How to remain in the public eye

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Abstract

The Botanical Garden of the University in Ljubljana had long been hardly present at all in the public life of the country. Our program has been divided into several levels: activation of journalists, organization of different events, guided tours for schools and groups of plant lovers, monthly lectures, workshops and writing articles to several magazines. The Garden also began to be promoted indirectly.

We are investing much effort in attracting attention of different media to get access to the public in the broadest possible sense (television, radio, newspapers) wherewith we have had considerable success in the recent years. Our presence in the media has progressed to a practically weekly basis. The indirect promotion of the Garden is associated to the fact that a number of television stations and various newspapers use it as a background for their contributions, shooting parts of their broadcasts in the loveliest parts of the Garden premises.

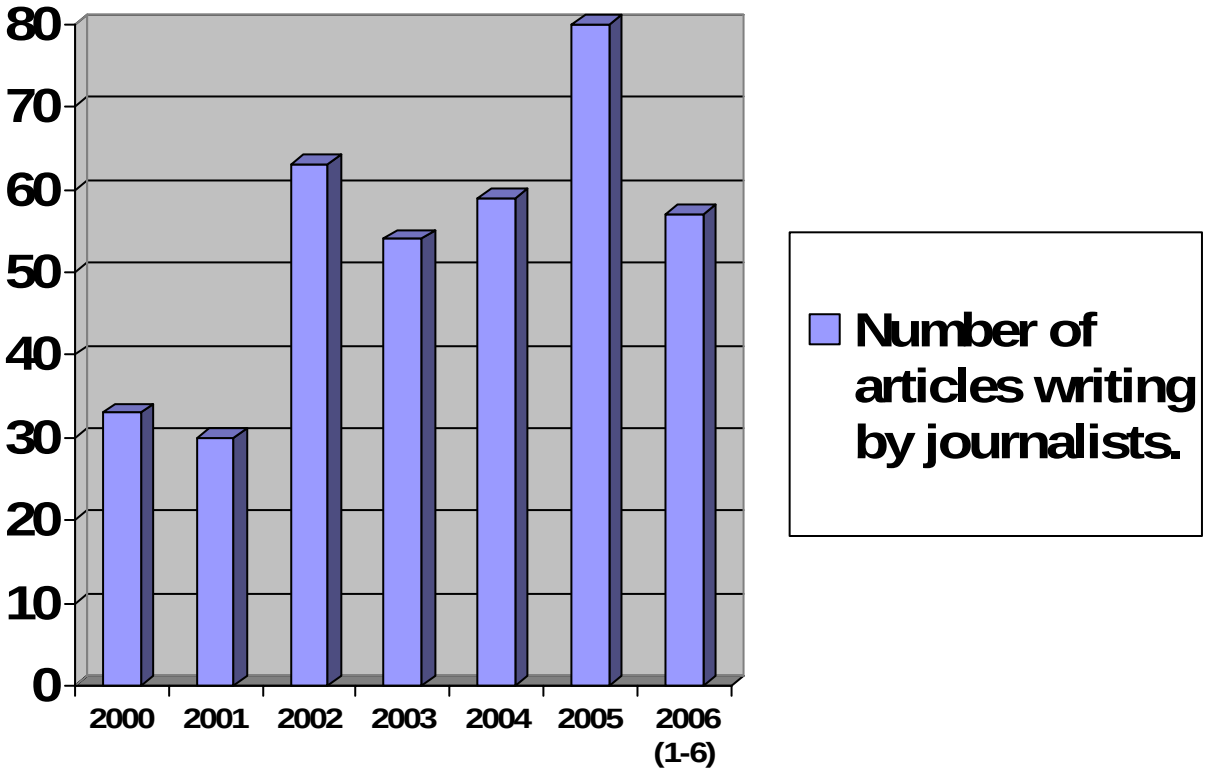
The goal of our endeavours is not only to present our Garden as such but also the activities and importance of botanical gardens in general, to enhance the interest of the broadest public in plant life and make it more aware of the need to protect plants and their habitats.

Introduction

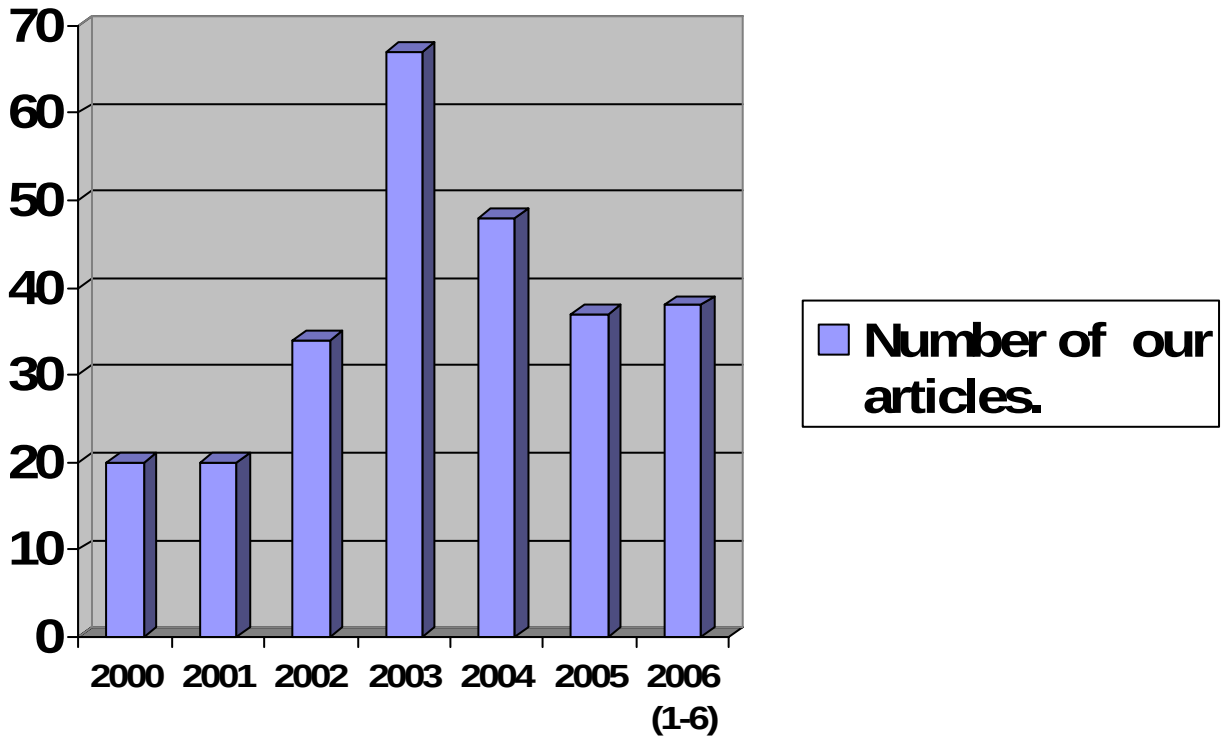
The Botanical Garden of the University in Ljubljana had long been hardly present at all in the public life of the country. In 1995 we embarked upon an intensive promotion campaign of the Garden in the public life. Our program has since 2001 been expanded and divided into several levels: activation of journalists, organization of different events. Added to the long-practiced guided tours for schools and groups of plant lovers, regular monthly lectures, workshops and announced guided tours. The representatives of the Garden began contributing monthy articles to several magazines. The Garden also began to be promoted indirectly.

We are investing much effort in attracting attention of different media to get access to the public in the broadest possible sense (television, radio, newspapers) wherewith we have had considerable success in the recent years.

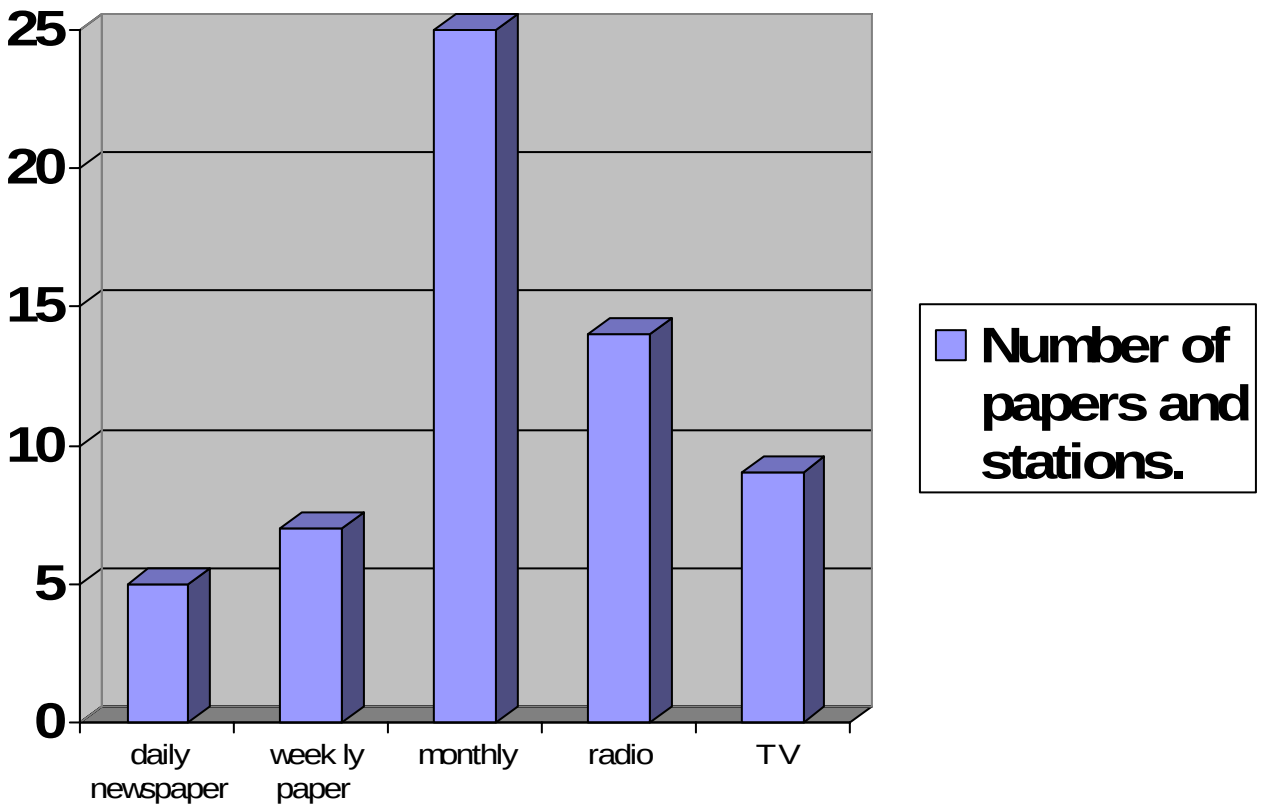
Results



***Graph 1**: Number of articles per single years, namely, by journalists reporting on the Botanical Garden or activities taking place on its premises. The 2006 data encompass but the first six months of the year.*



***Graph 2**: Number of articles that the expert staff of the Botanical Garden contributed to different newspapers. The 2006 data encompass but the first six months of the year.*



***Graph 3**: Number of various mass media in which the Botanical Garden featured in journalists' articles or our own contributions.*

Discussion

In the last six years the Botanical Garden of the University of Ljubljana has affirmed its presence in the mass media. Shown in two graphs are Garden-related articles contributed by others and our own published articles dealing with various plant species, their cultivation and the importance of botanical gardens with their specific presentations. A third graph refers to different media in which we were present through journalists' articles or our own writing.

The Botanical Garden team is comprised of four full-time gardeners and one full-time expert, and one additional expert exployed on a part-time basis. The Ljubljana Botanical Garden is visited each year by about 8500 primary and secondary school children and students for whom guided tours are provided by senior biology students properly trained for this kind of work. A considerable amount of time is being invested in the work with the media, as a result of which the public image of the Garden has acquired greater distinctiveness, thereby contributing also to that of other botanical gardens in Europe. However, in order to get media attention it is indispensable to engage in numerous additional activities and to constantly provide information on our work to the media. To this end the Botanical Garden organizes various workshops and lectures.

The Botanical Garden has featured in all daily newspapers, particularly the Delo, a daily with the largest circulation in Slovenia. We also managed to put our problems on the agenda of parliamentary questions. Articles on the Botanical Garden were published in all of the biggest local weeklies and monthlies. It was presented in several broadcasts on the national radio and TV, as well as some other stations. In the spring of 2006 three TV broadcasts, in three consecutive weeks, were dedicated to our work and in a broader sense to the importance of botanical gardens elsewhere, while problematizing the inadequeate support of the State to this realm of activities in Slovenia.

The Garden found its way into the mass media also indirectly. It served as a scenic background or a promotional ambient to TV interviews, announcement of events by different TV stations, various promotional events in the printed media, as well as events organized on a variety of occasions such as presentation of books. These contributions often targeted an audience other than that interested in the issues of the previous paragraph.

Our articles on plants, their importance and the role of botanical gardens, occasional presentation of botanical gardens in the most widely read Slovenian daily Delo, regular publication of our Garden-related articles in three or four most popular gardening magazines (Rože in vrt/*Flowers and Garden*, Gaia, Moj mali svet/*My Little World*, Vrtnar/*Gardener)* - all of this has enhanced the public interest in our autochthonous plants and also in the mission of our garden.

Our activities of the last six years have brought increasingly positive results in terms of the number of visitors and their reaction to the Botanical Garden, and also with respect to a more distinctive public image and importance of this institution. This has been reflected in a livelier interest of the mass media in our activities.

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Functionality of Lombardy's Botanical Gardens Network – Three years on

Professor Claudio Longo

Former director, Brera Botanic Garden, Milan, Italy

The network of Lombard botanic gardens was established in 2003. It includes seven botanic gardens (Bergamo, Pietracorva, Bormio, Toscolano, Pavia, and the two botanic gardens of Milan). These gardens have quite different characteristics: among them two have an historic character, one is a typical Alpine garden, another one is devoted to medicinal plants. The purpose of the network is to promote knowledge about these gardens in a wider audience, to foster some common cultural initiatives and to collect funds for common projects. A project dealing with spontaneous and endangered plants of the Lombard flora has already been funded and implemented.

The healing power of plants: Promenade performance for schools

Sarah Lloyd

University of Oxford Botanic Garden, Oxford, United Kingdom

As an education officer, it is sometimes quite unnerving when the educational experience of people visiting the Garden is in the hands of others. Especially when the 'others' are teenagers. This is the position we have been placing ourselves in through a Wellcome funded project entitled the 'Healing Power of Plants'.

Two years ago the heads of drama from local secondary schools were approached and asked if they would like to work with the Garden on an innovative project. There were a number of positive responses and schools that don't routinely incorporate a visit to the Botanic Garden in their plan for the year, were chosen.

'The Healing Power of Plants' is a broad theme that includes many weighty issues, issues of the use and exploitation of nature's resources. It was felt that young people needed more than a few hours to understand and develop their opinions on these, so the aim was to work with students over a sustained period rather than during a single visit.

Students were to work with the Garden's education officers and a group of professional actors over 10 weeks, to develop and perform a promenade piece, which communicated issues associated with the use of plants for medicine. The target audience was to be primary school students.

The process began with a performance of 'Green Fingers and Healing Hands' by Andrew Ashmore and Associates, a professional drama group which has worked with the Garden for a number of years.

Education officers introduced the scientific element to students using stories, each focusing on a specific question related to the theme. For example, 'Are plants still important in modern drug development?' 'Why doesn't modern medicine use more plant based drugs? 'How are potential discoveries made?' and 'Who reaps the rewards of discoveries?'

Most of the students involved had not set foot into the Garden since primary school. For some this was their first ever visit. These were issues the students knew little about. They were excited by the potential of performing in the Garden, but felt the medicinal plant theme was too restricting. The task was daunting.

This initial response isn't surprising. These were not science students, they had probably never thought about plants in this way before, or felt these were issues that were particularly important in their lives. It wasn't until the project had progressed for a number of weeks that the students realised that the theme has many facets. There were many ideas they had not previously considered and there were numerous ways in which their dramatic interpretation could develop.

The students, teacher and director worked together to develop the artistic element of the piece. This began with students choosing areas in the Garden in which scenes could be set. The students went on to develop themes for scenes using the different plants for inspiration. They did their own research into the plants they had chosen to focus on. They went on to discuss a story line that would bring everything together and engage the audience.

At times it was evident that the students were under pressure. We were taking bookings for classes of primary school children almost on a daily basis, until we were fully booked. The audience would be there, but could the students deliver. Maureen Hole, the head of performing arts at Wood Green School was not worried. She knew this was part of the process. She was right, and after 10 weeks and a shaky dress rehearsal in November's sub zero temperatures, Wood Green students were performing confidently, engaging with their young audience, explaining the role of plants in modern medicine.

In the first phase of the project the feedback from the audience was positive.

In an evaluation questionnaire, year 6 students were asked to choose words that described how the activities made them feel. A list of word was provided. 95 students responded to this section.

- 82 circled 'entertained'
- 62 circled 'amazed'
- 2 circled 'bored'
- 3 circled 'sad'
- 3 circled 'disappointed'
- 56 circled 'happy'
- 22 circled 'confused'
- 61 circled 'inspired'

Students were also asked if they learnt anything new from the activities.

114 students responded to this section. 90 students made a comment that referred to the healing properties of plants. Of these, 43 students referred to a specific example of a disease or condition that could be treated using a specific plant.

In the second phase of the project 126 students responded to the evaluation questionnaire in a similar way.

- 74 circled 'entertained'
- 34 circled 'amazed'
- 3 circled 'bored'
- 0 circled 'sad'
- 3 circled 'disappointed'
- 36 circled 'happy'
- 15 circled 'confused'
- 27 circled 'inspired'

Of the students who circled 'confused' or 'disappointed' nearly all had circled at least one other feeling that was positive rather than negative. E.g.'Entertained', 'happy', 'amazed', or'inspired' were circled in addition. Only one student chose 'confused' without any other positive choices, but did have a favourite part of the play.

Again, students were asked if they learnt anything new. All 126 students responded to this section. The answers ranged from no specific statements that plants could be beneficial to your health and could be used to make medicine through to more specific examples of some of the plants they encountered in the performance and the diseases and ailments they could be used to treat.

"I was amazed that plants made medicines". – Botley Primary School

"That you can get medicines from plants." – Cassington Primary School

"I learnt that plants were squished down and put in to our medicines." – Eynsham Primary School

"I learnt there was a illness called childhood leukaemia and you can cure it with rosy periwinkle." – Cassington Primary School

"I learnt the plants heal lots of illnesses and also very serious ones like leukaemia." - Botley Primary School

"I learnt how old the Botanic gardens are. I also learnt how asthma was cured. My sister has asthma. I also learnt how important plants are." – Botley Primary School

For many of the performing arts students this may have been their last chance to explore these issues in an educational environment. Most A-level drama students do not choose science subjects, or show an interest in science in the news. It is hoped that an informal learning environment such as the Botanic Garden or Arboretum may trigger a process of engagement with the issues and a greater understanding of the importance of plants and plant conservation. Whilst A-level students were focusing on delivering their message, their own opinions were developing.

This project was challenging for everyone and was dependant on the hard work of the secondary students, their performing arts teacher and the artistic director. It also provided an excellent opportunity for the Garden to build a relationship with the participating schools and teachers. A further benefit was lots of useful suggestions for future projects.

With this collaborative effort it was felt that the 'Healing Power of Plants' has been a very worthwhile project and provides a sound basis on which to build.

Acknowledgements

The Garden would like to thank the following students and teachers for their commitment to the project:

A-level students and performing arts teacher, Maureen Hole from Wood Green School in Witney, performing in the Garden in November 2005.

GCSE students and Sandy Kruger from Bartholomew School in Eynsham, performing in the Garden in March 2006.

A-level students and Tom Hollis from Gosford Hill School in Kidlington, performing at the Arboretum in June 2006.

Environmental education at the Center for Plant Conservation - Bogor Botanical Garden with case studies from Indonesia

Dr. Reni Lestari

Center for Plant Conservation - Bogor Botanical Gardens - Indonesian Institute of Science, Bogor, Indonesia

1. Introduction

One of the core competence of the Center for Plant Conservation-Bogor Botanical Gardens (CPC-BBG) of Indonesia, as an *ex situ* Institution is conducting environmental education (Strategic Plan 2005-2009 2006). The goal of the education at CPC-BBG is to enhance the environmental education activities.

Environmental education is an effort to change behaviour and attitude of the society that aims at increasing the knowledge, skill and awareness of the environment value and the environment problem issues. Environmental education is now incorporated in all major international strategies for biodiversity conservation and sustainable development (World Conservation Strategy 1980; The Botanic Gardens Conservation Strategy 1989; Convention on Biological Diversity 1992; International Agenda for Botanic Gardens in Conservation 2000; Global Strategy for Plant Conservation 2002).

Botanic Gardens are part of a growing worldwide movement working to make environmental education accessible to everyone. This education at Botanical Gardens is very strategic since the great number of visitors. The visitors of CPC-BBG could reach 1.2 million per year and 20-30 % of them are students.

