participants were split into groups to work on these.

The activities were:

1. Working in your group pick 2-3 ideas, giving reasons why you think they should be included and then place them in order of priority, listing which you think should be developed first.

   The ideas were divided into relevant categories, including energy reduction, waste minimization, purchasing and education. The categories would help in providing understanding and focus to the wide-ranging issues. There was then an opportunity to discuss how we might go about implementing the ideas. The groups were given details of support mechanisms: local councils, the University, product manufacturers and local knowledge. They were also made aware of difficulties such as lack of money, quantified information and time.

For the next two activities the groups were asked to follow on from one to the other:

2. From the ideas discussed in Activity 1, try to develop an idea of how you would assess a proposal for its environmental impact. What key areas would need to be assessed? What information would be required?
3. What stages or steps would be required for you to see your idea implemented?

Between each activity, the groups were asked to report back to the other groups what they had been discussing, with an open discussion held about any issues or points raised.

Outcomes

Possibly the main achievement of the Green Audits process has been motivate people to think constructively and support the Audit's further development. The ideas that have been produced are wide-ranging and will ultimately provide a strong basis for the Green Audit. They also provide a view of what needs to be evaluated and implemented. It indicates those ideas that staff considered of greatest importance, for example, the development of an educational area within the Garden and the need to develop a purchasing policy.

The questionnaire allowed for inclusion and openness, and the participative workshops developed ideas, set targets and gave suggestions of issues that might be raised when looking at implementation. These two stages provided a useful indication of how the audit could be developed and what questions may be raised.

For example, the idea of recycling paper into the compost, as opposed to sending it for recycling, was developed by two different groups. Both groups raised similar questions. Would the paper bulk affect the balance of the compost? Would there be problems with confidentiality? And would inks in paper be problematical? Such vital questions provide a growing framework for the Green Audit.

The questionnaire also raised questions that are more difficult and have to be viewed as more long-term issues. They included issues about control and how can we influence other departments. Also about the accessibility of data, such as scientific evidence that would help us to make informed decisions. However, this is where other referenced resources, such as our University Environmental Policy, can be vital in providing support.

Conclusions

The strengths of this process can be seen in the way it provides for inclusion, participation across the whole Garden, and raises awareness. It assesses and evaluates, produces ideas and develops clarity and helps in the framework for developing your audit.

The weakness we found was that even though we had support in carrying out a Green Audit, it is fundamentally an additional piece of work to an already burdened workload. Time for developing everything further may be difficult.

The opportunities? Such work will provide a useful working document and a useful reference for the Cambridge University Botanic Garden, but it could also be of influence and help to the wider audience and particularly the University.

The threats that can be evaluated at present are based upon keeping the existing momentum going. If time for developing is hindered this will effect the implementation of ideas and when linked with other hindrances, such as the lack of quantifiable data to justify and act upon ideas, staff interest and their enthusiasm could be lost and progress in developing further seriously impinged.

This paper has outlined a process that has provided a number of learning outcomes for us at Cambridge University Botanic Garden. The most important we felt were:

1. **Institutional support** is vital in being able to overcoming barriers. Barriers such as the second crucial outcome…

    2. **Time**. This was so necessary for the work to be even undertaken and allowed for the staff to have input into the process, which leads to the third vital point…

    3. **Participation**. This allows for inclusion, helps allow for concerns and ideas to be raised and can provide a sense of ownership.

    4. **Motivation**. We also learnt that in the end you just have to get on and do it. It's amazing what you can achieve in six weeks!

Finally, the work described here represents only the beginning of the process and what we have learnt to date. It has possibly taught us a great deal about our concerns, ourselves, and has given us a tremendous input to developing further a Garden that can say it practices what it preaches. It also is a reflection of the strength and character of the staff and the Gardens as a whole, and has wider implications as one person commented upon in their questionnaire… *"Great to have a work-placed, environmentally driven policy – it even rubs off at home!"*

The next step is with the continuation of the workshops for the remainder of the staff, the collation of the data and the production of a working document. We hope that this will be a short-term process and completed within the next six to eight months and we will keep you posted.

Evaluating the impact of a teacher development programme

Eugenie Novellie

Pretoria National Botanical Garden, Pretoria, South Africa

Summary

This study was aimed at evaluating the impact of a series of environmental education workshops for teachers at schools in South Africa. At the workshops teachers had to identify environmental issues that were particularly important for learners from their schools. They then received guidance in planning learning programmes and actively involving learners with the issues they had identified. (This is referred to as the 'issues-based' approach.)