2. Resources and facilities

At the end of 2005, more than 13,684 plants and 9,000 orchids, which consist of 3,864 species, have been planted in 87 ha of the bogor botanical garden. At least 5000 plants species have been collected by 4 botanical gardens in Indonesia, which located in Bogor, Cibodas, Purwodadi and Bali. The plant collections at the garden become valuable resources for conducting environmental education. The facilitators of this education at CPC-BBG consist of education staff, volunteer, guides and education practitioners. The facilities for conducting environmental education at CPC-BBG are for example the meeting and audiovisual rooms, nursery, herbarium, seed bank, laboratories and library.

3. Environmental education programs and activities

The example programs and activities of the environmental education at CPC-BBG including Cibodas, Purwodadi and Bali Botanical Gardens are as follows:

A. Tour of flora

The target groups of this program are school students from kindergarten to high school. The aims of the program are to increase the knowledge of environmental, flora and fauna as well as to increase the participation in solving the environment problems critically and constructively. Therefore, after joining the program, the students could hopefully develop their knowledge and understanding the nature phenomenon and the impact of people behavior to the changes of nature. Beside that, the students will love flora, fauna and nature. Furthermore, they will know the diversity and advantages of plants.

B. Communication and public awareness

There many communication and public awareness programs related with environmental at the botanical garden. Among the program is the production of the environmental video film and songs. Beside that, the education boards have been installed at the gardens, which explain the plant's collection, its distribution, its use and many other interesting stories of the plants. The garden has published website, books, leaflets, brochures, banners and stamps related with the plants. Marketing, fund rising and publicity of environmental education have also be done by the gardens. There are also many souvenirs related with plants available for the garden visitors, such as T shirt, post card, bags, calendar, mug, games equipment and many other souvenirs made from plants material. The competitions for students have also been conducted, such as make articles, poem, letter and drawing about plants and environment. Moreover, the gardens have chosen the environmental ambassador, who has actively worked for the environment.

C. Outreach program

The target group of this program are students of primary schools located at remote areas. The activities include introduce the medicinal plants and inform how to use the plants, plants propagation, nature games, build the medicinal garden at school and plant the trees and palms around the school. Those trees include *Altingia exelsa*, *Callistemon rigidus, Manglietia glauca* and the palm of *Pinanga javana*. The medicinal plants used at this program are *Orthosiphon aristatus, Hemerocallis minor, Dicksonia blumei, Berberis fortunei, Phaleria macrocarpa, Clerodendrum serratum* and *Grapthopyllum pictum*. The education staffs of the botanical gardens work and monitor the schools'garden several times. To increase the awareness of teachers and students to this program, the botanical gardens conduct the competition of these schools' garden. The criterias for the winner of the competition are the clean, creativity, facility and architecture of the garden as well as the plants condition and the cooperation of the working group.

D. Human resource capacity building

Some activities such as teachers training course on environmental education as well as lectures, trainings and workshops for botanical garden staff have been conducted. The teachers training course involves the teachers from schools surrounding the gardens. The trainers and the facilitators are staff of Ministry of Education, NGO's, environmental education experts and Botanical Gardens staff. On the other hand, the lectures, trainings and workshops for botanical garden staff regarding plants conservation, plants taxonomy, plant propagation, ecosystem and many other aspects are also very important to build capacity of the staff.

F. Network

CPC-BBG has been worked together with many other institutions in conducting environmental education, such as Botanical Gardens Conservation International (BGCI), International Association Botanic Gardens, HSBC, Investing in Nature, PT Bayer Indonesia, NGO's and the participants of environmental education programs.

4. Future education challenges for botanical gardens

Many environmental education program and activities have been conducted by CPC-BBG. However, there are still many challenges to develop the environmental education program for the future. Since the schools in Indonesia have the authority to develop curriculum based on the standard of the government, it is such a good opportunity for botanical garden to produce material of environmental education curriculum for schools, i.e. environmental books with the topics of plants diversity, *ex situ* plants conservation, sustainable use of plant's products, plants and the ecosystem and many other important topics. The material should be continuity and gradually from primary school, junior high school, senior high school and universities. If possible, publications of botanical gardens should be printed for teachers, schools and universities for free and the distribution mechanism should be fast and precise.

All program and activities, including tour of flora, communication and public awareness, outreach program, human resource capacity building and network should be done continuously, not a temporary and sporadic program. Periodical meeting for environmental education network and stakeholders is very important to be conducted. To increase the public awareness to the environment, the programs could involve celebrities and use an interesting plant's icon.

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Biography

Reni Lestari is a research staff of the Center for Plant Conservation-Bogor Botanical Garden, Indonesia. She holds a Ph.D. degree in Horticultural Science from Humboldt University of Berlin in 2005.

What's so therapeutic about horticulture?

Jean M. Larson

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Introduction

The Center for Therapeutic Horticulture, established in 1992, is charged with integrating physical, social, emotional, intellectual and spiritual aspects of plants and plant related activities into the education, research and therapeutic horticulture programs of the University of Minnesota's Landscape Arboretum. This is accomplished by teaching health care professional students and the greater community about the interconnectedness of people and plants and the vital role they play in achieving optimal health and well-being. The Center focuses on several elements that are fundamental to optimal healing environments including healing practices, healing relationships, the health and well-being of healers, and the physical environment in which care is provided. Increasingly, healing gardens and the therapeutic use of plants are being integrated into health care settings.

How plants are used in healthcare – past, present and future

Within the last twenty years there has been renewed interest in the role of designed natural environments and health. However, the importance of natural environments to health is ancient. The use of the garden as a place for healing can be traced back to early Asian, Greek and Roman cultures.

For example, the Chinese wrote the "Pen Ts'ao" - the oldest list of medicinal herbs known - on silk in 3000 B.C. The Greeks created healing temples for their gods. The temple for the god Aesclepius (god of healing) was built in pastoral settings with mineral springs, bathing pools, gymnasium, and healing gardens. Here people would come to worship, lodge, recreate and heal.

In the 1st century A.D., Dioscorides, a surgeon in the Roman Army, recorded the "De Materia Medica" including 950 curative substances of which 650 are herbal. The manuscripts include: drawings of plant, description of plant, medicinal qualities of plants, methods of preparations and contraindications and warnings (Gerlach-Spriggs et al., 1998).

Presently, hospitals and healthcare institutions often keep up extensive gardens and landscapes as an important part of healing. However, over the last fifty years, with the rapid growth of medical technology and economic pressure, this ancient concept has been neglected. In the United States, healthcare reform has prompted our public officials and healthcare administrators to measure success by the length of time (shorter being better) spent in the hospital and the efficiency of service delivery (Beal, 2004).

Despite a long history in healthcare, the effects of natural environments upon health have only been recently systematically studied. Since the mid-1980's, an integrated approach to medicine has helped reawaken the belief that gardens can play a significant role in the healing process. Perhaps the best-documented study to date is that of surgical patients and their access to views to

the outside world conducted by Roger Ulrich in 1984. This study demonstrated a relationship between the duration of hospitalization, pain medication usage and the ability to view nature through a hospital window (Ulrich, 1984). Patients with access to a view recovered faster and needed less pain medication to do so.

Healthcare institutions are increasingly recognizing the need for exposure to natural environments within the context of healthcare. The Joint Commission for the Accreditation of Hospitals Organization (JCAHO) has most recently stated:

> *Patients and visitors should have opportunities to connect with nature through outside spaces, plants, indoor atriums and views from windows* (JCAHO, 1999).

Unfortunately, most of our information regarding natural environments and healthcare is anecdotal. It remains difficult at present to make firm recommendations for the precise design of landscapes to promote health and healing. It is also unknown what the needs of specific patient populations are. Does one design cure all, or are different designs needed by different conditions? This question has gone unanswered.

Design principles in therapeutic landscapes

An emerging area of research and design focus within landscape architecture has sought to address the relationship of designed natural environments to health and healing. As the area of landscape architecture that addresses the interface between designed environments and health grows, confusion has developed regarding various terms applied to this concept.

Healing gardens is a term frequently applied to gardens designed to promote recovery from illness. Healing, within the context of healthcare, is a broad term, not necessarily referring to cure from a given illness. Rather, healing is seen as an improvement in overall well-being that incorporates the spiritual as well as the physical.

Therapeutic Landscape Design is more specific and relates to a particular aspect of a disease or healing process. The Therapeutic Landscape would be designed to produce a given effect and measurable outcome upon a disease process within a given patient and/or group of patients. It can be thought of as similar to a medication taken for a specific disease or illness. The Therapeutic Landscape is thus less focused on healing in the spiritual context, and more akin to the disease model of illness as practiced in most allopathic medical systems.

Numerous healthcare institutions within and outside the United States have begun to incorporate therapeutic landscape design. As Clare Cooper-Marcus, and Marni Barnes have noted in their book "*Healing Gardens: Therapeutic benefits and design recommendations*" (1999) these gardens focus on providing stress relief; alleviation of physical symptoms; and improvement in the overall sense of wellness for both patients and healthcare staff.

Successful gardens include the following design principles:

1. *Variety of Spaces*- Spaces for both group and solitary occupancy. By providing a variety of spaces, the patient is given choices, thus providing an increased sense of control - leading to lower stress levels. An area for solitary occupancy allows one to "get away" from the sterilized environments of the hospital. Areas for small groups (e.g. family members or support staff) to congregate provide social support to the patient.

2. *A Prevalence of Green Material*- Hardscaping is minimized and plant materials dominate the garden. The goal would be to minimize hardscaping to only one-third of the space being occupied. It is through the softening of the landscape the patient can feel an improvement in her/his overall sense of wellness.

3. *Encourage Exercise*- Gardens that encourage walking as a form of exercise have been correlated with lower levels of depression.

4. *Provide Positive Distractions*- Natural distractions such as plants, flowers and water features decrease stress levels. Other activities such as working with plants and gardening can also provide positive distractions in the garden setting.

5. *Minimize Intrusions*- Negative factors such as urban noise, smoke and artificial lighting are minimized in the garden. Natural lighting and sounds are additive to the positive effects of the garden.

6. *Minimize Ambiguity*- Abstract environments can be interesting and challenging to the healthy, but to the ill they may have counter-indicated effects. Numerous studies show that abstraction in design is not well tolerated by persons who are ill and stressed. Clearly identifiable features and garden elements should be designed. Abstract art in the facility and garden is often inappropriate.

Design elements in the healing garden

Whereas, the Therapeutic Landscape Design is more specific and relates to a particular aspect of a disease or healing process within a given individual and/or group. The Healing garden is a term frequently applied to gardens designed to promote improvement in overall well-being that incorporates the spiritual within the healing process.

In the book "*The Sanctuary Garden*" by C. Forrest McDowell and Tricia Clark – McDowell (1998), they say, "…the key to a (healing garden) is to honor and celebrate our broader human relationship with Nature and Spirit, not just plants". The proposed seven design elements are a guideline for the design. They are a means to the end process of identifying the intention of the space. That is, a marriage between the garden keeper and the spirit of Nature.

They suggest the healing garden carries with it seven design elements:

- A Special Entrance that invites and embraces the visitor into the garden
- The element of water for its psychological, spiritual and physical effects
- A creative use of color and lighting (be they plant or human-designed light sources) to elicit emotion, comfort, and/or awe in the visitor
- The emphasis of natural features as grounding points – such as the use of rocks, wood, natural fences, screens, trellises, wind, sound, etc.
- The integration of art to enhance the overall mood/spirit of the garden
- To provide garden features that attracts wildlife and provide habitat to a diversity of wildlife

Overall, the healing garden design should comfort the soul and renew the spirit – no matter if it consists of a bench next to a tree or an intricately designed landscape. Of most importance is the intention to honoring the design element and its relationship to the spirit of Nature.

Conclusion

The University of Minnesota Landscape Arboretum's Center for Therapeutic Horticulture has three main program components:

a. Education
b. Program Contracts
c. Outreach

Within the area of education, the Center for Therapeutic Horticulture has been collaborating with the University of Minnesota's Center for Spirituality and Healing (as part of the Academic Health Center) for the past eight years. In that time we have established a therapeutic horticulture certificate which includes three graduate level courses 1) Introduction to therapeutic horticulture, 2) Introduction to therapeutic landscape design 3) Applications in therapeutic horticulture. We are also in the process of turning the certificate of completion program into a post-baccalaureate certificate in integrative medicine.

Within program contracts the Center for Therapeutic Horticulture have over 12 contracts within the metropolitan region-serving people with a variety of needs. Including but not limited to people with Parkinson's disease, elders and children, adults with sever and persistent mental illness, adults with developmental disabilities, a youth with chemical health issues, and people with eating disorders.

Lastly, the Center for Therapeutic Horticulture serves as a clearinghouse of information for those interested in therapeutic horticulture. Each year the Center for therapeutic horticulture sponsors a lecture series entitled "Healing by Design". Recently, Jean Larson co-authored a book (Larson, 2006) on intergenerational gardening entitled "Generations Gardening Together" published by Haworth Press.

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Biography

Jean M. Larson has been the Coordinator of the Center for Therapeutic Horticulture since 1992. She has a Master's degree in Therapeutic Recreation and Outdoor Education. She is currently working on a Ph.D. in Kinesiology.

A picture paints a thousand words

Jacqui Kennedy

Kings Park & Botanic Garden, Perth, Australia

Setting the scene

Kings Park and Botanic Garden is 400 ha or 1000 acres in the centre of the city. It is situated in the South-west of the state of Western Australia. Western Australia has a population of approximately two million, with 1.3 million living in Perth, the most isolated city in the world.

Kings Park and Botanic Garden (KPBG) overlooks the Swan River and city of Perth and is made up of the State's Botanic Garden, areas of developed Parkland, children's playgrounds and picnic areas, but predominantly urban bushland. The Park is open 24 hours and is not fenced. Facilities need to be functional and sturdy to withstand the high volume of visitors.

KPBG is a special place for families, children, flora, environment, history, ceremony, culture, celebration, health and well-being and for just about every tourist who comes to Western Australia. It is the most visited tourist destination in Western Australia.

In KPBG we have a small diverse team working together to present an range of opportunities for our visitors to engage in discovering more about the rich biodiversity of Western Australia, particularly the South–west, as it is one of the world's 25 biodiversity conservation 'hotspots' and therefore of enormous importance and significance.

Engaging the visitor: An introduction

This presentation will showcase the work being done in Kings Park and Botanic Garden in the area of interpretation and education. There are a variety of opportunities both formally and informally for all ages. I will share a couple of examples of formal education programs and both formal and informal interpretive tools we use to grab the attention, engage and inspire some of the five million visitors who come to the Park each year. The primary focus of the paper however, will be on the interpretive signage strategy we have developed in KPBG and provide the groundwork for the workshop entitled, '*Streakers, Strollers and Studiers* – a Sign of the Times Downunder.'

As educators, we understand people learn in different ways and require exposure to a variety of stimulus, in order to absorb, understand, appreciate and connect with the world around them.

Engaging and inspiring visitors is elusive and challenging and the results are often intangible; but it is something to which we all aspire. It's one level to have a garden that is masterfully designed with flora that excites and an environment that stirs the soul. This immersion experience can touch people in different ways, and the challenge for educators is to move the visitor from awareness and empathy, to the next level that influences their attitudes and behaviour, in an effort to effect positive action for the environment.

Providing opportunities for the visitor to learn more about what's around them will increase their knowledge base and stimulate an awareness of conservation principles. Hopefully this will engage them to want to discover more: to 'do' something themselves, such as plant a waterwise or bird attracting garden, or visit natural environments to discover plants *in situ*. Better still, is to inspire them to take some form of ACTION to engage in practical conservation and sustainable development activities.

In taking our visitors through this process we call 'environmental education' – i.e. *awareness, knowledge, attitudes and action*, we are taking them on a journey that involves all their senses.

Because people learn and absorb information in different ways it is not enough to only provide one avenue of learning. Layering information and experiences provided in botanic gardens gives the visitor opportunities to understand and develop empathy for conservation, further leading them towards behavioural change. Touching their senses through immersion experiences, hearing stories told about the plants, engaging in discussion, reading interpretive signs and interacting in guided sensory opportunities are just some of the interpretive strategies used to convey the messages through an interactive, 'layering' approach.

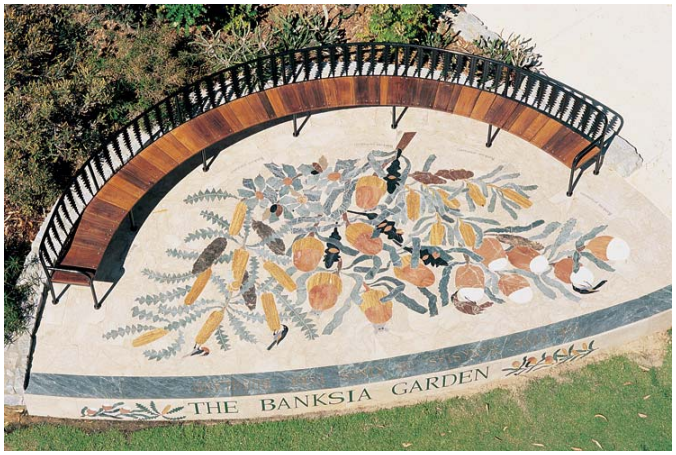
For instance, what mode of learning do you most enjoy? Visual, auditory, kinesthetics, abstract e.g.

- Guided Walk – kinesthetics –sensory - listening, touching, smelling, looking
- Reading an interesting sign – *abstract learning* – reading, synthesis
- Participating in a hands-on workshop –*kinesthetics* – physical action
- Theatre Show – *auditory* - story-telling, humour, song, dress ups
- Self-guided Walk or worksheet or brochure – *abstract and visual* - reading,
- Interpretive artwork – *visual*

Informal Interpretation - artwork

Examples of informal interpretation in the Park include:

1. The Banksia Seats Artwork, the Acacia Steps, Mosaic Entry to the Botanic Garden, Muttaburrasaurus, Lycopod Island and Stromatolite Walkway, Fritter Sculptures.



2. *The Fritter Sculptures*: Bounce the Kangaroo, Tickles the Lizard, Pobblebonk the Frog, Jelly Belly the Worm and Mother Wood Duck are the entry statement at a recently refurbished popular early childhood playground. The idea was to use these characters to focus on Western Australia's biodiversity and use them as an interpretive vehicle to relay subtle environmental messages. To introduce the animals to the children on arrival at the playground, parents can share a story poem about each one. Once inside the playground, a series of picture story books in large format have been produced putting the characters in context with the playground.

Formal Education and Interpretive Programs

One of the most effective ways to impart messages is through the art of story-telling. This ancient artform, if cleverly crafted, can inspire people of all ages, as the information is often sequential, and in context.

Example 1 – saying it with pictures

Story-telling is used in the formal education program we offer schools. For example, the research being done in the bushland of KP on trapdoor spiders, inspired a lesson about these traditionally non-charismatic animals and the work being done by BGPA scientists to bring this species back from the brink of extinction. Large format story -boards help tell the story of *Mygalomorph the Brave* and his battle for survival in Kings Park. This program has proven to be extremely popular with students and assists them in gaining knowledge, empathy and an understanding of cause and effect. After the story, the children work together to build their own trapdoor spider and then visit the area where these large spiders are found, to see the results of the revegetation program on the escarpment of the Park.

Example 2 – saying it with song

One of our most recently developed environmental education programs for students is a theatre show titled ' *The Great Aussie Garden Twittaly Twattle, Ting-a-ling, Theatre Show*. We worked with an actor to create a highly entertaining, interactive musical, with colourful props and costumes to help promote the message of planting water-wise native plants in the garden, which comes with the added bonus of attracting pollinators such as birds, possums and insects to the garden.

This program has attracted sponsorship from the Water Corporation and is being launched this week at the Kings Park Annual Wildflower Festival; an event celebrating the unique wildflowers of Western Australia.

These fun, face-to-face education sessions are extremely valuable at reaching students at a crucial time when their values are being formed. While this type of education and interpretation offers the highest impact, it only has the capacity to reach a certain number of people.

Example 3- a sensory approach

One form of public education in Kings Park that attracts over 5,000 visitors annually is the free-guided botanic or cultural heritage walks offered twice daily for the public by our volunteer Guides. The Volunteer Guides are well trained to provide a valuable information service in the Visitor Centre, with the support of a vast array of information brochures and displays.

But there are still visitors arriving daily, all with different reasons for visiting the Park, such as tourists, picnickers, fitness enthusiasts, wedding parties, Park neighbours, concert goers or lunchtime visitors from the CBD, who may not be able to access the guided walks or education sessions, but would still benefit from being presented with simple interpretive opportunities to enhance their visit and engage their minds.

Interpretive Signage Strategy

With the millions of visitors attracted to Kings Park and Botanic Garden annually, we needed another interpretive vehicle to assist with the task of imparting valuable information about the Park's rich history, flora and cultural heritage. It needed to be presented in an easily digestible manner that would appeal to a wide demographic and be available permanently every day of the year, in an unsheltered outdoor environment accessible by the public 24 hours a day. We decided to tell these stories through colourful, interpretive signs, to enrich the experience for the visitor and to add another interactive, interpretive 'layer' to what was already available. To make these signs accessible to all, the pictures on the signs needed to tell the story as much as possible.

To begin the daunting task of telling the many stories we wanted to share about this large and diverse Park, we needed a strategy.

What were the messages we wanted to impart and what was the most effective method of delivering them?

The strategy was to identify the *key* messages we wanted our visitors to take home with them, that would have a lasting impression of their visit to KPBG.

The Stakeholder Focus Group charged with identifying these important key messages, narrowed them down to three succinct 'take home' messages that would, in turn, underpin all the interpretive and educational activities BGPA undertake:

The three key messages are:

1. Kings Park is a special place
2. Western Australia has unique biodiversity
3. You can do It! – a call to environmental action.

The three key messages are reflected in the:

- interpretive signage developed for the Park,
- content of the guided walks,
- education programs for schools
- development of capital works programs, such as the Conservation Garden and children's playgrounds
- Kings Park's new retail store – *Aspects of Kings Park*.

The Education staff worked closely with the CEO at the time - Dr Stephen Hopper, who was driving the project, Curators and the Graphic Designer to develop the matrix of messages for the content of the signs and the template for the overall design. The process became more refined as we progressed and the outcome has been a distinctive series of signs that complimented BGPA's corporate identity, with flexibility for installation in a variety of locations. The signs follow a specialised formula, that, in turn provides a unified look to the messages being presented.

Subsequent to the installation of directional and interpretive signage, a series of branded brochures, books and website followed, to provide visitors with additional opportunities to learn more about the diversity this Park and the Botanic Garden has to offer.

To ensure consistency, a Style Guide for BGPA was developed that outlines the requirements for staff and designers to follow.

The Sign Journey

The photo montage in the powerpoint presentation is a snapshot of the journey the BGPA has travelled in an effort to ensure our visitors are presented with every opportunity to engage in their surroundings, to become more informed and ultimately be inspired to take some form of personal action FOR the environment.

(Journey images to the music '*We're Planting an Aussie Garden' by Quintin George.)*

In conclusion

I hope this presentation has painted a picture that Kings Park is a special place, where Western Australia's unique biodiversity is well showcased and BGPA is endeavouring to inspire visitors to take some form of action for the environment, such as planting water-wise gardens.

The interpretive signage has been extremely well received by our visitors, with many people contacting the Park with positive comments and enquiries regarding their production and whether they can get a copy of the signs or assistance with signs, etc..

One sign alone doesn't impart the key take home messages. It is the combined layering effect of the 'unconscious beauty' of the ordered garden, the standardised design and structure of a series of signs, the interactions with staff and the experiences the visitors have encountered that subliminally conveys the 'take-home' messages.

Research into the effectiveness of the signs was carried out by a team of five Honours students from Anthropology and Sociology at the University of Western Australia. The sample group was not extensive, however their findings did highlight that the '*general effectiveness of the Botanic Garden interpretive signs was very high.*' Respondents rated the signs as highly interesting, educational and easy to understand. Interest in most categories of signs was very high and many respondents could bring to mind memorable signs. However there is always room for improvement and this report supplied us with a number of valuable recommendations, such as:

a) more signs pertaining to Aboriginal history and culture as these seemed to hold the most public interest.

b) Provide some direct reference on the signs as to why Kings Park is a special place. Eg. KP is a special place because of its….

c) Tailoring some of the interpretation signs regarding WA's unique biodiversity to impress those Western Australians who already know a large amount about the biodiversity.
Eg. Did you know……?

d) Tailoring some of the 'You Can Do It' signs to more overtly encourage people to plant native species, demonstrating how they can be used as container plants in courtyards and balconies and help save water.

This feedback has been included in more recent signs we have developed. Eg. See WPP waterwise planting signs.

All the signs are on our website www.bgpa.wa.gov.au including images and descriptions of the interpretive artworks throughout the Park.

All the brochures and descriptions of the education programs can also be found on the website and I have examples to show you here if you are interested.

Thank you for listening and sharing the journey. I hope I have engaged your mind, stimulated your senses, sparked your creativity and inspired you to create something new and exciting for your visitors.

The workshop I will be conducting tomorrow titled 'Streakers Strollers and Studiers – a Sign of the Times Downunder' goes into detail about how to create the signs, design briefs and parameters, processes and installation. I look forward to seeing you there.

Remember

"Do not satisfy your vanity by teaching a great many things.

Awaken people's curiosity.

It is enough to open people's minds, do not overload them.

Put there just a spark…….…if there is any flammable stuff it will catch fire."

Anatole France

Biography

As the Manager of Visitor Services for the Botanic Gardens and Parks Authority (BGPA), based in Kings Park and Botanic Garden, I am responsible for education, interpretation, events management and event marketing, functions, volunteers, BGPA signage, website, visitor publications and other visitor services such as visitor compliance, safety, security and disability services. I have a teaching background with many years working in environmental education in zoos and botanic gardens in Australia.

Focus on Plant Biodiversity at the Royal Botanic Garden Edinburgh

Ms Susie Kelpie and Ms Cath Evans

Royal Botanic Garden Edinburgh, UK

Our mission statement is 'to explore and explain the world of plants'. Royal Botanic Garden Edinburgh (RBGE) was established as a physic garden in 1670 with teaching as an important part of its role. On our current site in Edinburgh we have an extensive range of glasshouses, library and science facilities as well as three regional gardens at Benmore, Logan and Dawyck.

RBGE's education delivers courses at all levels, from Nursery school, through to secondary, higher and further education. Professional courses include the MSc in the Biodiversity and Taxonomy of Plants. This is one of only a few courses in the country that focuses on the importance of taxonomy and evolution in the conservation of plant and habitat biodiversity. Our core professional horticulture course is the BSc (Hons) in Horticulture with Plantsmanship. This can also be taken as a shorter HND, emphasising the practical element of the first two years of the BSc course.
Adult education encompasses a wide range of classes, including botanical painting, photography, crafts and a broad range of practical horticulture courses. Recent innovations include particularly flexible approaches in which adult learners can build up a portfolio of hands-on workshops to gain the RBGE Certificate in Practical Horticulture.

The Schools Education Department has been working with teachers and pupils for the past 20 years, offering courses for teachers of early years (3-5), 5-14, 14-18 Standard and Higher Grade. Courses cover plant sciences, horticulture and expressive arts, the areas in which we have particular expertise. Our staff are all professionally qualified and experienced in the areas in which they teach. Our aim for all our courses is to enthuse and excite pupils and teachers about the world of plants by making maximum use of the wonderful resources at the Garden. The courses we offer aim to be practical and experiential, offering materials and ideas which are directly relevant to the Scottish curriculum.

The Royal Botanic Garden Edinburgh (RBGE) Schools Education team caters for over 10,000 pupils a year in the primary and secondary age-range through our curriculum-linked schools programme. We offer a very varied suite of classes for differing age groups.
The team consists of one full time primary schools officer, one part time secondary officer and a part time arts education officer. As well as the work done in Edinburgh we offer outreach programmes for primary schools such as the Rainforest Roadshow as part of the Edinburgh International Science Festival Touring Programme. We also deliver teacher's continuing professional development workshops throughout Scotland. All our programmes are designed to cover a half or full day and are taught by education officers. The numbers of schools we can cater for is restricted by availability of covered space and by the weather. In winter, our Primary Schools Programme uses the range of glasshouses and covers topics such as Rainforest Adventure, Senses, Plants We Eat and Life of Plants. Summer programmes make great use of our extensive outdoor collection and popular sessions include Scottish Trees and Teddy Bear's Picnic. There is also a small Children's Garden Project where local children grow vegetables, flowers and fruit.

We offer a very successful secondary schools programme covering the examination courses taken by Scottish school students. For 14-15 year olds we have the 'World of plants', for the 16-17 age group we concentrate on 'Plant adaptations' offering both practical workshops and tours of the garden and for 17-18 years we look at invasive species and more technical aspects of electron microscopy.
We are also offering a more practical horticulture course for 13-16 year old less academic students.

Our reputation for providing high quality Continuing Professional Development courses for teachers in plant science, horticulture and expressive arts is well established and our programme continues to expand.
The Education Department has established links with various education authorities and offers Continuing Professional Development (CPD) courses for them. We also work in partnership with Science and Plants for Schools (SAPS) delivering courses for primary and secondary teachers, and are expanding the range of courses we offer in response to teachers' requests and curriculum developments. We are also increasingly offering workshops at other locations on request.

It was felt that we were in a unique position to provide schools with a high quality plant resource for classroom display. The schools poster pack project 'Focus on Plant Biodiversity' was initiated, funded by the Royal Bank of Scotland 'Branching Out' scheme and RBGE membership. This publication will allow us to broaden our outreach to schools that are unable to visit the Garden and promote interest in plants.
To achieve this we have we have developed twenty A2 full-colour posters which include images of plants held in the RBGE Living Collection complemented by microscopic images and pictures taken in the field by botanists. They illustrate aspects of plant science in the 5-18 Scottish curriculum but are useful to anyone involved in plant-based education at any level.

Three over-arching themes guide the choice of plants on the posters. They demonstrate:

- Biodiversity
- The uses of plants
- Adaptation

The twenty posters divide into four sets of five: Plant Groups; Plant Parts; Plant Reproduction; A Closer Look at Biodiversity. Additional information is provided in a background booklet which is intended to increase teachers' knowledge and confidence in teaching these subjects.

Through these posters we will take the Royal Botanic Garden of Edinburgh into the classroom and extend our mission 'to explore and explain the world of plants' to a wider audience.

Author Biographies

Susie Kelpie
After spending 8 years as a secondary school biology teacher, I have been working as an education officer for the past 12 years.

Cath Evans
I have been employed at RBGE for 8 years, firstly as an Indoor Horticulturist looking after Temperate House, borders and the carnivorous plant collection, then as Primary Schools Education Officer.

Games for Education for Sustainable Development: From knowledge to understanding.

Prof., Dr Dmitry Kavtaradze

Moscow State University, Russia.

Introduction.

A person needs not only knowledge but also understanding for successful work. One can know everything about biochemical processes in onion roots, but does not understand how pesticide pollution would influence them. Traditionally, European education pays most attention to teaching knowledge and control over its digestion. Formal secular education powered by achievements of science, which is divided into branches, began to loose connections among things, internal connections, i.e. integrity of the world outlook. Lack of understanding, i.e. connections among facts and processes allows neither a person nor society to be efficient. So it is clear why modern methods of education for sustainable development try to reveal for children and adults connections among known facts and phenomena. For instance, everyone knows, that smoking is harmful for one's health; however, a lot of people smoke. While students create a game devoted to consequences of smoking for teenagers, they begin to understand how scientific data is connected with people's lives, their own thoughts and increased risk. So, children, who have created such a game, really cannot smoke.

Botanical gardens are still not widely recognized as unique centers of deep science and profound practice. One can be great in the lab and, sorry, helpless in the plant yard. Interactive methods of education and training are able to marriage theory and practice. And the babies are the educational games for personal and group decision-making.

After "Nuclear winter" modeling changed global policy and Russian way of development, interest to modeling with human participation (that potentially means simulation games- S&G) again became bigger. Sustainable Development shifted from global slogan to national plans, but it is still difficult to find human dimension of global model of sustainable development besides "Limits to Growth" (1972, 2003). It brings question "Is it possible to make S&G widely distributed and become part of mass culture?" There are several reasons why Environmental problems are more and more positively recognized while they are expanding, but methods of S&G are developing slower than area of sustainability problems is growing. The Strategy for Education for Sustainable Development was elaborated by EC UN and starts its life in March 2005 with special reference to interactive methods in education and training.

Key-note simulations.

Several simulations will be offered during keynote games.

1. Teaching and learning in "classroom for adults": just clap.
2. Do we know our hands and fingers?
3. What happens in one minute?
4. Make a plan with a piece of paper.
5. "Just follow me"

Debriefing of joint experience

1. Time horizon is still very close in public consciousness and it is still not in the toolbox of policy makers. The boys are not "bad"; the time horizon of their mind is short. Games are strong in expanding time scale. We are doing the "Time training" games and exercises. "Time management" is our resource in Environmental Management.

2. For serious decision makers, managers and government staff are globally perceived "games" as strange, “not serious”, hardly equal tool. G&S are not recognized as single way to explore problems between people and with environment, exactly what we are facing in training botanists and gardeners.
3. May be because scientific modeling (ecology, mathematics, chemistry, etc.) is usually not giving place to human personality contradictory to our experience from childhood — we are the irreplaceable part of any of game.
4. Simulation experience in decision making for scientifically does not give new "knowledge", but understanding. As wise person is not more "knowledgeable", but profoundly understanding problem. Educators are usually oriented towards new knowledge. Who is giving classes in wisdom and understanding in botanical gardens?!
5. ENvironment being transformed into "INvironment" became ethic, and intellectual context of personal cultural outlook and decision making in small certain patterns of activity with plants.
6. "Green Bag" (see abstract in our Conference) is an example of the toolkit for training in decision making in Environmental problems that collect up to 20 S&G that designed and used in USSR/Russia in 1981-2003 years and now widely used in Moscow and Moscow region.
7. Education is facing new task: to support personal and public culture of decision making in context of culture of humankind. Culture of nature resource management as environmental heritage became less national and mainly international resource Human being giving chance to get the answer about simple question: achieving Sustainability: does it possible? Simulation games are giving chance for positive answer.

What could be done in the nearest future will be discussed.

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Networking in Central and Eastern Europe

Dr. Suzanne Kapelari

University Botanic Gardens, Innsbruck, Austria

The Global Strategy for Plant Conservation (GSPC) outlines a series of targets through which the ultimate aim of halting the current and continuing loss of plant diversity can be achieved. Target 14 of the strategy involves '*Promoting education and public awareness about plant diversity: The importance of plant diversity and the need for its conservation incorporated into communication, educational and public-awareness programs'* (Secretariat of the Convention on Biological Diversity 2002).

As far as conservation is concerned, one major goal of botanic gardens should be to focus on communication, along with formal and informal education programs.

1. How many gardens in Central Europe offer education programs already?

In the course of the EU Project, *Plant Science Gardens*, a study was conducted to collect information about botanic garden education in Central European countries. Gardens were asked whether they do guided tours or other educational activities, the favourite topics they offer and whether or not they have a specially designed post for a garden educator

In the German speaking part of Central Europe - Austria, Southern Germany, and Switzerland - there are about 30 Botanic Gardens. Across all these facilities only 9 Botanical Garden educators are employed. Botanical Garden education is mostly entrusted to freelance staff.12 Botanical Gardens offer a developed educational program, 6 of these Gardens have guided tours on a regular basis whereas and the rest offer guided tours on request only.

In Northern Italy there are c 30 gardens that have at least basic interpretation via guided tours, however many gardens have a more developed programme targeted at specific audiences; these latter gardens also enjoy the benefit of full time education staff. For the Eastern European countries we do not have detailed data yet but know that in Bulgaria three botanic gardens are active in education and that there are two educators employed currently.

2. Expectations are high and Botanic Gardens so different

Education programs in informal settings like Botanic Gardens face high expectations not only from visitors but often from the senior management within the garden. Education programs have to target audiences properly and attract participants, should provide the latest standards in environmental interpretation, be easy to conduct and to promote, be cost effective and last but not least enjoyable so that people will come again.

But the resources botanic gardens and arboreta are able to put into education differ hugely from garden to garden and from country to country. Some larger gardens may have their own staff dedicated to the work, whereas in others, education is just one out of many responsibilities of

gardeners or the curator. Some gardens have a budget dedicated to the task; others may struggle to get reasonable funding for education activities.

So why not work together and face the challenge jointly? Exchange of experience is useful for everybody who works in, or is planning to work in, this field.

3. Environmental and Botanical Garden Education Network for Central Europe

The role of the UK Botanic Garden Education Networks is stated as: to help develop the educational potential of all gardens and arboreta and to facilitate the exchange of information between people involved in education, interpretation and public relations (Edwards 1993).

The Central European Environmental and Botanic Garden Education Network (EBGEN) is modelled on a similar concept to that of the UK Botanic Garden education Network. It will function as a focal point for spreading information though the botanic garden and environmental education community, exchanging teaching material and expertise, collecting and disseminating examples of best practice and will also be a forum to create and launch international projects.

Another main task will be to strengthen the field of nature education not only for the general public but also within Botanic Gardens, universities and public authorities.

4. The first steps have been taken already

There are many well functioning networks between botanic Gardens in Europe in general and in Central Europe in particular but only one working group - the "Botanische Gärten Deutschlands eV" (BGDeV) which concentrates on education. This working group is not exclusively for Gardens in Germany but has several members from other German speaking countries. EBEGEN will work closely with BGDeV and is very keen on a strong relationship, but needs to organise itself in a different way because BGDeV prefers to speak German in their working sessions whereas a Central European network needs to use English as its common language.

The EBGEN will include members from other non governmental environmental organisations because they will bring a different point of view and expertise in other disciplines.

From the left: Dina Dostal University Botanic Garden Vienna, Francesca Uzzo and Sarah Campegiani, Natural History Museum, Trento, Sabine Sladky Meraner, Suzanne Kapelari, Christian Bertsch, University Botanic Gardens Innsbruck, Andreas Jedinger, Natopia, Tirol

Meanwhile pilot meetings have been held in Innsbruck to work on a preliminary basis for discussion. To date we have agreed on the following aspects:

4.1. What are the main aims of the network?

- **Exchange** of information, materials, experiences, "best practices" (collection of ideas), Botanic garden staff & experts, "Expert pool" list, photos etc.

- **Public Relations** & **Strengthening of biodiversity education** (website, leaflets etc); at least one further **training per year for** BGE´s, teachers, BG staff etc.; the topic will be decided by the core group and conducted by a selected member
- **Lobbying & Fundraising**
- **Contact** with other organisations & networks
- **International projects**

4.2. What will the Environmental and Botanic Garden Education Network (EBGEN) look like?

The **Core Team** (like a board of directors) will consist of: elected officials (every 2 years, staggered positions) and will have a president, a vice president, a treasurer and 3 controllers. They will develop an application process for core group positions. If possible there should be one representative from each member country

The Core Team duties are ; to organize at least one conference per year and training days for the forthcoming year (theme, country); to work on a budget and fundraising; to review memberships; to set up a work plan for the next year (including projects); to review the coordinators duties and further work; to hold elections for members of the core team, plan team meetings etc.

The **Coordinator´s** responsibilities are to manage the website; collect, organize, distribute information, update membership & run mailing lists; post job announcements; prepare meetings, summarize them, take minutes, manage invitations etc; to be the support assistant for training host organisations; to follow work plans given by the core planning team and to write an end-of-year report to members & the core group.

Members will pay a membership fee which will be graduated according to the size of the organization. Individual membership will be possible, which will allow participation in the annual conference and training days, use of the mailing list and homepage, etc

4.3. How will the network be financed?

Approximately 10 000 € will be needed for training, committee meetings and the Co-ordinators salary. Money should be raised through membership fees, donations, EU funds or others. 2006 and 2007 will be partly funded by the EU Project, Plant Science Gardens which among other things aims for bringing together Botanic Garden Educators in Central Europe and the Balkan States.

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The delight factor: Exploring the role of landscape in transformational learning

Christine Joy

Royal Botanic Gardens, Melbourne, Australia

Hand, Heart, Head

For many years educators have spoke of the importance of the emotions in the learning process. The 4H (Hand, Heart, Head, Health) movement in the US, for example, from the beginning of last century identified the emotions as crucial to both healthy living and the learning process. Those who have written about the role of the environment in learning are perhaps most eloquent. 'Nothing without joy' (Malaguzzi), 'a sense of wonder' (Rachel Carson) 'a symphony of the senses' (Sally Jenkins) 'extinction of experience' (Robert Michael Pyle) among many others. All seek to communicate the intensity of the experience where the emotions are integral to the learning process and all seek to communicate the intensity that environmental learning can bring to the child's feelings. For me their beautiful words come together in what I call 'The Delight Factor.'

Such writings guided us in the development of both the design of the Ian Potter Foundation Children's Garden and its programs. The garden itself, situated at the Royal Botanic Gardens Melbourne, opened in 2005 and 'is a place where children can delight in nature and discover a passion for plants. It is a garden that celebrates the imagination and fosters the creative nature of play.'

How do the children who visit the RBG Melbourne express their emotions? What is their expression of the Delight Factor? It is in their small hands holding mine and it is in their small emphatic faces and their words when they say, 'this is the best day of my life!' or 'I love you' because they are deeply connected (in love) with the experience.

So, within the scope of emotional possibility what is our objective as facilitators of experience? I hope that within this state of being 'in love' with the experience, there is the life-changing moment; the trigger, the seed planted, a new way of seeing, a new way of feeling about plants. Within this context we choose not to preach about the destruction to the world's natural ecosystems and the depletion of its resources, or place responsibilities on small shoulders (Sobel) Working with people's natural propensity to affiliate with other life forms, or biophilia (Wilson) is a powerful point to work from.

If the goal of our teaching experience is to engender joy, exuberance, enthusiasm, wonder, curiosity, amazement and passion and then the outcome of that must surely be for learners to respond with passion, joy, innovation, optimism and hope.

Sensory immersion: The emotions and memory

"In nature play, in which all the sense are active, a correspondence of feeling within the child, a symphony of responses to the world is aroused. Our first feelings are educated by our senses, for it is our senses that begin the task of articulating and differentiating the feelings."
Sally J enk inson

There is no coincidence here that the same word is used in our language for defining both the sense of feeling, touch and to be moved by emotion or touched. It is not only the sense of touch but all the senses that feed and enrich our emotions. And it is this remarkable combination that triggers and enhances memory. Perhaps no coincidence either that sense, the word that defines the way we experience the world, also means to have knowingness or wisdom, as in good sense.