To determine the impact of the workshops, the teachers and their principals were interviewed several months after teachers had completed the workshops. The aim of the interviews was to assess the impact on the teachers, the learners, the schools and the community.

The interviews revealed that over the period following the workshops the teachers had maintained ongoing school activities centred on the environmental issues they had identified. Many had broadened the scope of their issues and engaged in new environmental activities. The issues teachers dealt with at school had a significant impact on the learners, the school and the community. The involvement of principals appeared to be a crucial element in establishing a successful environmental education programme at schools.

Background

With the aim of integrating environmental education within the school curriculum, the National Botanical Institute (NBI) developed a two-year capacity building programme for teachers from historically disadvantaged schools in Gauteng Province, South Africa. Our workshops, *Teacher Capacity Building: Skills Development through Environmental Education*, were conducted with primary school and high school teachers (Symonds 2000). Teachers were asked to identify environmental issues that were relevant to their learners' daily lives or of particular importance to their schools.

Examples of the issues identified in the schools were: the poor state of the schoolyard and garden; inability to establish a vegetable garden; littering; poor sanitation; water wastage; vandalism and drug abuse.

In the workshops the teachers participated in activities on how to expand research on the issues they had identified, on planning learning programmes and ways to involve learners actively in dealing with the issues. The teachers were encouraged to present the lessons to their classes, to create awareness, bring about change and, ultimately, to sustain their involvement in addressing these issues at school.

The workshops were conducted within the framework of Outcomes-based Education (OBE) (Symonds 2000). OBE has been introduced in South Africa relatively recently and many of the teachers were not familiar with its principles. It was an additional challenge to familiarise teachers with OBE by putting theory into practice.

The fundamental aim of the workshops was to empower teachers to initiate and maintain environmental education at their schools. It was critical firstly to establish the extent to which a lasting impact had been achieved, and secondly to identify the factors that influenced the outcome.

This study was designed to establish:

- Whether the teachers succeeded in initiating and sustaining learning programmes on the issues identified at the workshops.
- Which of the skills presented at the workshops were the most practical and useful to the teachers and their principals.

- The extent to which the teachers, the learners, the schools, and even their greater community benefited from the lessons learned at the workshops.

Method of evaluation

Personal interviews were conducted with the teachers and their principals 10 to 18 months after the teachers had completed the workshops. Of the 121 teachers who completed the workshops, 42 from 20 different schools were interviewed. In addition, the principals of 18 of these schools were interviewed separately. The interviewers, staff from the Gauteng Department of Education (GDE) and the National Botanical Institute, asked pre-set questions and recorded the answers directly onto questionnaire sheets.

Results of the survey

Environmental activities in schools

- *"We are now involved with the littering problem outside our school, previously we thought that was outside our jurisdiction"* (Mogale Primary School).
- *"It made me aware of broader issues"* (Sandile Primary School).
- *"I am now aware that our environment depends on us"* (Bajabulile Primary School).

These are some of the quotes teachers used to express the positive way in which the workshops changed their perception and attitude towards the environment.

With one exception, these teachers were all involved in environmental activities at their schools. They reported that they became more involved with environmental activities after the workshops and initiated new projects. This was particularly evident for two of the events on the environmental calendar: Arbour Day and Water Week. Only one out of 20 schools did not celebrate Arbour Day with tree planting ceremonies, school gardening and clean-up campaigns. During Water Week, 13 of the 20 schools arranged talks, cleaning-up of streams, and water monitoring projects in co-operation with various water conservation organisations. Other new initiatives were recycling and Aids awareness.

Maintaining the issues at school

Teachers and principals were asked to comment on the sustainability of the projects introduced around the environmental issues. Of the 42 teachers, 36 claimed that they had managed to keep the projects going and most of them repeated their lessons the following year. However, only 12 of the 18 principals were able to verify that the teachers had in fact initiated and kept up the programmes. (This result suggests that some of the principals were unaware of the efforts of their teachers, or alternatively that some teachers made exaggerated claims – we were unable to determine which.)

The impact of the workshops on the school and community

During the interviews the principals were asked to comment on the broader impact of the workshops. Table 1 summarises their comments.

The impact on teaching and learning

The teachers were all confident that they acquired new skills at the workshops, although a number of principals could not detect any noticeable difference. Those principals (13/18) who felt that their staff had in fact acquired new skills, identified the following:

- The ability to share their knowledge of Outcomes-based Education with other teachers and to facilitate lesson planning sessions.
- The ability to bring about change and improve the conditions at school.
- Effectively using group work with learners.
- Increased teacher confidence.