Educators such as Pestalozzi, Steiner and Montessori, stress the importance of the senses as learning tools. Research on the use of sensory experiences suggests significant and long-lasting learning that contributes also to changes in children's feelings that lead to positive attitudes and behavior towards nature and the environment.

So, how do we engage the senses in new, surprising and captivating ways? Sensory experiences can be gentle, subtle, funny, surprising, forceful or powerful. Try 'Cheeks and Tummies'. Meet trees and their amazing surfaces, textures, temperatures, smells by placing cheeks and tummies against them. Children cannot help but communicate what they feel, they enjoy a sudden freedom in their responses to plants, and therefore a heightened sensitivity and playfulness. They interpret for themselves. They delight in their own interpretations and share them with others. Adults and children alike begin to laugh and smile, eyes reflect emotion. The emotional connection between people and plants is opened, renewed, rejuvenated, by this simple gesture; and importantly, also the connection between group members.

All emotions?

Obviously fear can be immobilising, can cause helplessness, apathy and inaction. Without disregarding fear entirely as a useful emotion, let us consider the fear we can use to become stronger, braver and test ourselves.

Every child enjoys the fun of the fear associated with playing in the dark with others. In plant landscapes there is potential for scary games, exploring the Wildwood, the scary forest where monsters lurk, where you can lose yourself. The archetypal wildwood, can symbolise the journey's obstacle, a place of danger and the unexpected, but also a place of growth. No wonder that in the IPFCG the most satisfying squeals emerge from the Bamboo Wildwood! No wonder either that the most popular play spaces in the IPFCG are wild places, where children from about 7 years of age head instinctively to challenge themselves. Children who are lucky enough to carry these landscapes in their imagination, either from being read to or from time spent playing in wild spaces, carry these emotions with them, inspiring further risk-taking and learning, and inspiring rich imaginative play. It is a reminder to us all that we need the unexpected to grow.

Is there a connection between the sense of fear managed and another significant emotion in discussions about the natural world, awe? Standing under the tree the children call Lady Loch ('she' is an Algerian oak planted by a Lady Loch 116 years ago) is certainly awe-inspiring. Her branches and 'fingers' touch the earth and sweep her giant leaves about, she encloses you in her vast circus tent or a green cathedral, her trunk is vast; being under her is transforming.

Transformation in this context is through sensory immersion, related emotion and heightened awareness to a new place, a new way of thinking feeling and seeing. These are the moments that form us as individuals. Revisiting these places or memories is energising and renews and rejuvenates our connections to place.

Does Chawla refer to these moments when she speaks of our 'deepest levels of connection with the natural world.' One approach to deepening levels of connection might be to slow down the learning experience, as so many learning experiences seems to be driven by a sense of urgency to have them completed. I liken 'slow learning' to the 'slow food' movement and it might also be termed deep learning, deep looking, deep thinking, deep growth.

The emotions and interpretation

So, as learning facilitators, when comes the point when we are diminishing the experience through over-interpreting, over-teaching, over-designing? When we are giving information rather than sharing experience? Perhaps some anarchy is required rather than order (Hart, 2003) and the buzz of the unpredictable?

Do we remember the power of the unexpected, the thrill of the mystery of our own play in rich, wild spaces? Other questions we can continue to ask ourselves as we design learning places and experiences might include;

Do we trust that visitors are able to direct their own discovery? Are learning experiences personal and open rather than directed or closed? How do we avoid over-controlling the experience with our own interpretations? Do we acknowledge that discovery can be emotional, physical, intellectual, spiritual? How do we retain a compelling sense of mystery? And what is the relationship between mystery, discovery and transformation?

Agency, identity, and belonging

Important as knowledge, reasoning, and attitudes are as children seek to understand the world and their place within it, they do not form our deepest levels of connection with the natural world. The qualities of our attention and movement through the sensory world, our sense of agency and identity and the play of emotions they engender are at least equally important. (Chawla)

How do we encourage a sense of *agency and identity* they are vital to the learning experience? If a sense of agency and identity engenders a 'play of emotions', then what is our role in designing learning experiences that facilitate this? Brainstorming the meaning of Chawla's terms can lead to the development of a set of questions relevant to an interpretive organization and might include;

- Can our visitors contribute to change? (e.g. through real gardening experiences)
- Can our visitors contribute to decision-making processes? (e.g. round-table decision-making)
- Do we engender a sense of belonging to place through learning experiences?
- How do we recognise/measure a sense of belonging?

People passion

'People Passion' is one of the key design elements for learning experiences at the IPFCG. It acknowledges our connection to others and their interests through their enthusiasm, as powerful

motivating tool. Lifelong and life-wide interests (such as gardening) are often triggered by engaging with people who are passionate about what they do.

Research shows that adults who are actively engaged with and committed to caring for the environment have two main sources for their enthusiasm; positive experiences in rich natural environments as children, and family role models (or other significant adults) who demonstrated their respect for the environment (Chawla, 1999).

We planned so that 'people passion' would be an active player in communicating delight (and therefore care and respect) in the plant landscapes and also in allied programming. Gathering 'nodes' and the inclusion of staff and other inspired people in programs are strategies for working with *people passion*.

Sense of wonder

What is the connection between the sense of wonder and the perception of mystery? Einstein writes that 'The most beautiful thing we can experience is the mysterious. It is the source of all true art and all science. He to whom this emotion is a stranger, who can no longer pause to wonder and stand rapt in awe, is as good as dead: his eyes are closed.'

Is feeling a sense of wonder to also be driven by emotion to question and to understand something new, but perhaps not always to know all? To also delight in the mystery?

In regards to the landscapes and experiences we provide for our children to play and learn in, shouldn't they be joyful, playful, and allow for the contribution of the imagination, the creation of stories, stories that connect us to people and place, ones that we carry away with us not just in our heads but in our hearts? They remind us, as educators, that the Delight Factor is the most powerful of teaching tool of all.

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Biography

Christine Joy, one of the 6 designers of the award-winning Ian Potter Foundation Children's Garden in Melbourne, Victoria has been Education Coordinator at the Royal Botanic Gardens Melbourne since 2000. She has used the environment as teacher in both Australia and Spain. Inspired by the role of plant landscape in children's play she examines the 'Delight Factor' and the role of the emotions in 'deep learning' and transformation.

'Children use landscape, its plants, animals, shapes, dark, light, its loose material to create stories through play. In fact the creation of great stories comes from an intimate and emotional relationship with landscape. Time spent playing, time spent thinking and feeling. I want to explore the role outdoor spaces, their people and programs can play in engaging and immersing the heart and mind.'

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Darwin-inspired learning: Reflecting on practice in botanic gardens

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Introduction

2009 marks the bicentenary of Darwin's birth and 150 years since the publication of *The Origin of Species;* a year that offers opportunities for the botanic gardens in general and for education in particular. The Charles Darwin Trust (CDT) has already developed resources for schools and programmes for teachers successfully through The Charles Darwin Forum. Its expertise could influence botanic garden education practice if educators implement aspects of Darwin-inspired learning.

For the broad-spectrum of visitors gardens might draw attention to Darwin associated plants, ranging from foxgloves and cabbages to tropical orchids. Educational visits during 2009 might emphasise Darwin's ways of working and establish some of his experiments to develop children's thinking, argumentation and reasoning skills. Simple experiments that underpin Darwin's theories translate well into botanic garden education activities that can then be replicated in schools.

Objectives

This paper identifies some of Darwin's fundamental ideas and considers how he developed his thinking. Using Darwin's methodology and investigation skills botanic gardens could enhance plant science teaching on site and in school grounds if they can disseminate these activities widely.

Opportunities for Darwin-inspired learning

Darwin asked key questions about distribution and diversity of life on earth based on close observation during the *Beagle* voyage and in the countryside of Kent; observations that led him to think about plant and animal adaptation and survival. Close observation leading to thoughtful questioning can be encouraged during school visits.

Darwin walked every day, sometimes two or three times in a day, around a small copse he created. This Sandwalk route was his thinking path; a place to think deeply about problems and cogitated on conflicting evidence. While we give children plants to observe and questions to answer, do we give them the time to mull over their own ideas about why bees visit plants and such like? Do we ask questions that will make children think more deeply; 'Why are there so many different plants?' and 'How did they come about?' big questions, but ones which may motivate individual research. Time to think and individual problem solving are essential to working like a scientist.

Educators understand the benefits of group work, collaboration and working towards co-constructed knowledge. Darwin wrote meticulously and at length about his experiments, his methods, his observation and inferences. Then he asked for corroboration from others or for data regarding anomalous evidence from their experiments and protracted and detailed correspondence ensued. Dividing a plant investigation between groups with a plenary to present findings to others is good scientific practice and offers an effective group focus.

Giving children a means of recording their findings is equally important. Darwin wrote in different notebook for each of his research topics. He didn't write on worksheets. To work like scientists, children must access contemporary "notebooks" – digital cameras, hand held computer to record text, MP3 players to record discussions and sounds, digital video can capture insect behaviour and data loggers record environmental conditions. Most of these functions are already available on a single device which saves data to a website ready to work on in school.

Darwin is particularly significant for botanic gardens because of his associations with Henslow, who created Cambridge Botanic Garden and Joseph Hooker who is closely associated with Kew. These friends and colleagues in other countries sent him plants that he nurtured and studied on detours from the Sandwalk.

Like botanic gardens, Darwin grew edible plants. His kitchen garden enabled self sufficiency and experimentation. He grew many varieties of the cabbage and pea family, a range of fruit trees and flowering plants with interesting physiologies or life cycles. A keen gooseberries breeder, he studied reports of gooseberry exhibits or visited county shows.

All these plants are easily grown in botanic gardens or schools and yet they provided Darwin with a source of inspiration for reasoning and theorising:

> *"See how different the leaves of the cabbage are, and how extremely alike the flowers; … how much the fruit of the different kinds of gooseberries differ in size, colour, shape, and hairiness, and yet the flowers present very slight differences. It is not that the varieties which differ largely in some one point do not differ at all in other points; this is hardly ever, perhaps never, the case. The laws of correlation of growth, the importance of which should never be overlooked, will ensure some differences; but, as a general rule, I cannot doubt that the continued selection of slight variations, either in the leaves, the flowers, or the fruit, will produce races differing from each other chiefly in these characters."* (Darwin, 1859 Chapter 1)

Darwin experiments that botanic gardens could consider

How will botanic garden educators encourage close observation, ask big questions and expect children to apply their scientific observations and reasoning. A few examples are included here:

Tropical vegetation

Darwin described in great detail the lush tropical vegetation he saw on his *Beagle* voyage. Can children describe tropical plants in your glasshouses? Can they raise questions about identification or composition?

The natural environment of Kent

After 5 years on the *Beagle* Darwin settled in Downe Village, Kent and for the next 40 years worked on his experiments and theories. The landscape and natural environment was his laboratory. How can you encourage children to make close observations over the year to acquaint students with their local environment? Every year of observation is an addition to a long term study of a tree or hedgerow.

Darwin's garden

The Down House kitchen garden has changed considerably but English Heritage, with the help of Darwin's descendants, has reinstated it to resemble Darwin's experimental garden. Instead of bringing cowslips in from the countryside, plug plants now allow visitors to identify pin eye and thrum eye structure of anthers. Schools could replicate this experience by using plug plants in containers.

Evidence of Darwin's notion that "the real importance of a large number of eggs or seeds is to make up for much destruction at some period in life; and this period in the great majority of cases is an early one" (Darwin quoted in Glick & Kohn p167). In the orchard at Down House is a replica experimental weed plot. Darwin chose a piece of ground:

> *"three feet long and two wide, dug and cleared, and where there could be no choking from other plants, I marked all the seedlings of our native weeds as they came up, and out of the 357 no less than 295 were destroyed, chiefly by slugs and insects."* (Darwin, 1859).

A simple experiment that encourages children to work systematically and from five minutes data collection each day comes a resource from which to theorise about natural selection through predation.

Flower beds

Botanic garden floral collections and order beds can be connected with plants that Darwin used. Specific families are a focal point because variation within species was particularly important in his work.

The structure of orchids and co-evolution of pollinators delighted him. There is a precedent (the Writhlington School Orchid Project) for schools making orchids a central plank of holistic education. Children, as young as 11, are already fully involved in research and enterprise. Enchantment is shared in the process.

Plant breeding

Darwin's correspondence indicates his systematic and meticulous observations of vegetable and fruit plants; seed counting, tasting, comparison. He grew 54 varieties of gooseberry and put plant breeding into context. By consulting early records he found that over a period of 76 years gooseberry exhibits increased 8 times in weight (to the size of a small apple). Botanic gardens might show crab apples and culinary apples e.g. Bramley's – for the comparison to be easily observed. Schools could grow these plants in their grounds, a local allotment or even containers.

Plant adaptation

The Down House glasshouse has a display of climbing plants with various clinging methods that is easily replicated in botanic gardens. There are many plants showing this adaptation that don't need precious glasshouse space and schools could grow them in a useful addition to the grounds; climbers provide summer shade over a pergola and illustrate the science in *The movements and habits of climbing plants* (Darwin, 1875).

Interdependence and pollination

Food webs are difficult to demonstrate without reference to insects. Attracting insects and bees in particular to a public or school garden confronts Health & Safety concerns. Educational experiences are a priority when children must understand human dependence on pollinating insects for food production.

Darwin covered various plants to keep out pollinators and compared the minimal seed production of covered plants with copious seed produced of uncovered plants. Vegetable and wild flower plants are available to buy or to grow from seed to replicate this experiment in schools and botanic gardens. Weighing yields of covered and uncovered plants shows effectively our dependence on insect pollinators for food. Darwin involved his own children in watching bees and they were a lifelong interest for his young protégée John Lubbock.

Conservation

Darwin also connected red clover survival with the number of cats locally. Bumble bees, having a long proboscis necessary to pollinate long tubular clover flowers. Cats kill field mice but where cats are absent, field mice multiply; field mice destroy bumble bee nests. Without bumble bees, clover will not be pollinated and set seed, so will eventually become extinct locally. Theorising about conservation from observation of the local environment should be encouraged in schools.

Changes in botanic gardens

What has to change for the public and schools to become aware of Darwin inspired learning? Is there a circular path in your botanic garden where children can walk alone (10 paces apart) to have 3 or 4 minutes to think by themselves?

Does your garden have plant collections that answer Darwin's questions on plant distribution and diversity, plant adaptation and plant survival? How will you put these questions to children to motivate them to look more closely at plants and consider our dependence on the natural world? The nature of your questioning will be critical to students' thinking and the answers they generate.

Do you have a bank of Darwin related investigations that can be divided between school groups of different ages and abilities? If a botanic garden sets up Darwin experiments in situ students can also discuss how they would set these experiments up at school.

How do we assess whether children have observed, and thought about what they have seen? A starting point is collection of data and developments in children's questioning. Initial observations can be developed and extended if teachers can make more than one visit a year with the same children.

Students need to present their findings during a visit and a botanic garden may also act as a clearing house, a central point for collecting and disseminating data from schools after visits.

Conclusion

A visit to Down House is inspirational; the experience of walking in Darwin's footsteps and he is in your thoughts as you walk his paths observing the environment he knew. Children we have worked with there begin to change the way they react and the dynamic of the lesson changes. They are observing plants closely, they are asking questions about things that they have never noticed before and we focus their thinking until they find their own answers. We give them time to think and big problems to consider.

If you implement some of these suggestions your way of teaching will alter. The way children react in a botanic garden will change especially if you abandon the teacher's worksheet and trust children to record the information that they think is important to the big questions you pose. You will have to be prepared for students to think the unthinkable and surprise you – just as Darwin shook the world when he put forward his ground breaking theories.

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Biography

Currently leading research for Plascigardens EU project linking botanic gardens with primary school plant science at IOE she is Education consultant for the Charles Darwin Trust.

Schools and their potential to help in the protection of plant biodiversity!

Susan Hunt & Dr Fiona Hay

Royal Botanic Gardens Kew, Wakefield Place, UK

The MSBP at Wakehurst Place, is a global conservation initiative responding to the increasing threats facing the world's plant species. The collected and stored seeds in its vaults are intended to remain viable for hundreds of years, retaining a bank of plant genetic diversity for use of future generations. However, it is unknown if some species may deteriorate after a relatively short length of storage with a subsequent loss of the genetic material. It is vital to identify those species with a limited stored seed lifespan so that a programme of more frequent monitoring and replacement can be instigated.

To determine which species seeds are short or long-lived, accelerated ageing tests are carried out.

With guidance from the MSBP and the Learning Programme at RBG Kew, at Wakehurst Place, a trial is underway to train schools to carry out a seed longevity study of the native British flora. School students will be involved in making a genuine contribution to maintaining plant biodiversity.

The proposal will give students:

1) An understanding of why it is vital to conserve plants as seeds in seed banks for the future of the planet and its people.
2) Experience of investigative procedures and techniques which directly link into the Science Curriculum 2006, 'How science works.'
3) An opportunity for schools to be acknowledged as contributors in a real life research investigation, which will make an impact on a global seed conservation project.
4) An awareness of the challenges faced when we set out to store viable native seeds and conserve the genetic diversity of the world's flora.

In addition to the conservation of biodiversity study, the students will be exposed to the related issues of plant ecology and evolution arising from the investigation.

This is a novel approach to tackling bio diversification and conservation research and increasing public awareness and concern.

Biography:

Sue Hunt is an R&D Education Officer based at RBG Kew at Wakehurst Place. Sue's role is based upon a collaboration between the RBG Kew and Science and Plants For Schools (SAPS), with a vision to stimulate exciting, secondary, plant science education. She has a background in plant tissue culture research at Unilever research Ltd and teaching secondary students.

Shelf Life: A practical introduction

Michael Holland

Chelsea Physic Garden, London, United Kingdom

Introduction

When working with visiting school groups, one of the first questions I ask of them is "Did anyone eat any plants for breakfast?" Often, the response is laughter and disbelief that a grown man would ask such a silly question. When I fetch the box of Weetabix® with *Triticum aestivum* (wheat) growing out of it, or a tin of coffee granules containing *Coffea arabica* the penny starts to drop. These plants and products are relevant to their lives and this is a visual way off pointing this out. It is also useful for demonstrating the concept of Biodiversity - both within and between plant families. Other educational offshoots include nutrition; labels and their typography; multiculturalism and geography (some of the items might only be used by specific cultural groups and the countries of origin of the plants are diverse) and, of course, recycling.

L ycopersicon esculentum*in a pot of tomato soup*

The initial idea came after seeing a Hovis bread baking tin for sale in a Chelsea antique shop several years ago and thinking that growing wheat plants in them would be both visually stunning and educationally effective. I've had an interest in growing everyday kitchen plants from seed since I was about 8 years old, when my parents gave me Keith Mossman's 'The Pip Book' (out of print), which is a must for anyone interested in saving and germinating seeds from kitchen 'waste'.

Solanum tuberosum *in a potato crisp packet*

In March 2003 I began to collect food packaging as well as material to propagate (seeds, cuttings, rhizomes, runners and tubers) of a selection of foods and food plants. The plan was to use the product packages (jars, boxes, bottles, wrappers and bags) as containers in which to grow those plants that make up the products' ingredients. It is a bit of a mouthful, but two simple examples include a potato plant growing in a bag of potato crisps and wheat growing in a bag of bread. This collection of plants is something that will be expanded upon in various directions as an educational resource aimed at all visitors to the Garden.

At the 2004 RHS Chelsea Flower Show, we created a small 'shop' with shelves showing 90 different 'living' products. The most prominent plant families are Solanaceae (potato, tomato, chilli); Poaceae (maize, rice, barley, oat, wheat); Fabaceae (Broad bean, pea, soya bean, pea nut, chick pea, tamarind) and Rutaceae (citrus plants). Cotton was growing from the cash register, since our bank notes are woven with it. We were awarded a Silver-Gilt medal for this display.

The Chelsea Flower Show display

Generally, the majority of the items on display contain just one (the main or sole ingredient), some which don't are: houmous (chick pea and sesame) and *Aloe vera* and lemon washing up liquid.

Other non-food products include cotton wool, pine cleaner, and printing ink (soya and linseed) as well as selection of plant-based medicines (morphine, taxol, aspirin, hyoscine, as well as various essential oils).

Our Shelf L ife *display in our plant theatre at Chelsea Physic Garden*

Grow your own *Shelf Life* display

Part of the purpose of 'Shelf Life' was to encourage recycling, so collect seeds from the food you eat and save relevant packaging that would otherwise be thrown away. Fill the packaging with soil or potting compost and plant the seeds (or rhizomes) inside. When planting, remember that drainage is important, so fill the bottom of any packaging that you are using with gravel or horticultural grit. This will provide drainage and also weight the plants and stop them from toppling over.

When deciding what to grow, remember that choosing foods and products that are relevant to the lives of the children in your class is the key. A few growing tips are listed here:

- **Ginger** - fresh root ginger grows easily indoors in the warmth. Half bury rhizome in sandy compost and keep watered.
- **Peanuts** will grow, as long as they are not roasted - they do require a period of warmth, and the peanuts are produced under the soil.
- **Sugar cane** can be bought fresh in markets and can be made into a cutting that looks good growing in an empty sugar packet. Cut a section of cane just below a node and bury it at a 45% angle in moist compost in a warm place. Alternatively, you can grow sugar beet seeds. Sugar beet is a variety of beetroot and it is a lot easier to grow than sugar cane.