The teachers listed the following skills acquired during the workshops as being the most practical and useful to them:

- Competence to deal practically with environmental issues; to be able to identify key environmental issues and to drive change.
- Understanding of Outcomes-based Education.
- The ability to communicate, share and plan learning programmes with other teachers.
- Effectively using group work with learners.

New teaching skills and educational activities pursued by the teachers after the workshop are listed in Table 2.

Table 1. Principals' comments on the impact of the workshops

Question Posed	Comment from principals (number of replies in brackets)	Response: (18 principals)
Have teachers shared their newly acquired skills with colleagues?	Teachers shared OBE knowledge and theory (4)	1 Yes-at formal feedback sessions
	Teachers shared lesson planning skills (3)	
	Teachers shared and received input from other staff relating to the Issue (2)	4 Not sure
	(Staff from two schools were invited to assist neighbouring schools with interpreting OBE and lesson planning)	3 No reply
Have learners benefited from their teachers' attendance of the workshops?	Learners gained knowledge, skills and values from their involvement with the issues (11)	15 Yes
	Learners benefited from their teachers' improved teaching methods (4)	2 Not sure
		1 No reply
Has the school shared in the benefits of the Workshops?	Cleaner school yards (5)	9 Yes
	Water bills were reduced (2)	4 Indirectly
	School obtained funds from selling vegetables (2)	2 Not sure
	Staff assisting other schools with OBE and lesson planning resulted in prestige for the school (2)	3 No reply
	Vandalism reduced	
	The spin-off of positive publicity resulted in additional sponsorships	
Has the community shared in the benefits?	Schools provide vegetables from their own garden to the community (2)	7 Yes, directly
		5 Indirectly
	Schools are involved with community gardens (3) (One of the garden projects involves an old age home and home for the physically disabled)	2 Not sure
		4 No reply
	Schools use unemployed parents to perform tasks (e.g. gardening, welding and preparing meals) (3)	
	Cleaning up campaigns outside schools provide a cleaner community (2)	
	Opportunities for squatter camp children to get to know how to use modern toilet facilities	
	School introduced a drugs policy and co-operated with the rehabilitation of 3 learners.	

Table 2. Educational activities in which teachers were involved at school

Educational Activity	Number of Teachers Involved (total 42)
Formal planning with colleagues	37
Integrating their learning area with that of colleagues	34
Group work with learners	41
Using brain storming techniques with learners	39
Using picture studies with learners	41
Assessment techniques used:	
Peer assessment	31
Self assessment by learners	23
Group assessment	32

Lessons learnt

Value to teachers and principals

Although teachers thought that the workshops had the most dramatic impact on their own environmental awareness and competence, they were appreciative of the added insight the course gave them with regard to OBE. Principals clearly placed a high priority on the pedagogic skills development in relation to the practical implementation of the new school curriculum. Principals noticed that teachers tried out their new teaching methods, that they were able to share OBE knowledge and had the confidence to facilitate lesson planning sessions with staff members. Teachers from two schools extended their assistance to help neighbouring schools with learning programme planning.

Growing environmental education at schools

It was evident that the workshops inspired teachers to pursue environmental education. Principals were able to identify committed teachers who were willing to drive new activities. In this way schools gained wider environmental awareness. This was particularly evident from the success of Arbour Day and Water Week activities.

Challenges and constraints

The crucial role of principals

From personal observations when visiting the schools and from the data collected, it is clear that the attitude, interest and involvement of the principal greatly influence the success and sustainability of environmental activities at a school. It is evident that a school is more likely to be successful if:

- The principal is aware of the environmental issue identified at the school.
- The principal can verify that staff presented their issue-based lessons.
- The principal is able to identify new skills acquired by staff.
- Structures, such as time for official report-backs at staff meetings, are put in place to facilitate the sharing of newly acquired expertise.
- Activities around the issue continue after teachers have completed their course.
- The principal is interested in and able to comment on the impact of the environmental activities on the school and community.

It is interesting to note that those schools that are most active in the environmental field were subsequently better placed to engage in partnerships with external sponsors. It would seem that once schools have proven their commitment and are able to deliver, it becomes easier to generate funding and support for additional projects.

School management

At one of the schools surveyed, problems with school management prevented teachers from implementing their issues and from participating in any environmental activities.