- **Cereals** growing from cereal packets look great and are often particularly familiar/relevant to children. The mini boxes of cereal that come in 'Variety packs' are great for this as they are the right size and come with their own waterproof liner.
- **Avocado Pear** - soak the stone overnight (some people recommend cracking it with a hammer to help it split a little) and then submerge the lower half in fresh water with toothpicks pushed into the stone. Change the water regularly and see what happens.
- **Tomatoes -** either obtain the seeds from the fruit or from a garden centre (if you do this, then a dwarf variety might be best).
- **Potatoes** - put a smallish spud into a large crisp packet with grit below it and soil above. Keep the soil moist and see what happens!
- **Coffee -** it is possible to grow this from seed, but requires un-roasted beans from an old-world coffee shop. For facts about the history of coffee, see www. realcoffee. co. uk
- **Apples & Pears -** seeds can be taken from the fruit, but in order to 'fool' the seed into thinking it is springtime you have to put the seeds into the fridge for a few weeks before sowing them. (This is called stratification.)

Practical points

I have received much help from the Chelsea Physic Garden horticultural staff in the form of seeds and advice as well as watering at weekends. So far, it has cost very little money, except for the products making up my ever increasingly exotic evening meals, the compost and the 3 mini shopping trolleys in which some of the items are displayed. In addition to my eating and shopping habits changing significantly, I have found myself almost constantly (almost obsessively) on the lookout for packaging and products so far absent from the collection.

Problems and limiting factors

- Sun bleaching of packets
- Drainage issues – especially with glass jars
- Non-waterproof paper packaging going soggy or being eaten by snails
- Potentially cramping containers
- Glass containers heating up in the sun and cooking the roots
- Storage space
- Top heavy items falling over - use sturdy metal bookends and 'blu-tac' to steady top-heavy items for use in the classroom
- Sharp metal edges of tins - use tape to cover these

	Common Name	**Latin name**	**Plant Family**	**Product(s)**
1	Potato	*Solanum tuberosum*	Solanaceae	Crisps, potato salad
2	Tomato	*Lycopersicon esculentum*	Solanaceae	Ketchup, soup, pasta sauce, juice
3	Chilli	*Capsicum frutescens*	Solanaceae	Pickled chillies
4	Maize	*Zea mays*	Poaceae	Corn flakes, polenta, popcorn
5	Rice	*Oryza sativa/ Zizania aquatica*	Poaceae	Rice cakes, dried rice, sake
6	Oat	*Avena sativa*	Poaceae	Porridge. oat cakes
7	Wheat	*Triticum aestivum*	Poaceae	Bread, weetabix®
8	Barley	*Hordeum vulgare*	Poaceae	
9	Broad Bean	*Vicia faba*	Fabaceae	Tinned braod beans
10	Soya Bean	*Glycine max*	Fabaceae	Soya sauce, soya 'milk'
11	Pea	*Pisum sativum*	Fabaceae	Frozen peas
12	Peanut/ groundnut	*Arachis hypogaea*	Fabaceae	Roasted peanuts, peanut butter
13	Chick Pea	*Cicer arietinum*	Fabaceae	Houmous, tinned chick peas
14	Lentil	*Lens culinaris*	Fabaceae	Dried lentils
15	Tamarind	*Tamarindus indica*	Fabaceae	Tamarind paste
16	Tea	*Camellia sinensis*	Theaceae	Tea bags
17	Coffee	*Coffea arabica*	Rubiaceae	Instant coffee granules
18	Lemon	*Citrus limonum*	Rutaceae	Lemon curd, Washing up liquid, lemon soda drink
19	Orange	*Citrus aurantium*	Rutaceae	Marmalade, orange soda drink
20	Mandarin	*Citrus reticulata*	Rutaceae	Tinned mandarins
21	Okra	*Abelmoschus esculentus*	Malvaceae	Frozen okra
22	Cotton	*Gossypium hirsutum*	Malvaceae	Cotton buds
23	Longan	*Dimocarpus longan*	Sapindaceae	Tinned longan
24	Lychee	*Litchi chinensis*	Sapindaceae	Lychee juice
25	Ginger	*Zingiber officianale*	Zingiberaceae	Ginger preserve, ale, pickled
26	Mustard	*Brassica nigra*	Brassicaceae	Dijon mustard
27	Nutmeg	*Myristica fragrans*	Myristicaceae	Whole nutmeg
28	Aloe vera	*Aloe vera*	Liliaceae	Washing up liquid (with lemon)
29	Coriander	*Coriandrum sativum*	Apiaceae	Soup (with carrot)
30	Carrot	*Daucus carota*	Apiaceae	Soup (with coriander)
31	Olive	*Olea europaea*	Oleaceae	Olive oil, jarred olives
32	Ginkgo	*Ginkgo biloba*	Ginkgoaceae	Ginkgo juice drink
33	Mango	*Mangifera indica*.	Anacardiaceae	Juice, chutney, pickle
34	Avocado	Persea americana	Lauraceae	Guacamole, body cream
35	Strawberry	*Fragaria vesca*	Rosaceae	Jam, juice
36	Sunflower	*Helianthus annuus*	Asteraceae	Oil, spread
37	Sesame	*Sesamum indicum*	Pedaliaceae	Houmous, paste, biscuits

Finally, I hope you have as much fun doing this as I have. A little more information is available at http://www.chelseaphysicgarden.co.uk/education/. shelflife


CROPLIFTERS
WILL BE
PROPAGATED

Citizen's participation in the educational activities at the Ecology Park.

Kôzi HAYASI

Natural History Museum and Institute, Chiba, Japan

Introduction

International organizations of museums have not treated environmental education as an important function of museums. This is strange because international organizations of zoos and aquariums (WAZA 2005) and botanic gardens (Wyse Jackson & Sutherland 2000) have stated that every zoo, aquarium or botanic garden should take part in the conservation of global biodiversity and also the in situ conservation of wildlife. Thus natural history museums are required to put environmental education as a crucial mission of the museums (Hayasi 2006). I strongly hope that every natural history museum will do so in the near future.

In recent years, I have introduced an environmental education workshop entitled "education for sustainable society" as a workshop program at the museum. Participants are school teachers, citizens involved in environmental education and students interested in environmental education. The participants were encouraged to exchange opinions on a particular subject; to reflect on their daily activities; and think how and whether these activities related to the sustainability of the community, of the country and of the world or not. This may be a rare program since Japanese natural history museums do not directly address the issue of sustainability.

Natural history museums or botanic gardens address the topic of conservation of biodiversity reasonably well. The question to be addressed is how to educate audiences on the conservation of biodiversity? Traditional didactic educational methods such as lectures are still widespread in museums. Educators of museums or botanic gardens must reconsider their didactic style. Hooper-Greenhill (1999) stated that critical pedagogy (Fien 1993) is relevant to learning in a museum situation. I believe that in museums or botanic gardens, critical pedagogy is most effective, especially for the education for sustainable society. Recently the BGCI released the ESD guidelines for botanic gardens (Willison 2006). In reality, however, most museums or botanic gardens appear to find it difficult to include ESD in their mission statements. We stated that the educational goals of the Ecology Park are education for environmental conservation and education to encourage and assist the regional talent for conservation. I think this is a good example to include ESD in education of museums or botanic gardens.

Ecology Park

The Ecology Park (Figure 1) is an open-air facility that spans 6.6 hectares (16.3 acres). The Park is not a typical botanic garden but a kind of nature restoration park, where visitors can observe the life of plants and animals native to the Boso Peninsula, Central Japan. The park is close to the main building of the museum, which contains exhibition rooms, an auditorium, a lecture hall etc. We provide several programs for people of all ages at the park. Some of these are as follows.

Ecology Park Gallery

There are two types of Ecology Park Gallery programs. One program was originally created as a program for groups of elderly people. Most local governments in Japan have "schools" for senior citizens. Groups from such schools sometimes visit the museum and the Ecology Park. We have created a program for such groups. The objectives of this program are to appreciate the nature of the season and to express one's own impression on the displayed works, namely digital photographs, postcard-sized paintings (Figure 2), haiku or tanka (short poem), essays, collage of natural materials (Figure 3) or frottage of leaves etc. It takes approximately 90 minutes to walk around the park, gather materials and create a personal work. Each work is photographed using digital cameras. After lunch and participating in another program in the museum (usually lectures

and/or guided tours of exhibition), the works are projected on a screen one at a time. Each participant briefly explains his or her work and then receives warm applause. It is important that the participants learn actively throughout the program.

Another Ecology Park Gallery program is a type of photo contest. Digital photographs of any theme that are taken in the Park by visitors of all ages are invited. All the photographs are displayed in a simple frame (Figure 4) for a definite period of time, and the photographs are selected through voting by visitors. Visitors can also comment by writing on a Post-it note and place it on a comments sheet for the photograph (Figure 5). Interactive discussion on the sheet occasionally occurs. Voting encourages visitors to view the works very carefully. Selected "excellent" photographs are exhibited for longer days. Thus visitors participate in making of the exhibits by applying and/or voting. As part of an advanced program, participants will make exhibits that will be displayed along the park path. Small panels of a photograph and a short message (like haiku, a short poem) or explanation will be prepared by visitors and not the museum staff. Such "instant exhibits" in the field can be created by using digital photographs and laminated plastics.

Forest Explorer program

Forest Explorer is a worksheet-based program mainly for children. A child can search for some shapes or colors in the Park; make a poem, and observe plants, insects or birds, etc. by following the worksheets (Figure 6). Approximately fifty types of worksheets of various themes and for different seasons have been prepared. A child returning to the entrance is welcomed by the staff and interviewed regarding his or her experiences in the Park. Staff should listen to what the child talks about, ask questions to get the child to recollect what he/she has seen/encountered, and try not to teach anything. This Interview (debriefing) process appears to be the core of the program. The child can strengthen his/her memory of performing a particular task in the Park through the process.

As a reward, the child can put an animal stamp on his or her stamp card. The rule is one sheet at a time in order to concentrate on the theme. After completing the program five times, a child can get a copy of a paper craft collection of animals and plants found in the Park. Currently, we have ten types of paper craft collections; all have been originally created by the staff. The Forest Explorer program is held on Saturdays, Sundays, legal holidays and long school holidays. School groups can participate the program on weekdays on request. Many children have become familiar with nature observation through this program.

Partners of the Ecology Park; the Volunteers

Approximately fifty citizens—from high school students to the elderly—act as volunteers in the Park, and they are referred to be as Partners of the Ecology Park. One of the functions of a Forest Explorer Partner is to listen to the children talk, sympathize with and facilitate them, and try not to teach them. Other volunteers are Nature Observation Partners, Birding Partners and New Project Partners. Other possible activities are developed by New Project Partners. The partner can himself or herself make a plan of activities by consulting with the museum staff. Any partner must have a minimum experience of one year prior to submitting a new project. This may be termed as the period of "arranged introduction" between partner(s) and the museum staff.

The EcoPark12 program is one such new project. It involves gathering participants and taking them on a tour of the Park every month to investigate the phenology of trees or herbs, and recording the observations. Approximately twenty people participate in the program every month and exhibit of the results of their observations on the wall of the Orientation House in the Park. Staff of the museum watch them and provide a little support.

Partners are now indispensable to the educational activities in the Park. Some explore citizen participation in not only the educational but also the research and collection activities in the Park and museum.

Conclusion

Public institutions such as museums or botanic gardens function as a "school" for citizen participation in community and/or social activities. In the "school", citizens learn how to participate in social activities and communicate and learn from each other. Of these, some "graduate" and then participate in other social activities. Although there are no regular terms or fixed curricula, public institutions function as schools of social participation for citizens that enable them to create and maintain a sustainable society.

Acknowledgments

This work was carried out in collaboration with Mr. Kazuhiro HIRATA and Dr. Masahiko ASADA of the museum. I also thank all the volunteers for their efforts and the other staff for their help.

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Legends

Figure 1. Ground plan of the Natural History Museum and Institute, Chiba and of the Ecology Park

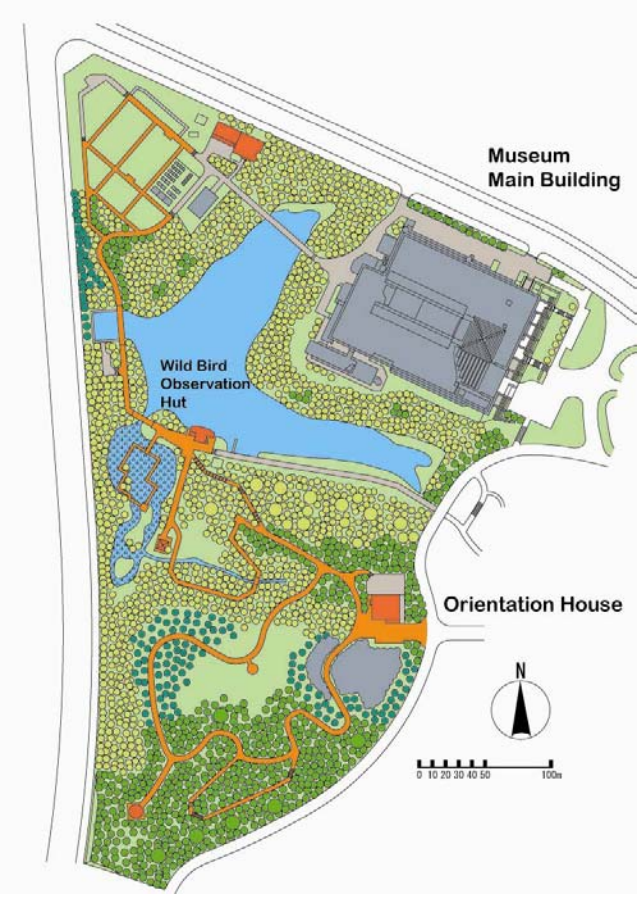


Figure 2. A work of the Ecology Park Gallery, postcard-sized painting

Figure 3. A work of the Ecology Park Gallery, a collage of natural materials

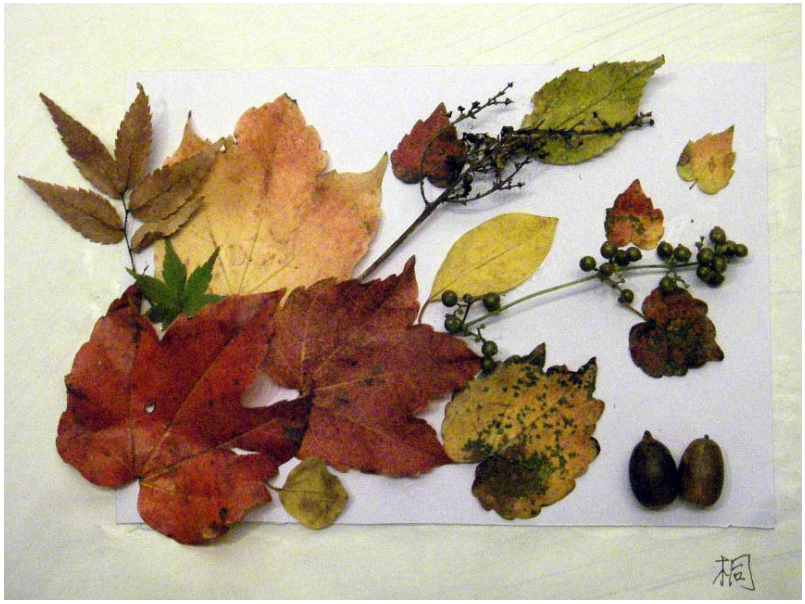


Figure 4. Exhibition at the Ecology Park Gallery, a contest of digital photographs

Figure 5. Exhibition at the Ecology Park Gallery, visitors can vote and comment on the photograph.

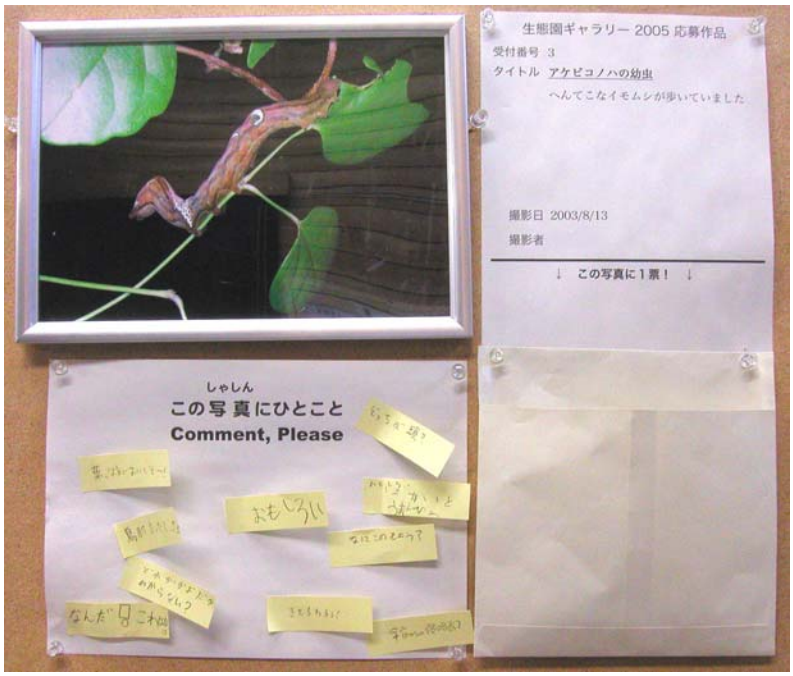
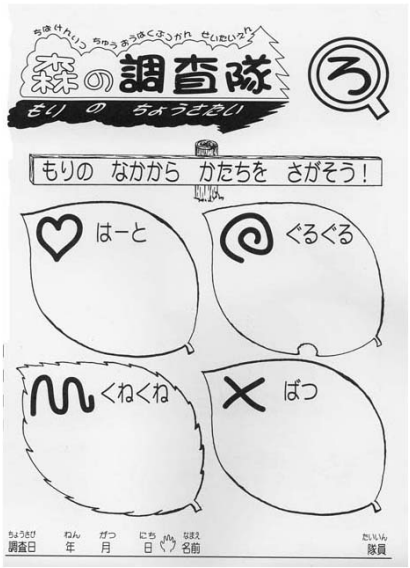


Figure 6. A worksheet of the Forest Explorer Program. The actual size of the worksheet is A5 (14.8cm x 21cm). The task of the sheet is to find four types of shapes; heart, spiral, snaky and cross in the Park.



Schools and their potential to help in the protection of plant biodiversity!

Susan Hunt & Dr Fiona Hay

Royal Botanic Gardens Kew, Wakefield Place, UK

The MSBP at Wakehurst Place, is a global conservation initiative responding to the increasing threats facing the world's plant species. The collected and stored seeds in its vaults are intended to remain viable for hundreds of years, retaining a bank of plant genetic diversity for use of future generations. However, it is unknown if some species may deteriorate after a relatively short length of storage with a subsequent loss of the genetic material. It is vital to identify those species with a limited stored seed lifespan so that a programme of more frequent monitoring and replacement can be instigated.

To determine which species seeds are short or long-lived, accelerated ageing tests are carried out.

With guidance from the MSBP and the Learning Programme at RBG Kew, at Wakehurst Place, a trial is underway to train schools to carry out a seed longevity study of the native British flora. School students will be involved in making a genuine contribution to maintaining plant biodiversity.

The proposal will give students:

1) An understanding of why it is vital to conserve plants as seeds in seed banks for the future of the planet and its people.
2) Experience of investigative procedures and techniques which directly link into the Science Curriculum 2006, 'How science works.'
3) An opportunity for schools to be acknowledged as contributors in a real life research investigation, which will make an impact on a global seed conservation project.
4) An awareness of the challenges faced when we set out to store viable native seeds and conserve the genetic diversity of the world's flora.

In addition to the conservation of biodiversity study, the students will be exposed to the related issues of plant ecology and evolution arising from the investigation.

This is a novel approach to tackling bio diversification and conservation research and increasing public awareness and concern.

Biography:

Sue Hunt is an R&D Education Officer based at RBG Kew at Wakehurst Place. Sue's role is based upon a collaboration between the RBG Kew and Science and Plants For Schools (SAPS), with a vision to stimulate exciting, secondary, plant science education. She has a background in plant tissue culture research at Unilever research Ltd and teaching secondary students.

The Inquiry, Integration and Differentiation Project: Professional development for middle-level Appalachian teachers at the University of Tennessee Gardens

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Abstract

The Inquiry, Integration, and Differentiation Professional Development Institute for Appalachian Educators (IID) was held at the University of Tennessee in 2005 and supported by an Improving Teacher Quality grant from the Tennessee Higher Education Commission. The aim was to build capacity through teacher professional development. The project addressed teachers' knowledge of content specified in the state curriculum framework by focusing on environmental science in a summer program followed by two academic year symposia, and also addressed pedagogical skills through training in inquiry strategies, subject integration, and differentiated instruction. The university gardens and a nearby national park were used for field studies. An independent evaluation concluded that the IID project substantially met its goals and objectives.