Education for sustainability

Education can increase concern over unsustainable practices and increase our capacity to confront and master change…it is humanity's best hope and most effective means in the quest to achieve sustainable development (UNESCO 2002).

Principals reported that the impact of the workshops was felt beyond the classroom and the school. The positive ripple effect stimulated parent and community interest in school projects and in some instances the community was actively drawn into projects.

The issues-based approach appeared to be particularly effective in empowering schools to take ownership of environmental problems and to bring about change.

References

Symonds, A. (2000). Teacher capacity building: skills development through environmental education. *Roots* 20: p.25–28.

UNESCO (2002). E*ducation for sustainability. from Rio to Johannesburg: lessons learnt from a decade of commitment*. UNESCO, Paris, France.

Acknowledgements

I thank Stellar Mabunda and Tiny Ndlovu of the Gauteng Department of Education, South Africa, Alexis Symonds and Suzelle van der Westhuizen who helped with the interviews and Dr. Jeff Wolfson, for his comment on the questionnaires. The project was funded by UNESCO and the NBI.

Research projects with plants in secondary schools: anything for botanic gardens?

Jesús Piqueras

Stockholm Education Administration, Stockholm, Sweden

Traditionally, evolution and ecology studies have been dominated by zoologists and most of the generalisations and theories have been based on empirical studies on animals. Even though plant studies have lately become more important in such areas of the science the dominance of animal examples is still present in much of scientific popularizing and education matters.

Since 1993 a team of teachers and university researchers have led the course *Research in Science* at Blackeberg secondary school in Stockholm. The aim of the course is to introduce the students to the scientific research approach and, at the same time, to provide deeper knowledge in different science areas. The students, during the three years of high school education, carry out five different research projects. In the ecology project, we have developed during the last few years a large number of research projects using plants as study objects so as to enlighten topics such as diversity, adaptations and evolution.

The aim of my presentation is to discuss how the ideas and methods of the *Research in Science* course can be carried out in botanic gardens with the participation of garden educators. We have developed straightforward but very illustrative experiments in ecology which could be carried out in the 'wilder' parts of a botanic garden (most botanic gardens have representative local flora). I present here two experiments on plant and animal interactions (pollination with bumblebees and herbivory with two slug species). The botanic garden with its facilities can be used as a 'field station' for such experiments and garden educators can develop their own complementary educational programmes for the schools.

Research in science at Blackebergs Gymnasium

This is an optional subject for students on the Science Programme at secondary school (16-18 years old). It was started by teachers at Blackebergs and Stockholm University. The work started in 1993 with support from the Swedish Council for the Planning and Co-ordination of Research.

Aims for the students:

- To become acquainted with different kinds of research work.
- To learn research methodology.
- To get a deeper knowledge within parts of the ordinary courses in science subjects.

Five projects

- Who will find the Higgs particle
- The right sugar for "jelly candy"
- To be or not to be?- a biochemical project
- How can we "read" the environmental pollution of the Baltic?
- Flowering meadows and hungry slugs

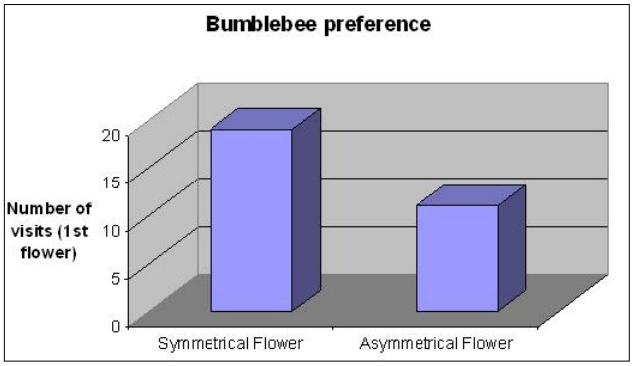
Flowering meadows and hungry slugs

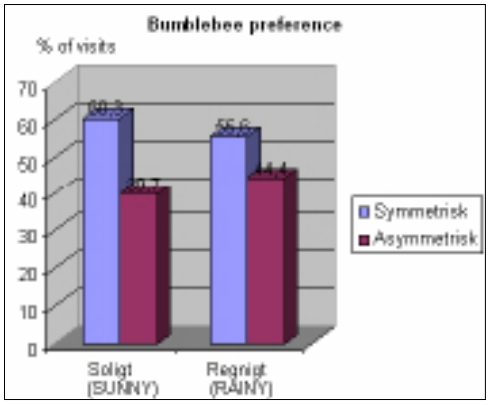
1. Planning (spring)
2. Field work (summer).
3. Report (autumn).

Bergianska trädgården at Stockholm

Plant and insect interactions

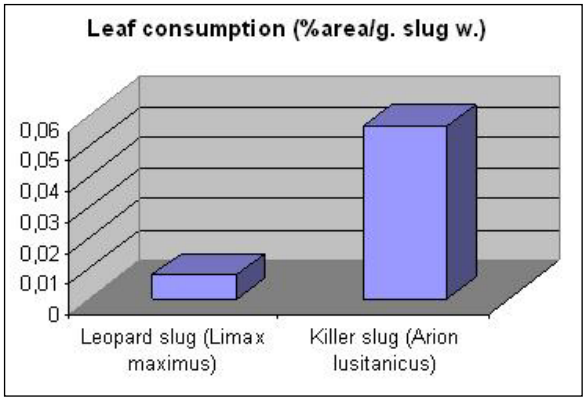
Is flower symmetry important for pollinators' choice?





Hungry slugs: an experiment in herbivory

Who eats more?



Anything for botanic gardens?

Some advice:

- Choose common animals and plants
- Choose the simplest method
- Ask for help and advice
- Do not be afraid to make mistakes … you can learn from them!

What is important?

- To work with children's curiosity and phantasy
- To learn to stay questions from observations
- To answer the question with an experimental approach.

Acknowledgements

I wish to thank all participants at the Congress for stimulating discussions, a very pleasant atmosphere and their contributions to the exchange of ideas.

I am most grateful for financial support received from The International Programme Office and Stockholm Education Administration.

List of authors

The postal addresses, fax and telephone numbers and email addresses listed below are the latest known. The addresses given at the start of each paper show the authors' affiliations at the time of the Sydney Congress.

Amirtham Alexander	Annai Genetic Garden, Sevapur-Po, Tharagampatti-via Karur-Pt, Tamil Nadu 621311, India *greenalex@rediffmail.com*
Abel Barasa Atiti	National Museums of Kenya, Nairobi Botanic Garden, Museum hill Road, PO Box 40658, 00100 GPO Nairobi, Kenya *batiti@hotmail.com*
Caroline Walach Baldyga	Fairchild Tropical Garden, 10901 Old Cutler Road, Coral Gables, Miami, Florida 33156-4296, USA cbaldyga@fairchildgarden.org
Barbara Boyle	Royal Botanic Gardens Kew, Kew, Richmond, Surrey TW9 3AB, UK b.boyle@rbgkew.org.uk
Robert Brett	Cambridge University Botanic Garden, Cory Lodge, Bateman Street, Cambridge CB2 1JF, UK rb272@cam.ac.uk
S John Britto	Annai Genetic Garden, Sevapur-Po, Tharagampatti-via,Karur-Pt, Tamil Nadu 621311, India britto@sjctni.edu
Bel Browning	Royal Society for the Prevention of Cruelty to Animals, Mallydams Wood Study Centre, Fairlight, Hastings TN34 lEN, UK belbiker1@aol.com
Catherine Ducatillion	Institut National de la Recherche Agronomique, Jardin Botanique de la Villa Thuret, 41 boulevard du Cap, 06606 Antibes Cedex, France ducat@antibes.inra.fr
Jan Ellis	Brisbane Botanic Gardens, Mount Coot-tha Road, Brisbane, Queensland 4066, Australia vsomg@brisbane.qld.gov.au
Janelle Hatherley	Community Educatioon Officer, Royal Botanic Gardens and Domain Trust, Mrs Macquaries Rd, Sydney, NSW 2000, Australia Tel: (02) 9231 8068. Fax: (02) 9251 4403 janelle.hatherly@rbgsyd.nsw.gov.au
Romi Ige	Brooklyn Botanic Garden, 1000 Washington Ave., Brooklyn, New York 11225-1008, USA romiige@bbg.org
Pat Irwin	Environmental Education Unit, Rhodes University, PO Box 972, Grahamstown 6140, South Africa p.irwin@ru.ac.za