Description of the Project

The Inquiry, Integration and Differentiation (IID) project was conducted in 2005 at the University of Tennessee (UT) as a professional development opportunity for middle-level teachers in the state's Appalachian region. The median household income in this area is almost half the average for the United States, $24,000, compared to $41,994 for the U.S. as a whole, with over 20 percent of residents living below the poverty level (U.S. Census Bureau 2004). The unemployment rate in this area is nearly twice the state average (Tennessee Department of Labor and Workforce Development 2004). The percentage of students receiving free or reduced price lunches indicates the level of poverty of the school clientele. *All* (100 percent) of the children in two Cocke County schools receive free/reduced lunches. The school with the least has 64 percent on free lunches. In Scott County, the percentage receiving free or reduced lunches ranges from 80 to 92 percent. The schools in the Appalachian counties also serve many special education students, with percentages ranging from a low of 7 percent to several schools at 21-22 percent, one at 24.5 percent, and another at 34 percent. Researchers claim that differentiated instruction (Tomlinson 2003) is an effective way to address the high numbers of special education students in these schools.

Nadel & Sagawa (2002) argue that child poverty in the U.S. is greater in rural than in urban areas as poor rural children often receive substandard educations, inadequate health care, and have limited opportunities for further intellectual development. As for their teachers, researchers have noted that in the area of science many U.S. middle level teachers lack confidence in both their understanding of the content and their ability to "do" science (Lederman 1992).

The IID program was conducted at UT's botanic gardens, greenhouses, and laboratories as well as at field sites in the Great Smoky Mountain National Park. In the two-week summer institute and two autumn-term follow-up symposia participants received sixty hours of instruction provided by a multidisciplinary team of a science teacher educator, a botanic garden

educator/horticulturalist, two graduate students studying public horticulture, and several guest speakers. Guest speakers included a university instructor with expertise in evolutionary theory, the Acting Director of Georgia's Calloway Gardens, a visiting international scholar with expertise in environmental science, an environmental educator from the Great Smokey Mountains National Park (GSMNP), a biologist with the Park's All Taxa Biodiversity Inventory (ATBI) project, and an educator representing the "newspapers-in-education" program of the *Knoxville News Sentinel*.

Photo 1: Ranger leads participants in investigations in the GSMNP.

IID project aims were to advance participants' knowledge of plants and environmental science as well as to develop their educational theorizing and pedagogical skills, especially in using active learning strategies, inquiry, differentiated instruction (also known as "layered curriculum") and in developing outdoor study sites on school grounds. Participating teachers experienced an inquiry approach themselves as instructors modeled the recommended high-impact strategies. A communication network and Website (http://web.utk.edu/~appalsci) were created to provide resources to both participants and other Appalachian educators.

The IID project focused on curriculum and instruction in grades 4-8 (ages 9-14). Teachers at this level are at a disadvantage if they have not earned a degree in a content-area discipline or have not developed their expertise. Researchers have found that inquiry science is not taught in many classrooms due to teacher inadequacies in background and experience at this level (Brown & Bentley 2004). Many at this level recognize that they need more content background preparation, and also training in strategies to enact curriculum that better reflects the nature of the discipline.

In the U.S. in the past decade, professional development has responded to major policy changes at the federal level with the implementation of the No Child Left Behind Act. The introduction of curriculum standards for schools has emphasized rigorous teaching of content. Accountability for student achievement as measured by annual standardized multiple-choice tests has put new pressures on teachers. Across Tennessee as in others states, both science and social studies have

lost ground in the daily curriculum due to the emphasis on reading and mathematics. However, beginning in 2007, student achievement in science will be tested annually. One problem in the area of science is that many teachers lack confidence in both their understanding of content and their ability to "do" inquiry teaching (Lederman 1992).

Of course, reading and maths goals can be achieved through studying social studies and science, and in particular, environmental science. For IID project activities, environmental science using an inquiry approach was the focus. *Inquiry* teaching is recommended by both state and national standards documents, in science, the *National Science Education Standards* (National Research Council 1996) and Project 2061 (American Association for the Advancement of Science 1993); in math – the *Principles and standards for school mathematics* of the National Council of Teachers of Mathematics (NCTM 2000), and in two social studies documents, the *Curriculum standards for social studies* of the National Council for the Social Studies (NCSS 1994) and *Geography for life: National geography standards* (Geography Education Standards Project 1994). These various standards address conceptual understanding and include new curriculum content, such as, in science, the nature of science. Much of the new content in science and social studies is associated with a science-technology-society (S-T-S) approach, which naturally lends itself to multi-subject curriculum integration (Penick 2002).

Photo 2: Participants investigate bark flora and fauna.

In addition to the need for the content background, these teachers need to update their pedagogy. They need to know methods that are supported by research, including active learning strategies (Harmin & Toth 2006), problem-based and cooperative learning strategies (Thayer-Bacon & Bacon 1997), using technology appropriately (Penick 2002), and differentiating instruction

(Tomlinson 2003). Thus the IID program aimed to help participants develop both standards-based content background and an expanded repertoire of effective teaching strategies (Bentley & Alouf 2003).

The project also aimed to improve communication between different communities of the educational enterprise. Being geographically isolated, Appalachian educators can benefit from a professional support network as they take risks in teaching new content and trying new activities and strategies. An ideal network would include fellow teachers and content specialists, educators working in informal settings such as museums and parks, science teacher educators, and research scientists at universities and in industries. Such a network can provide on-going support via email and help in accessing the many resources of the Internet.

Photo 3: Teachers gather stems for rooting in the UT Gardens.

The IID project fostered the idea of teacher as *reflective practitioner*. A reflective practitioner has a base of knowledge that is built upon through on-going inquiry into the subject matter and through continually rethinking and reevaluating classroom practice. In this view, teacher development aims at renewal through *culture building* (Lieberman & Miller 1990). Recognizing that teachers are professionals with special expertise, we aimed at providing learning situations that would build on teachers' knowledge and experience. According to Ayers (1991), professional development is most effective when it unites what teachers are doing in their classrooms with reflection and inquiry, teacher voice, and valuing and analysis of personal and professional experience. When links are made between teachers and the resources that are "out there" many opportunities emerge for shared conversation and growth in content understanding and pedagogy. Reflective teachers know that good teaching is not a place where one finally arrives, rather it is always in process, evolving and changing in response to new situations. Teachers need a sense of professional community if they are to develop their skills and maintain enthusiasm and energy. Isolation, particularly characteristic of Appalachia itself, can result in either lack of self-

confidence or an idiosyncratic mode of operation. Teachers have much to contribute to the conversation and they have *the* key role to play in school improvement.

Photo 4: Teachers use vermiculite to root plant stems.

In summary, the IID project addressed: (1) content specified in state and national standards documents; (2) inquiry-oriented curriculum; (3) research-based teaching strategies and technology, and (4) a professional network to enhance peer communication and teacher access to the resources of the community.

Evaluation Results

An external evaluation team was contracted to provide formative assessment during the project, and a summative evaluation after the project concluded in late 2005. The evaluators used the following sources of data:

1. Interviews with participants,
2. Pre-post intervention surveys and content assessments,
3. Interviews of the project's principal director,
4. Review of project-related instructional materials and participant products.

The evaluators drew these conclusions based on the available evidence:

1. The design and implementation of the process for recruiting participants was thorough and effective in generating interest and applications. The recruitment materials were well designed and user-friendly.
2. Project staff made progress towards achieving all stated project objectives. Objectives that were not addressed to full potential related to the limitation in opportunities for collaboration due to a relatively low number of participants (8 instead of the targeted 25) and to low attendance at the autumn sessions.
3. Participants rated their project experiences extremely favorable.
4. Participants reported gaining new content knowledge consistent with project objectives and with the state curriculum framework.
5. Participants developed an understanding of new pedagogies introduced by the project, such as, inquiry-based and hands-on strategies, which they perceived to be readily transferable to their classrooms.
6. Participants reported that they had a limited opportunity to incorporate new knowledge in their classrooms thus far because the particular topics would not be addressed until later in the school year.
7. While less than a semester elapsed before participants were interviewed, they reported some opportunities to transfer the knowledge and skills they learned in the project. Teachers indicated that they had experienced some evidence of early effects on their students and some reported that their students were enjoying science more due to the hands-on, inquiry-based classroom activities they were employing as a result of the project.
8. Several unexpected benefits occurred: teachers reported that they transferred inquiry-based teaching strategies to other subjects. One elected to pursue teaching in Africa based upon project experiences with an African guest lecturer.
9. The inherent collaborations necessary for this project to be successful worked well. Project faculty and staff supporting the project, teachers, and school system officials worked together to ensure that participants experienced a meaningful and beneficial learning opportunity (Skolits & Graybeal 2006, 3-4).

Photo 5: Seeds sprouting in latex glove.

Recommendations

Based upon the data collected and analyzed for the IID project, the evaluators offered several recommendations:

1. In future projects, a verification and contingency plan should be in place so that each stage of the recruitment, selection, and applicant notification process occurs on a timely basis.
2. The wording of project objectives should be tightened. The objectives addressed significant purposes and the implementation of the project was consistent with stated objectives, however, objectives could be stated more concretely and expressed in terms that enable measuring the extent to which they are achieved.
3. Early collaboration and communication efforts with schools and teachers should take place, especially regarding any competing activities that may limit the number of potential participants.
4. Participants identified strengths of the project. Very few improvements for the future were recommended, however, scheduling follow-up sessions on Saturdays seems most worthy of consideration (Skolits & Graybeal 2006, 4).

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Bringing the bush to the city through our botanic treasure, Tondoon

Merilyn Anne Haigh

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Introduction

The purpose of this paper is to share an insight into the treasure that is Gladstone Tondoon Botanic Gardens.

This paper will provide:

- A brief insight into the establishment of a Regional Native Botanic Garden
- How we inspire and encourage our Children to appreciate, conserve and preserve the environment
- A view of the unique partnership and balance between Industrial Urban Lifestyles and an awareness of the natural environment

Content

Tondoon Botanic Gardens, an integral part of the Regional Port City of Gladstone, Queensland, Australia. It is a unique Regional Native Botanic Garden maintaining a scientific collection of Native Regional Plant Species all are from local provenances, including the Port Curtis Region in Central Queensland and Tropical Far North Queensland. Established in 1984, the area of the Garden is 104 hectares, which includes 21 hectares of Developed Display, and 4 hectares of Lake, and natural bushland. The Gardens are fully funded by Gladstone City Council which is the local government authority.

Gladstone, a modern highly industrialised City with a large transient population of over 28,000 and a regional centre of another 34,000, has been the recipient of a host of accolades including State Winner of Tidy Towns 2002 and Tidiest Industrial City in Australia 2003.

The Gladstone Region is not only being developed as a major port, but is underpinned by coal exports and a hub for light metals processing. It is also an area of significant visitor interest which is highlighted by its hinterland, subtropical coastline and off shore and reef islands. Gladstone is one of the southern gateways to one of the seven natural wonders of the world the Great Barrier Reef. The region contains a number of unique plant associations which deserve major recognition and conservation.

When you first visit Gladstone, you will notice the bustle of many large industries and the deep water Port. Just fifteen minutes from the Central Business District, the tranquillity of Tondoon is a welcome relief to the industrial cityscape. It is important to remember that Industry has championed opportunities and prosperity for the Gladstone Region and environs.

The area is home to many pristine parks, marina parklands, and green belts. Industry, along with local government and community groups have provided many areas of recreation for the local population.

Creating a treasure within the industrial hub

The Gardens were officially opened in October 1988 and extensive development has continued since the opening. The physical qualities of the 104 hectare site were the major determinants influencing the planning concept for Tondoon which features a Wildlife Lake, Arboretum, and Forest Reserve as an adjunct to the Botanic Gardens. These elements are also integrated with a large water system linking important elements across the site.

The geography of the site is typical of the region with steep rocky slopes covered by sclerophyll woodland forest, with contrasting with patches of dry eucalypt scrub in the deeper more protected valleys.

However with the massive earthworks required to form the lake and the undulating lower gardens a gentle sloped user friendly garden was created. Many visitors regularly comment on the ease of access, on well laid out pathways with ease of wheel chair use throughout the Garden.

The steeper paths to and along the upper slopes of Mount Biondello provide many different flora and fauna habitats as well as provide views over the expanding City and Harbour.

From what was dry woodland of mainly eucalypts and acacias, these plantings have been enhanced in to a cool green paradise. There are three main themes developed within the Garden, these ecosystems include Dry (microphyll vine forest), Subtropical and Tropical Rainforests all of which are intriguing to the visitor.

Industry and the Gladstone community

The Garden was established as a special refuge and biological asset for the people of Gladstone. It was also developed to ensure that the nation's environmental heritage of specific local bio regions is passed on to future generations.

Most industries are large by world class standards, and these include Comalco Alumina Refinery, Central Queensland Port Authority, Queensland Alumina, NRG Power Station, Queensland Cement and Lime, and Boyne Aluminium Smelters.

Industry is always trying to create the unique balance in the community. Gladstone is a good model of a mix between large industry and the environment.

There is a sustained effort by all industry to conform to the clean air policy of State and Federal Environmental Protection Agencies, with continual monitoring taking place.

Regular forums, advertising and committees are held within the Community to encourage for ongoing public involvement with Industry in creating a positive image and profile for the region and Botanic Gardens.

The Gladstone Area Promotion and Development Limited work in partnership with all major industries in the area to provide free guided tours to gain an insight into the operation and

community profile of each industry. These tours are extremely popular with visitors to the Region. The Gardens are featured on the Industry Tour Brochure as a "Must See", tourist destination whilst visiting the region as further evidence of its importance in the region.

Most industries in Gladstone are eager to create the unique balance between the environment and a vibrant Gladstone community.

Public awareness of plants of the region

The Prime Display area associations are plantings that are arranged in categories such as Geographic and Ecological associations. This specialisations is a special area to the Gladstone Region as all species in the Prime Display Area are indigenous plants of the Port Curtis Region.

This area provides a fabulous learning tool for locals and visitors alike, as they can learn more about the local plants and then be encouraged to put this learning into practice in their own home gardens by replacing inappropriate exotic plants with more suitable endemic species. It also provides the visitor to the Garden with a unique area in which to focus on local species plantings. Each area within the prime display is created to replicate a Ecotype typical of plant associations in the area.

> "Planning and creating Tondoon was in many ways a community experience involving many local people who were enthusiastic about identifying the specific local vegetation, determining its botanic qualities and experimenting with its potential for use in ornamental horticulture. (Lawrie Smith) the Landscape architect worked with Groups such as the Society for Growing Australian Plants, Gladstone City Council, and Civic Beautification, Orchid and Foliage Society and Wildlife Preservation Society in the implementation and development of Tondoon." Lawrie Smith, Landscape Architect Tondoon Botanic Gardens 1999

Tondoon has vital educational and conservational resources, a Herbarium of Plants of the Port Curtis Region. This is run entirely by volunteers. All specimens all identified by the Queensland Herbarium and then incorporated into the Tondoon Collection.

The Society for Growing Australian Plants, Gladstone Branch, have a unique relationship with Tondoon in promoting the use of native plants. The Gardens have been involved in a number of publications on plant identification, cultivation and advancement of growing local plant species.

Today this work continues with these groups and a dedicated group of Herbarium Volunteers who are instrumental along with the Gardens Curator, Brent Braddick identifying specific local vegetation and participating in field trips to reserves, private property and national parks by further botanic investigations and developments.

Challenges to educate for the future – our children

Who will teach the Children? The Essence of Nature Will.

The Challenge for the Visitor Services Section at Tondoon is to empower an industrial orientated highly urbanised population in developing an awareness and knowledge of the natural environment surrounding them. Bringing the bush to the city. A key focus is on hosting local school groups, in 2005 (80 classes participated in lessons in the Garden) over 5,000 School

Children visited the site and a 20% increase in requests for visits from local schools is expected in 2006.

The following is a quote made by the Gardens first Director of Parks and Recreation Mr Neil Kershaw:

> "This returns us to the key point: Tondoon is a blurred concept, an organism, that contains practices, techniques, goals and objectives that share overlapping attributes. An undue emphasis on planned precision, although laudable in some respects, is also limiting. Rather it is a wild gesture for the future." Neil Kershaw, Discover Tondoon 2006.

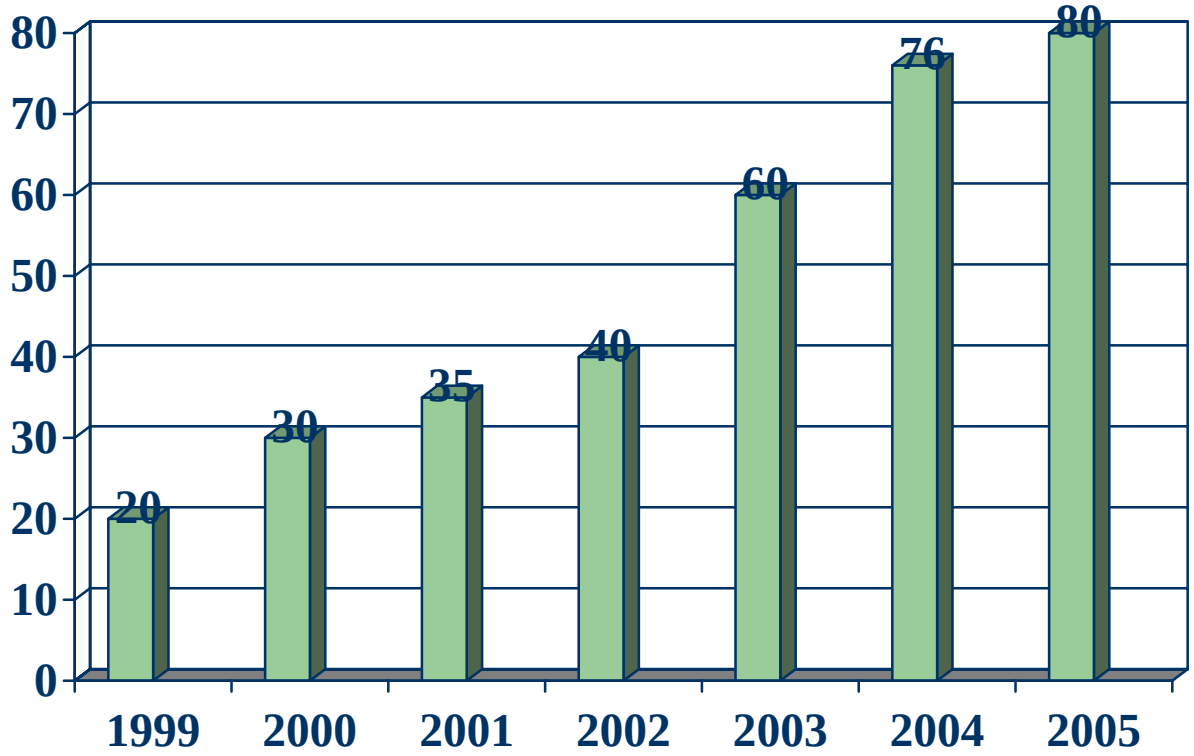

Figure 1 - School Visitation Figures 1999 - 2005

One of the most popular plant awareness experiences that is presented at Tondoon is the "Australian Plants & Their Uses" for Mid Level Primary Children.

This experience is also offered as a guided walk to the visitor. The interpretation of local plant species and their uses progresses to a hands on tasting commercial products made from native food plants, colloquially termed "Bush Tucker". Lilly Pilly Jam with damper and Lemon Myrtle Coconut Cake are among the favourites.

> "By learning about the uses of plants such as medicinal, food, shelter, hunting and gathering made by the indigenous inhabitants prior to the arrival of

> Europeans, Australian Children are learning about Aboriginal Culture. This understanding of Aboriginal Culture also helps to form relationships between Aboriginal and White Australians. Doctor Grace Johansen - Discover Tondoon 2006

At Tondoon Botanic Gardens our emphasis is on teaching the traditional use of plants along with comparing the modern day applications.

Children and adults alike particularly love the hands on tastings of commercial products. This is a novel approach, which has attracted much visitor and School interest at the Gardens.

A popular local species that we are promoting is Lemon Myrtle (*Backhousia citridoria)* It has many uses commercially, within Bush Foods products ranges and various recipes incorporate the plants wonderfully strong lemon smell. Examples of products include Lemon Myrtle liquid soap and Davidson Plum Jam.

A number of Gardens Botanical and Environmental Experiences have been developed to increase awareness of the natural environment and stimulate student's awareness in line with Education Queensland's Learning Outcomes.

It is essential that we continue teacher liaison with the planned excursions to ensure that the desired learning outcomes are achieved.

Current programmes require ongoing review to further inject new life into our delivery and content.

Evaluating Tondoon's education/interpretation programmes

The process of evaluation of our programmes has been in the form of developing overall "Positive Partnership and Important Links" from the Garden out in the Community.

The flexibility of our programmes to involve other individuals and local groups for inspiration and technical advice has contributed much to their success.

After each lesson we send out a feedback form to Teachers to clarify that the learning outcomes have been fulfilled for a particular lesson.

Sharing nature and leaving lasting impressions

Since then the Gladstone Community has embraced environmental education at the Garden extremely well, through our dedicated staff and development of programmes interest is growing from strength to strength. The hands-on learning approach has been the best way to deliver interpretation to the Visitor.

Popular programmes for Children include Environmental Puppets & Storytime Sense-sation, Discovering Nature in the Garden, What is a Rainforest? Australian Plants & Their Uses, How Diverse are Australia's Plants, Biodiversity in the Web of Life. School Holiday programmes continue to provide participants with hands on learning and a chance to interface and appreciate the wonderful environment of the Garden.

Being a Regional Botanic Gardens our challenges are numerous, usually associated with inadequate budgets and resources. How we deal with this? We operate activities with the generous assistance of our Friends of the Garden Group, and charge a minimal fee for groups and Schools visiting the Gardens to cover material costs.

Children visitations have been our best source of promoting with our interpretation programmes in Tondoon, "Hands on learning encourages repeat visitation". Hands on programmes involve storytelling, art and craft, sensory, visual, puppets, simple propagation activities.

Our main challenge in the Garden is to factor in that in a reasonably small community local children to visit the Garden more than once during their schooling. It is important for us to receive ongoing feedback and evaluation from Teachers. So we can increase the participation and ongoing visitation.

The Ecofest concept: garden, community & industry working together

In creating a more positive image between industry and the environment, the Ecofest is co-ordinated by the Gladstone City Council between the many local industries and environmental community organisations and groups.

The Ecofest concept was developed by the Boyne Island Environmental Education Centre after Staff attended a seminar by world environmental expert David Bellamy. In 1998, Mr Bellamy commented on the surprisingly good balance that exists between industry and the environment in the Gladstone Region. He was also impressed by the level of community involvement and suggested that the Region should promote its environmental attributes.

Education Queensland supported the Ecofest idea to work in partnership with industry and community groups in educating the community on the environment and sustainability.

The Ecofest has been designed to promote environmental sustainability through educational displays and interactive activities provided by local industry, business and community groups as well as promoting products and practices with an “environment” theme for the whole Family.

The theme Ecofest, “Sustainable World, Sustainable Gladstone” was adopted to emphasise the importance of co-ordinated local action by industries, government departments, Councils and community groups that work individually and in partnership to protect and conserve the environment.

The Ecofest provides an opportunity for these organisations to showcase the local efforts, contributing to global sustainability.

Ecofest Experiences - Feedback from the Community 2006

Most Enjoyed Experience	Number of Respondents	Initial Attraction General Comments	Most Enjoyed Comments
Stage Entertainment	26	Seeing people here concerned about env ironment	Env ironmental theme to encourage these v alues in children
I nformation & L earning Opportunities industry stalls	24	Seeing the standard being improv ed all the time.	Env ironmental awareness and any new technology av ailable
Children' s activ ities	21	L ots for Kids to do	Env ironmental improv ement and initiativ es
Wildlife (General)	21	Opportunity to expose children to env ironmental issues	Ways to discuss the env ironment with Children
Bilbies (T harsupials on Display)	16	Great F amily and social outing - Outside	How the env ironment and industry interact
Atmosphere	10	T he interaction with wildlife, snak es, crocodiles, and j oeys (baby k angaroos) and Ranger T im,	Children excited to come and learn more about the env ironment
Ev erything	10	Meeting and talk ing with people inv olv ed with the env ironment/	Ranger T im, liv e animals and to learn all about being eco friendly.
Reptiles (Crocodiles, snak es & turtles)	9	L earning about local industry	
Ranger T im (National T V personality)	3		
Pook i Doos Entertainment	2		
Camels	1		
Storytelling T urtle	1		
TOTAL RESPONSE	144		

Enhancing the visitor experience - discovering the treasure

Community Education at Tondoon has become increasingly popular, thanks to this amazing facility we are able to focus on requests for Community Education, School Holiday Programmes, Spotlighting Tours, Barefoot in the Park, Ecofest - World Environment Day Celebrations, Group Tours, Garden Events, Tourism Projects and Guest Speaker Initiatives.

In developing the site popular events such as weekly guided walks with the Friends, partnerships with tourism bodies and industry have undoubtly increased Tondoon's profile.

There is also an annual calendar of exhibitions in the Tondoon Botanic Gardens Visitor Centre featuring interesting art and interpretative displays

The great horticulturist and garden designer - Gertrude Jekyll said -

> "I am strongly of the opinion that a quantity of plants however good the plants may be themselves and however simple the number does not make a collection" (Paradise in your garden p.27).

We believe through our careful stewardship that the Gardens have become a key place for learning and appreciation of horticulture, botany and ecology for the whole community of Gladstone and visitors to the region.

Conclusion

Our job as staff of the Garden is to provide positive learning experiences, lasting memories and impressions to all visitors to Tondoon.

The Gladstone Tondoon Botanic Gardens will continue to provide a unique oasis away from the industrial scape in our community for locals and visitors alike. There is a special balance between humans, and the local biodiversity when you come to experience some special time within this amazing treasure.

The future brings many challenges to Tondoon these include:

- Sustainable water use - due to diminished rainfall in many catchment areas, sustainable horticultural practices are required to allow for more sustainable innovative water conservation practices.
- Obtain corporate sponsorships to meet deficiencies, resourcing and development.
- Staffing and Maintenance - increase numbers and staff to allow for maintenance and continuing development of the Gardens e.g. Japanese Tea Garden.
- Recruitment and Sustainability of Additional Volunteer Input - Challenges to keep appropriate involvement.
- Development Interpretation/Education Programmes - Limited staff and resources, may limit growth and demand for programmes without careful management and planning.

In 20 years since establishment of the Garden current staff has still managed to keep the original concepts pure. Our understandings of the Botanic Garden development are still the same as the original staff. We can only hope that this legacy is carried on for many years to come. We have also been fortunate to see the unique balance and partnership of a marriage of industrial environments and nature.

> Like all similar projects Tondoon will never be complete, it provides an invaluable legacy to pass on to future generations, this will ensure that the unique characteristics of the regional flora and fauna will be appreciated and will influence the landscape of the continuing development of Gladstone and the Region. (Lawrie Smith - Tondoon Story p.112)

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Sponsorship

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Botanic Garden Santa Elisa: Agriculture environmental education

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The Botanic Garden Santa Elisa situated in the Instituto Agronômico de Campinas (IAC), has undergone improvements concerning educational activities. IAC develops many meaningful scientific researches in different agricultural botanic fields and it also has important collections of plant Germoplasm, but its activity in education is still initiating.

The new educational project encompasses both agriculture practice and landscape aspects as the fundamental base of the educational activities, focusing on enlarging the debate and also generate knowledge related to environment both locally and globally.

The aim of this paper is to publicize the characteristics of the Botanic Garden Santa Elisa situated in IAC as well as the educational project which is intended to be established.

One of the goals of the new educational project is to create a trail inside of the farm where the Botanic Garden is located. Along this trail, "Estações de Cultura" will be built with characteristics from the landscape and from the agricultural cultivation fields which will be experienced by visitors strolling along the path while being coordinated by researchers from the Institute who will be responsible for all the technical and educational assistance IAC can provide.

The Botanic Gardens

The collections of medicinal plants were the first Botanic Gardens of history; though they were not called like that, they represented classified and identified vegetal collections which had a well known specific use that could be spread along the time. The first quotes date from the 16th Century when the word Botanic Garden appears and many gardens were founded in Europe. The spice trade was, perhaps, a relevant evidence of the economic role that plants found in other continents had for Nations as Portugal, Spain, Holland and England.

The Botanic Gardens had a significant contribution in the cultivation and diffusion of vegetal species around the Planet. As time went by, many different activities were combined to the Botanic Garden activity, always related to its geographic localization and scientific and educational interest and compatible with the international directness of vegetal conservation. Many of these institutions started to focus their attention on the particularities of its regional Flora, generating researches on cultivation of native plants with economic potential. This extension of the scientific research is particularly connected to the Tropical Botanic Gardens.

In 1991 the Brazilin Botanic Gardens Network was created. It has the purpose of organizing Environment Education projects, directs and supports the creation of institutions alike and

publicizes the Brazilian Botanic Gardens report. In this year there were only thirteen Botanic Gardens in the country; nowadays there are thirty two (the majority of them situated in the southeast of Brazil and still being established). This number is still small considering the total biodiversity Brazil has, mainly inside Tropical Flora.

The distribution of Brazilian Botanic Gardens follows the international criteria. They are situated in historic more developed regions where the educational and financial standards are higher and not where there are more native vegetation resources. The non– existence of Botanic Gardens in areas such as Cerrado and The Amazon basin which represents a major part of Brazilian Flora is an evidence of that. The possibility of development of new Botanic Gardens in Brazil is enormous owing its diversity of Flora and mainly to some states as the North where the vegetation is still native and threatened.

Campinas area

Campinas municipality is situated in the middle east of the state of São Paulo, 674 meters of altitude, between latitudes 22° 46´10´´S to 23°03´11´´S and longitudes between 46°50´19´´W to 47°13´05´´W. It stays in an area of 795Km² and its population is around a million inhabitants. The climate is classified as CWA (Köeppen), with annual precipitation of 1.380mm.

Campinas presents a diverse and important economy; the metropolitan area has 22 municipalities and urban index superior to 80%. In these municipalities the agricultural and industrial production, commercial network and services offer stand out. Considering agriculture, some important crops stand out such as different horticultural products, tropical fruits and flowers. There are numerous small rural properties in this region, using agricultural machinery which shows better financial situation of its owners.

The Agriculture Institute of Campinas (IAC)

The IAC was founded in 1887 with the aim of helping the development of the agricultural production of the State of São Paulo, mainly the coffee cultivation, the country economic base. The research in IAC has diversified in its 119 years.

The agricultural and scientific policy produced by IAC is based in the improvement of productivity and quality of cultures. The major area of research of the institution include genetic improvement of plants, vegetal products quality, efficiency of plants towards nutrients and tolerance of toxic metals, methods of soil evaluation, plants, micro organisms, and water analysis, soil biology applied towards the productivity of cultivated plants, sustainable environmental planning, deteriorated areas recovery, management systems of soil and water, integrated systems of vegetal nutrition, handling agricultural residue and soil pollution. IAC has graduation courses (master degree) in the following fields: Tropical and Sub tropical agricultures, genetic improvement, agriculture production, soil and environment resources.

The Institution has around 220 researchers, 280 research assistants, among other workers who develop its scientific activities, it has five scientific research farms spread along the State and also Santa Elisa farm in Campinas where the botanic garden is located.

Santa Elisa farm is situated in the northeast area of the city and is totally inserted in the urban area of Campinas. It has 700 hectares with wild Flora of Cerrado and Rainforest, as well as

botanic collections of ornamental plants and economically important crops such as coffee, rubber tree among others. The biggest part of the farm area is used for agricultural experiments.

IAC owns around 60 thousand data (from a national total of 200 thousand) divided in Germoplasm collections, economically important crops and sustainable development projects. Its central and secondary library owns a total of 82 thousand offprint, 32.751 books and thesis and 3.300 magazines and articles.

Approximately 500 cultivars were put at service for the national agriculture in the last sixty years, showing the pioneering introduction and genetic improvement of the majority of the Brazilian crops. IAC has a major role in the national agriculture and its subsidies have great impact in the results Brazilian agro business has reached.

Santa Elisa Botanic Garden Objective

The activity of a Botanic garden is attached to three main areas: scientific research, genetic plant resources conservation and environmental education. Santa Elisa is a reference in the first two topics but still insufficient in activities related to education.

The current proposal of IAC is to expand its educational projects, having the agriculture as its bigger attractive, using the landscape as reading base and project reference. The landscape in this sense is defined as:

"An holistic concept, in which, on a physical substratum, all living things live in a complex way, animals, plants and mankind, holding some knowledge, producing images. These images are, therefore, a lot more than what your eyes can see, having ecological and cultural meanings (witch includes social and economical aspects) (Magalhães 2001)."

The educational proposal

The educational model of Santa Elisa Botanic Garden comes from the view of the Brazilian educator Paulo Freire, applied to botanic garden that uses "in situ" e "ex situ" plant genetic resources, having agriculture as the main theme, and the landscape as written before.

The main aspect of the educational approach is the generation of knowledge and not simply the transference of the environmental concepts. The educational proposal presents the visitor as someone who participates, criticizes and produces knowledge. The use of practical examples, created by students and tutors together is one of the most important activities to be developed by IAC and it will be applied to botanic collections, scientific experiments, cultivation fields, culture and buildings.

Escorting around activities and agricultural experiments will be a distinctive aspect of the Botanic Garden. This activity should reach especially rural growers and members of agriculture communities, generating knowledge related to agriculture production and applying this knowledge to their reality. The same attitude must direct the activities, the construction of buildings and landscape design of IAC. The Botanic Garden should work with the research centers of the Institute, not hindering the development of scientific research but always when it is possible include it in the educational activities.

The plant resources, especially the botanic collections and the still existing wild Flora of Campinas should be included in the educational proposal, also generating knowledge between tutors and visitors. The botanic and agricultural preservation is the main theme of the Santa Elisa botanic Garden.

The landscape proposal

The landscape proposal incorporates the issues related to agricultural landscape (present in the farm) and also the urban area of Campinas. The intention of that is to create a main route for visiting the botanic garden. The visitor will receive a "passport" and will pass through many "Estações de Cultura" taking part of educational activities, following the agricultural experiments, establishing a closer contact with the botanic collections and appreciating the landscape of the farm.

In each "Estação de Cultura"(Coffee Station; Rubber tree Station), the visitors will be able to get to know different aspects of each crop production in the farm and will have their passports stamped, creating the need for returns when their passports will be stamped again until all the spaces are fulfilled, returning many times to the garden.

The idea is to encourage visitors to gather many different experiences related to botany, agriculture and environment. The audience will range from school children to rural growers and they will take part in the educational activities, debating several social environmental issues so that this created knowledge can be transferred to their real lives in urban or rural zones.

The leisure and contemplative activities of a botanic garden with its guided trails and cultural possibilities are not forgotten. The aim is to enlarge the participation of IAC using agriculture, botany and landscape of the farm, transforming the Institute in an important centre of environmental debates of the city and perhaps of the country.

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Biography

Mr. Graziano is a Landscape Architect graduated in 2001 at University of São Paulo – Brazil. He is working in São Paulo City Hall as a public space designer and also as a volunteer researcher at Instituto Agronômico de Campinas – IAC since 1998.

Conserve rare genes in botanical gardens for display and education

H.K.Goswami

Bhopal, India

A large number of plants need urgent and utmost protection because majority of them are "medical wizards" yielding life saving drugs and many are potential requirements for industry. To be precise, 70-85% medicines in the Asian and up to 60% in European and American markets originate from plants. This is a biological truth that not every species has the same quality of "product" because the set of "genic combinations" are different and many a times, hybridizing results are not as per desired goal. In recent years, people have become conscious of biodiversity. Basic awareness regarding balances in nature through plants has become a common knowledge. Also, visits to national parks and botanical gardens have increased about three fold, at least in India and I am convinced that the importance of conservation can be permanently carved in minds by "LABEL POSTERS" in the Botanical Gardens. Inquisitiveness can be further enhanced if we give Evolutionary information of a genus or species so as to pressurize biological importance.

Label-posters

The concept of label-poster is to educate a common person about the plant species in such a way that the most desired, scientifically useful information be communicated in a simplified way so as to acquaint an onlooker regarding practical utility of plant life and their conservation. After going through garden people should be convinced to convey that "look here, the plants are not only good for balances in environment, but there are also many species which produce life saving drugs, chemicals and lot many things. And also, many species are surviving for millions of years on this earth, with the same features. Many plant-species are still the same, by and large unchanged, since the dinosaurs ruled the earth!

These species maintain internal features/important characters exactly same, as were present several million years ago. So genes may change quickly or may change very slow.

Where to display?

At any place wherever the plants are growing in a Botanical garden !

1) We should take a round of the garden, visit all plants and select species for informative labeling in text lines not exceeding 10 lines each (about 6 points). Higher number of selected species will depend on the amount of money available, size and number of species in the garden and overall possible care.
2) Write a very informative text about each species, including at least ten important information points, and then select 6-8 points of sensitive relevance in 110-120 words. This concept of label-poster is the key of success of education through botanical garden because a visitor will be able to know what essentially he ought to know about the plant. A visitor will also realize the overall importance of plants.
3) The points of selection can be chosen to correspond with:

a) Latin name of the species with common name (Local common name may differ)
b) Photo or line diagram (for typical leaf or fruit shape)
c) Genus with family, type of plant, eg. Pteridophyte/Gymnosperm/Angiosperm) safer number of species and distribution (not to discuss with Taxonomists because these go on changing) using affix eg. "more than 20 spp."
d) Why is this species important? Or, why should we know about this species? Botanical comments, related to evolution or ecology. We need two points in four lines.
e) Importance as per economic botany/utility.
f) Medically important on priority (if any).
g) Any historic account ("said to be related with"--There are many such affiliations with hundreds of species in India.)

4) Label-poster: In order to keep uniformity, a standard size be fixed, 50cm long and 25 cm wide, a plain white or yellow thick plastic or any such synthetic sheet can be chosen in bulk (protection from rain, excessive frost and heat). Any other size can be chosen, intention is that the label poster be placed in the vicinity of the plant and at a distance of not more than two meters from where people would see. At the bottom this can be written "LABEL-POSTER FOR GENERAL EDUCATION." This comment can keep us away from undesired complications for example the change in name of species, change in the number of species etc.

EXAMPLES

GINKGO BILOBA (Ginkgoaceae, gymnosperm)

(Maiden Hair Tree)

Ginkgo flourished 200,000,000 years ago with 16 species; all others disappeared, now found as fossils. Ginkgo biloba is the lone survivor.

Possesses Sex Chromosome mechanism (XY male plant; XX Female plant).

Considered religious tree, grown around shrines in China, Japan and Korea.

Presence of very primitive feature makes Ginkgo a living fossil.

Ovules are cooked-eaten; seeds contain volatile oil, often used as expectorant and sedative.

Wood also used for preparing toys.

(LABEL-POSTER FOR GENERAL EDUCATION)

TAXUS BACCATA (Taxaceae, gymnosperm)

(Common Yew)

Found world wide; genus has more than 10 species.

Very hard wood, used to prepare fancy handles of knives, swords, wood carvings, panelling of gates and fences, also bows in olden days.

Now is world famous for cancer cure wonder drug Taxol (also Taxocol).

Leaves produce compounds to cure epilepsy, nervousness, headaches, etc.

Oil very rich in organic compounds.

Except the fleshy aril, all parts are poisonous.

Extracts added to hair lotions, beauty and shaving creams.

(LABEL-POSTER FOR GENERAL EDUCATION)

CYCAS REVOLUTA (Cycadaceae, Gymnosperm)

Cycas genus lives on for 160 millions of years; many species look like palms.

Young leaves resemble ferns, with primitive features.

Rare Gymnosperm to produce motile spermatozoids like ferns; also called as living fossil.

Sex Chromosome mechanism (XY Male plant, XX Female plant).

Male sporophylls organized in a male cone, female sporophylls found loose.

Female sporangium (ovule) is the largest in the plant kingdom.

Yields Sago from the trunk; roots and seeds have abundant starch.

Forest growing Cycads offer good feast for rodents.

This plant is a male plant OR This is a female plant

(LABEL-POSTER FOR GENERAL EDUCATION)

Biography

H.K. Goswami is a retired University Professor of Genetics at Bhopal, India and has deep interests in biodiversity and germplasm conservation. He considers that the botanical gardens can more effectively convince men, women and children alike on the importance of plants and why some of these need special care. He is the founder of Society of Bionaturalists and the Journal Bionature. Dr. Goswami is fond of arranging field expeditions to study natural flora and fauna and offers seminars/ advice on natural conservation.

Developing Education at the National Botanic Gardens, Glasnevin.

Felicity Gaffney

The National Botanic Garden, Glasnevin, Ireland

The National Botanic Gardens at Glasnevin was established in 1795 with the purpose of '*promoting a scientific knowledge in the various branches of agriculture'* .

Education was interpreted in many different guises over our two hundred year history with the emphasis for much of that time primarily on training horticulturists and demonstrating gardening techniques. With an initial brief which had an emphasis of education at its core the development of 'Botanic garden' education as we know it today really began to evolve in 1997 when the first guide in the history of the gardens was recruited. The opening of an education and visitor centre followed in 2000 and the establishment of an education department which now has a staff of seven permanent guides and also seasonal staff.

Visitor numbers have increased from an estimated 125,00 in 1990 to 400,000 in 2006. These greatly increased numbers present a unique opportunity in Ireland to promote not only the National Botanic Gardens but also our mission to enhance an understanding of plants and their importance in our lives, as well as a recognition that plant conservation is an essential part of environmental sustainability. A considerably extended educational programme has been developed at the Gardens to achieve this potential including exhibitions, lectures, workshops and a wide variety of other events. As with any major botanic garden it is important to maintain a balance in our activities (horticulture, conservation, education, science and amenity) so that we meet the diverse needs of our visitors and other users.

Education, Events, Exhibitions.

Education, events and exhibitions have promoted the profile of the gardens encouraging new visitors and providing stimulus to our regular visitors.
The key to the increase in attendance has many contributory factors, investment in the infra structure of the gardens and major restoration projects combined with the excellent work of the horticultural team has made the gardens an extremely pleasurable place to visit, but the role of the education department has played a key role in increasing visitor numbers.

As part of our education strategy, the visitor profile was assessed in order to understand the current audience, and to identify target audiences in order to increase the visitor numbers. In order to make the gardens as accessible to the public as possible our policy of free admission was continued but a small charge for parking was introduced. Then a schedule of events and exhibitions was developed to appeal to as broad a section of the general public as possible while safeguarding the ethos of the gardens as a scientific institution. From the outset, most of our events were held free of charge, with free lecture series, free educational programmes for schools and free tours at weekends with a minimal charge for pre booked guided tours for groups.