N Anil Kumar	M S Swaminathan Research Foundation, Community Agrobiodiversity Centre, Puthoorvayal Post, Kalpetta, Wayanad 673121, Kerala, India. Tel: 91 4936 204477, 207019 Fax: 91 4936 207019 cabcmssrf@eth.net, cabc@satyam.net.in
Barbara Kushner-Kurland	Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, New York 11225-1008, USA barbarakurland@bbg.org
Maite Lascaurin	Instituto de Ecología, Jardín Botánico Francisco Javier Clavijero, Km 2.5 Carretera Antiqua a Coatepec, No 351, Congregación El Haya, 91000 Xalapa, Veracruz, Mexico maite@ecologia.edu.mx
Peter Lehmann	Australian National Botanic Gardens, P.O. Box 1777, Canberra ACT 2601, Australia peter.lehmann@deh.gov.au
John Lennis	Royal Botanic Gardens Sydney, Mrs Macquaries Rd, Sydney, NSW 2000, Australia john.lennis@rbgsyd.nsw.gov.au
Heila Lotz-Sisitka	Environmental Education Unit, Rhodes University, PO Box 972, Grahamstown 6140, South Africa h.lotz@ru.ac.za
Mark Loveday	Healesville Sanctuary, Badger Creek Road, Healesville, Victoria 3777, Australia Tel: 61-3-5957 2821 mloveday@zoo.org.au
V S Manickam	Centre for Biodiversity and Biotechnology, St. Xavier's College, Palayamkottai – 627 002, Tamil Nadu, India.
Steve Meredith	Botanic Gardens of Adelaide, North Terrace, Adelaide, South Australia 5000, Australia smeredith@deh.sa.gov.au
Chris Millican	Field Studies Council, Orielton Field Centre, Pembroke SA71 5EZ, Wales, UK 01646 623920 chris.or@field-studies-council.org
Eugenie Novellie	Pretoria National Botanical Garden, National Botanical Institute, Private Bag X101, Pretoria Gauteng 0001, South Africa novellie@nbipre.nbi.ac.za
Lorraine Perrins	Royal Botanic Gardens Sydney, Mrs Macquaries Rd, Sydney, NSW 2000, Australia lorraine.perrins@rbgsyd.nsw.gov.au

Jesús Piqueras	Education Co-ordinator, Stockholm Education Administration, Lindevägen 126 2tr, 120 48 Enskede Gård,, Sweden.
	jesus.piqueras@swipnet.se
Christine Preston	Cambridge University Botanic Garden, Bateman Street, Cambridge CB2 1JF, UK
	cmp25@cam.ac.uk
Loïc Ruellan	Conservatoire Botanique National de Brest, 52, Allée du Bot, 29200 Brest, France
	Tel: 02 98 41 88 95 Fax: 02 98 41 57 21
	animation@cbnbrest.com
V P Sajeev	M S Swaminathan Research Foundation, Community Agrobiodiversity Centre, Puthoorvayal Post, Kalpetta, Wayanad 673121, Kerala, India.
	Tel: 91 4936 204477, 207019 Fax: 91 4936 207019
	cabcmssrf@eth.net, cabc@satyam.net.in
S Seeni	Centre for Biodiversity and Biotechnology, St. Xavier's College, Palayamkottai – 627 002, Tamil Nadu, India.
	s.seeni@redifmail.com
Gary Shadforth	Royal Botanic Gardens Melbourne, Private Bag 2000, South Yarra, Victoria 3141, Australia.
	gary.shadforth@rbg.vic.gov.au
Jenny Stuart	Brisbane Botanic Gardens Mt Coot-tha, Mt Coot-tha Road, Brisbane, Queensland 4066, Australia
	vsomg@brisbane.qld.gov.au
Mary South	88, Hamilton Road, Bishopstoke, Eastleigh, Hants S050 6AN, UK
	mary.south@btinternet.com
Kathy Stewart	Royal Botanic Gardens Sydney, Mrs Macquaries Road, Sydney NSW 2000, Australia
	Kathy.stewart@rbgsyd.nsw.gov.au
Lucy Sutherland	University of Middlesex, School of Health and Social Sciences, Enfield, London EN3 4SF, UK
	l.sutherland@mdx.ac.uk
Fabienne Virago	Museum of Sydney, Cnr Bridge and Phillip Streets, Sydney NSW 2000, Australia
	fabienneb@mos.hht.nsw.gov.au
Didik Widyatmoko	Center for Plant Conservation, Bogor Botanic Gardens, Jl. IrH Juanda 13, Bogor 1622, Indonesia
	inetpe@indo.net.id
Christine Wildhaber	Southwark Parks Ranger Service, Chumleigh Gardens, Burgess Park, London SE5 0RJ, UK
	Tel: ++ 44 (0) 207 525 1078
	christine.wildhaber@southwark.gov.uk