The opening of a new lecture theatre presented the opportunity to develop our very successful lecture series. Initially we ran a monthly afternoon lecture, which would appeal to interested members of the public and keen gardeners alike. As with other aspects of education there was no budget available for speakers so we used in house expertise and invited friends of the gardens who out of loyalty to the institution gave lectures free of charge. In turn this meant

that we could continue our policy of not charging for educational events. The response in terms of audience was overwhelming. I remember one rainy afternoon in December over one hundred and fifty people turned out for a talk on Dublin's parks and gardens. We also encouraged horticultural societies to avail of the facilities at the gardens and hosted their lectures also. This led to improved relations with the varying societies and promoted the gardens as the epicentre for horticulture in Ireland.

In 2005 we introduced adult education classes in horticulture and botany. These were very well supported, again we used in house expertise but in this case a charge was made for both courses. The monies raised all went to the National Botanic Gardens Trust Fund. Not only was this a very successful fundraising event, but it also attracted a new younger audience than normally attends our lectures.

Schools Programme

The schools programme has been evolving since 1997. We clearly place a major emphasis on our work with schools, both first and second level. In the absence of a dedicated education space the kind of programmes we have had the capacity to present are themed tours with a cross curricular emphasis. One of our major themes at present is that of sustainability and the role botanic gardens can play in highlighting this important issue. For example earlier this year we did a weeklong series of events on this subject. Another of our initiatives, which we expect to have an impact on primary schools, is a new web based outreach programme developed in collaboration with Dublin City University. Both of these subjects are discussed below.

Sustainability Week

In an effort to promote the ethos of sustainability, *Sustainability Week* was held at the National Botanic Gardens. During the week of events, lectures and demonstrations were given on composting, Sustainability workshops were held for school groups, and one glasshouses was transformed into a '*Sustainability House.*' This housed displays of living plants outlining the environmental cost of major crop plants such as cotton bananas, coffee, tea and sugar, exhibitions of biological control and information on how the gardens are reducing their use of chemicals in horticulture, managing glasshouse pests in an environmentally friendly way, cutting back on energy consumption and reducing reliance on peat, a dwindling natural resource. There was also a display of the various types of composting bins and demonstrations of environmentally friendly ways of encouraging wildlife in gardens. Large panels were installed in which school groups creatively expressed their thoughts having taken part in a workshop on sustainability, with some very interesting results as the accompanying photos illustrate. After some discussion we have decided to expand the sustainability workshop and offer it to transition year students (gap year between exams for sixteen year olds which aims to develop the student as a person).
The format is adapted to be more suitable for this age group using power point presentation, a quiz, a tour of the garden illustrating the importance of biodiversity conservation and the importance of plants in our lives followed by a role play activity.

Ecsosensor Web.

An exciting new collaboration project between the National Botanic Gardens, Glasnevin and the National Centre for Sensory research at Dublin City University was launched in May of this year. This innovative project is a new web based initiative for Primary Science education. Based in the Great Palm house range of glasshouses, the project uses a specially developed wireless sensor network which act like mini weather stations to measure, light, heat, humidity and temperature and transmits live to the website, where the data is represented in an

accessible user-friendly manner. The site not only contains dynamic graphing and information on environmental conditions within the glasshouses but also exciting botanical information. Children can learn fascinating and fun facts about the plants growing in the houses and take a themed tour through the glasshouses to learn how people use plants, how different plants have adapted to where they live and what's being done to protect and conserve threatened plant populations. See accompanying powerpoint presentation.

Interaction with art.

We have run many successful solo and group art exhibitions since the opening of the education and visitor centre in 2000. The brief for exhibitions is that the content must have a botanical, environmental or horticultural base, these exhibitions are very well attended and have brought a new dimension to the visitor profile to the gardens. One collaboration which has been an outstanding success is the annual Sculpture In context exhibition held throughout the gardens, glasshouses and education and visitor centre. Not only do experienced well known sculptors participate but also newer artists are given an opportunity to submit. Pieces from over ninety artists are displayed as part of *Sculpture In Context 06*. An award has been established for the best interpretative work in an attempt to develop an innovative approach to the interpretation of the collections at the gardens. This exhibition has grown into a high profile national event in the Irish arts world and has turned Sept. and October into two of the busiest months in the gardens.

Challenges for the Future

- What has been achieved today has been done without any specific dedicated budget for projects. Where as the funding for the gardens comes from central government funds covering wages and equipment no money is set aside for developing education programmes, or for educational publications, gradually with new management in place this situation is improving.

- Coupled with this, staffing issues such as low pay and poor promotional opportunities has led to a constant drain of educational expertise from the education department by both seasonal and permanent employees to more lucrative employment.

- Equally, whereas the attendance figures have increased dramatically and an audience has been developed for lectures and demonstrations, the challenge is to sustain that interest while continuing to develop new audiences.

- As part of the management plan for future developments of the gardens a new children's glasshouse and education centre for school groups is being developed. This will provide a dedicated space for workshops and practicals in an informal environment and provide the opportunity to develop more hands on programmes.

Conclusion

In conclusion although we have travelled a long way in terms of education and improving accessibility to the gardens through our public education programmes there are still many challenges left to face. However, the ground work has been firmly established and we look forward with optimism to the future.

Biography

Felicity Gaffney has been developing education at the National Botanic Gardens of Ireland since 1997. She is Head of Education and Visitor Services and is responsible for all events exhibitions and education.

Biodiversity Education and Education for Sustainability at Kirstenbosch National Botanic Garden – A world heritage site.

Donavan Fullard

Kirstenbosch National Botanical Gardens, SANBI, South Africa.

Education for Sustainable Development provides the means by which we engage people in a more sustainable future. It further aims to empower citizens to act for positive change which implies a process-oriented, participatory and action oriented learning approach. (Tilbury D and Calvo S, 2005). The important role for education to attain sustainable development is recognized globally and it is strongly argued for botanic gardens to engage in 'stronger' forms of Education for Sustainability. Willison (1997) described EfS as a 'holistic approach to education which emphasises the interrelationship of disciplines.' The challenge for environmental educators in botanic gardens, according to Tilbury and Calvo is that they no longer can afford to be confined to educating people about ecology, but that social realities and consumer choices need to be imbedded within such programs.

This paper will endeavour to share experiences made on our journey in our attempt to implement the Decade of Education for Sustainable Development within our Environmental Education programme at the Gold Fields Environmental Education Centre, situated within the Kirstenbosch National Botanical Garden in Cape Town, South Africa. The programme is located within the education directorate of the South African National Biodiversity Institute (SANBI), previously the National Botanical Institute (NBI).

I will highlight the role that our education programme plays in an attempt to help society and more specifically schools, find solutions to the challenges of sustainable development through our key focus areas which inlcude a national curriculum linked garden-based school programme, a school and community indigenous greening programme(outreach), teacher professional development and other capacity building programmes. In South Africa, education plays a critical role in ensuring improvements in quality of life of all people, the eradication of poverty, reducing inequalities and promoting sustainble development and growth (Wagiet R, 2002). This paper will share ways in which we, as an education unit in a botanical garden can and are contributing to the Decade of Education for Sustainable Development and critically reflect on achieving sustainability through our Biodiversity education programme.

Context

Kirstenbosch National Botanical Garden is one of eight national botanic gardens of the South African National Biodiversity Institute (SANBI), previously the National Botanical Institute. SANBI came into being with the signing of the National Environmental Management: Biodiversity Act No.10 by President Thabo Mbeki in 2004 and our mission is *"To promote the sustainable use, conservation, appreciation and enjoyment of the exceptionally rich biodiversity of South Africa, for the benefit of all people."* The world renowned botanical garden in Cape Town is situated on the slopes of Table Mountain and is seen as a gateway to the Cape Floristic Region protected areas. It has been inscribed as South Africa's sixth World Heritage Site in 2005

and this is the first time that a botanical garden has been recognised as a natural World Heritage site. World Heritage sites are places on earth that are considered to be of outstanding universal significance to humanity.

At Kirstenbosch NBG both Informal and Formal EE take place. Informal EE is geared towards tourism and accommodates mostly tourists, both locally and internationally. Due to the past political dispensation and the related demographics of Cape Town access and the utilisation of the garden was limited to a priviledged section of the local population.
The decade of education for sustainable development challenges us through their pusuit of a global vision: "the vision of education for sustainable development is a world where everyone has the opportunity to benefit from quality education and learn the values, behaviour and lifestyles required for a sustainble future and for positive societal transformation." (UNESCO, 2005) to engage the broader section of the population through our EE programmes. The biggest challenge however is formal EE.

In South Africa, environmental education processes are now integral to all of the 8 learning areas in the formal curriculum, each learning area having a particular environmental focus embedded within it. These are held together by the principle of the National Curriculum Statement that recognises the relationship between human rights, inclusivity, a healthy environment and social justice. (Irwin, P and Lotz-Sisitka H, 2005) This principle has been extended to the Further Education and Training band.

The **Kirstenbosch Environmental Education Programme** located at the Gold Fields Environmental Education Centre within the Kirstenbosch NBG is part of a National Environmental Education programme facilitated by the South African National Biodiversity Institute and started in 1996. The EE programme is currently functional in 6 of the 8 national botanical gardens. For the purpose of the paper I will focus on the Kirstenbosch Environmental Education Programme.

The **mission of the programme** is:

"To use the garden and the resources of SANBI to inspire and enable people from all walks of life to take responsibility for their environment."

The **aims** of the programme:

1. To develop effective environmental education and interpretation programmes which respond to international and national environmental policies and legislation.
2. To make the gardens more educationally relevant and accessible to all teachers and learners, particularly those who in the past did not have the opportunity to visit.
3. To contribute to transformation in education through our programmes and networks.
4. To promote the education value of indigenous gardens in schools.
5. To ensure effective communication and networking within the SANBI, between education and other directorates, and between the SANBI and the public and others involved in environmental education.

6. To contribute to the transformation process by appointing staff from previously disadvantaged groups wherever possible, and providing support and mentorship to enable staff to develop to their full potential.

The **objectives** of the programme:

1. Promote the understanding of the holistic nature of the environment, which is characterised by the interrelationsips between economic, social, cultural, ecological and political issues in local, national and global spheres.
2. Interdisciplinary, intergrated and active approaches to education.
3. Developing environmental knowledge and understanding of concepts.
4. Developing skills such as problem solving and analysis of environmental issues.
5. Promoting environmental values and respect for indigenous knowledge systems.
6. Creating opportunities for people to take action to address environmental issues.

The programme targets the learners or youth from all over the Western Cape, but particularly those from the disadvantaged areas and under-resourced schools of the Cape Flats to participate in its exciting and national curriculum linked garden-based and outreach greening programmes, which cover a wide variety of themes, learning programmes, activities and valuable environmental learning experiences. The programme is also geared towards supporting the educators through a teacher professional development programme as well as the broader community through its outreach greening initiatives.

Kirstenbosch EE Programme therefore has a three pronged approach to its education strategy namely: Garden-based, Outreach greening and Teacher professional development programmes strengthened and supported by resource materials development and curriculum development. In the past these processes functioned fairly independently from one another. Currently we have a much more integrated approach where these programmes are directly linked to one another. A case in study is the example of a primary school that has gone through the full cycle of involvement - West End Pimary School in Mitchell's Plain on the Cape Flats. They initially enquired about the programme, made a booking to come on a visit experiencing the garden-based proramme. After their visit they wanted to become involve in biodiversity conservation – applied to be part of the Outreach greening programme and two and a half years later they are one of our model schools on the programme. The educators involved have been part of various teacher professional development processes. They have also benefitted from our National Lotteries Funded Biodiversity Education and Education for Sustainability programme and is currently involve in the Eco-Schools programme as a further extension of their commitment and involvement in Environmental Education.

Garden-based programme

On average about 10-16 000 learners from Grade R – 12 participate in the 2-3 hour guided school programme offered, per year. The programme primarily supports formal education with exciting, hands-on activities that engage learners with indigenous plants, animals and issues related to the sustainable use of these plants. Themes, with a variety of learning programmes on offer include Introduction to Kirstenbosch and Fynbos, Plants and People, Ecology, Water, Biomes, Plant reproduction, Plant adaptations,Travel and Tourism and of course Biodiversity. The guided programme focuses on experiential learning and learners are actively encouraged by assistant education officers to participate in their groups through discussion and debating of environmental issues. Learners are also encouraged to reflect critically on these issues and to make connections between the issues they encounter and their lives back in the community. An example here is

their experience in the Useful Plants garden where the sustainable use of useful and medicinal plants are not just explored, discovered and investigated, but also probed and linked to their lives from a socio-cultural perspective.

Our programme has been fortunate to receive funding from the National Lottery Fund, which makes it possible for us to provide free transport to 50 schools from previously disadvantaged areas per year on a free visit to our Biodiversity Education and EfS programmes for the next three years (2005-2007). A total number of 8400 learners per year benefit from this programme. The selection criteria used to identify schools includes schools that have been on our outreach greening programme and never visited the garden, schools that have shown commitment to the environment through their action, schools that visit regularly but have difficulty paying and schools with learners with special needs as well as those identified by education district offices. The commitment and involvement of the educators are crucial in this process and it is compulsory for them to be part of a professional development process which consists of a series of workshops. These workshops deal with educators participating in an environmental audit, grappling with the conceptual understanding of biodiversity, environment and sustainable development, working with national curriculum statement documents and lesson planning processes to strenghten and support their capacity to continue with the process of touching the hearts and minds of learners through environmental education back at their schools.

The outreach greening programme

The programme was initiated at Kirstenbosch in 1997 and the purpose of the programme is to develop indigenous water-wise gardens at schools and to use the garden as a teaching and learning resource tool to incorporate Environmental Education into the curriculum. A systemic approach is employed to transfer a range of skills to 'Green Teams' at school (consist of learners, educators, grounds personnel and community members-mostly parents) to successfully develop and sustain their garden. Practically orientated workshops consist of basic horticultural training processes which include garden design, soil preparation, plant propagation, plant maintenance etc. These are followed by workshops that include garden interpretation and lesson plan development by teachers.

Aims of Outreach greening programme.

1. To establish indigenous, water-wise school and community gardens.
2. To encourage ecological awareness and environmental responsibility.
3. To develop gardening skills to enable economic empowerment and local environmental action.
4. To promote the educational value of indigenous plants and gardening.
5. To develop partnerships between communities and organizations.

Teacher professional development

The Kirstenbosch EE programme has always played a crucial role in supporting educators as a service provider in the implementation of the education transformational processes, specifically Outcomes Based Education and the National Curriculum Statement policies. Currently, staff is supporting educators with the implementation of the NCS within SANBI 's context through a process of participatory action research. As part of post-graduate research, staff members collaborate with teachers and curriculum advisors from the provincial education department in the development of new and special programmes, teaching and learning support materials, etc. The process of working with educators is seen as a vital component to ensure the sustainability of the

projects at school. As indicated previously, series of workshops are run with educators to encourage and empower them to develop their own lesson plans and EE activities to be used back at school within their local and relevant context. Educators are also supported through funding to further their studies – 5 educators involve in the greening programme are doing the Rhodes University Participatory Certificate Course in EE.

The Greening of the nation programme

The Department of Environmental Affairs and Tourism made funding available to support the greening initiatives nationally. The programme is an extension of our outreach greening programme with a strong focus job creation, capacity building and training, food security and beautification. The Kirstenbosch Outreach Greening Programme supported various community projects in the past and this funding which is part of the government's Expanded Public Works Programme, allowed us to further strengthen those projects through job creation and contribute to poverty alleviation in areas identified by President Thabo Mbeki as poverty nodes targeted for socio-economic upliftment through urban renewal programmes. In Khayelitsha a group called Umanyano Lomama (meaning - women unite) is supported to employ local unemployed women to develop and maintain vegetable gardens to support the local community and schools through a soup kitchen. At the Gugulethu day clinic a group of 30 HIV/AIDS patients have been employed and supported to develop a vegetable garden and indigenous and medicinal garden of which the produce are utilised effectively to address their particular needs. In Lavender Hill – a gangster and crime ridden and poverty stricken community – local people were employed to clean up their communal court yards and streets used as dumpsites and replace it with beautiful indigenous gardens. Training were given to these participants and 'champions' in the community projects have been identified and given opportunity for further horticultural training at higher institutions.

With the integration of our garden-based, outreach greening and teacher professional development programmes we promote a strong 'action competence approach' to environmental education (Jensen, B & Schnack, K. 1997). The development of skills such as critical thinking, problem solving and interpersonal skills form the basis of our work and what we try to promote and achieve through our programmes at Kirstenbosch. By introducing learners,teachers and the community at large to our programmes we hope to stimulate the development of a 'critical perspective' that will hopefully lead to 'concrete action' in a local context and hence contribute to the Decade of Education for Sustainable development.

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ALIENATION FROM THE WILD

David Fox

Gurukula Botanical Sanctuary, India

Gurukula Botanical Sanctuary is situated in Wayanad, on the western edge of the Western Ghats in southern India. While the degradation of habitats throughout the region has increased to intolerable levels, GBS has worked steadily since 1981 to create a unique plant conservation project. The programme focuses on around 2000 species from about 100 families of plants. There are 500 species of orchid: 300 from south India, 40% of which are found *only* in this region. Most come from destroyed or degraded habitats in the region: roadsides, plantations, dam sites. It is a Noah's Ark of the plant world, propagating rare and endangered species that have never been cultivated before. In addition to this conservation work we strive to create an effective programme of nature education, largely aiming for a sense-based approach.

It is clear that an increasing alienation from the natural world is taking place in virtually all human societies. This is manifested in ill health, fear, environmental degradation. One alarming aspect of this is that knowledge and information seem to have a very limited effect in changing these trends. Most people know that the environment is in a dangerously bad way. Most people *do* care. Programmes like Life on Earth, The Blue Planet and so on are watched by millions and millions of people. Campaign after campaign tells people, "You *can* make a difference!" And the downward spiral just keeps downwardly spiraling. We can talk all we like about the dangers facing us and about the need to act before it's too late. But it's not as though most people are grossly under-informed about the state of the world. Is yet more knowledge, more "public awareness" really going to turn things around? Well, in some cases it may do…there are times when whole communities are spurred to action, usually because of immediate and pressing need. But it is also true that the world is awash with information, with knowledge, with public awareness, with *very realistic* forecasts of doom….Why are we seemingly so unable to respond? If I watch myself closely I see that I suffer a more or less constant feeling of need: for things, for experiences, for sensation. On a subtler level it may be a restless running around in my own head, chasing after dreams and fantasies. It seems this sense of lack itself cuts us off from the abundance of life, and perhaps triggers the greed and the hatred with which we shrink the world…..and in so shrinking it, we increase the sense of lack, in turn increasing the greed and so on. …..A fine mess indeed, and one which contracts our minds and our bodies so thoroughly that it is all but impossible for us to make true contact with the world and the people around us. It is a kind of sickness. And most of the time we are not even aware of being "ill".

The real tragedy of this is that however hard we try to separate ourselves we cannot do it. Our very attempts to protect ourselves create the suffering we seek to avoid. If I am walking in the rain with you and you are relaxed and at ease while I am tense and hunched, I don't stay any drier than you. But our experience of the rain is very different. It is not getting wet that is the problem: it is how I experience getting wet. Similarly, many children and adults are braced against the forest when they first arrive at the Sanctuary. They fear for their physical comfort and the fear itself increases their discomfort. They are physically awkward and uncertain. They will often pretend to be finding everything wonderful because that's what they "should" feel….they've read about rainforests, they've watched documentaries, they think conservation is important, therefore they should be happy to be here. And this pretence itself just adds another layer of disconnection.

At GBS we are seeking ways to break through these layers of resistance and disconnection. With varying degrees of success we try to bypass the opinionated mind, the habitual ruts of our thinking. Many people talk of how we live too much in our heads yet we don't truly see the full extent of this. Nor are we aware of the depth of disconnection it creates. If your vision is distorted but you don't know it's distorted then you will have no sense of distortion. This became very clear to me one day as I was thinking about the Earth moving round the Sun. I suddenly realized that all my life, whenever I had thought about this, it had always been an image in my mind, a picture in my imagination of a planet circling a star. But suddenly I saw, I felt, I experienced that it's not a thought, an idea: it's this, now. From the beginning of the last sentence to the time you finish reading this one you will have traveled somewhere in the region of a thousand miles through space. Right here, right now, I am tearing through space at thirty or forty times the speed of a bullet (66,000 miles an hour to be precise). All the mystery, depth and beauty of the universe, of life are this, now: not as an idea but as fact. We can't separate from it any more than the chair I'm sitting on can separate from itself. It *is* us. When the depth of this begins to be touched, an intimacy is born where the world is no longer just 'around' us. This can bring about a radical (though not always dramatic) shift in our way of responding to our environment. It is this intimacy that we are trying to encourage at GBS.

So what do we actually *do*? Our aim is one of immersion in the wild. Small groups of students come to stay for anything from four days to four months. The long-term stays are with older teenagers (17-19year olds). The youngest groups are 10 or 11 year olds. The longer stays can be hugely effective while the value of the shorter ones is sometimes questionable. Smaller groups are also more responsive on the whole. There was an example of a very successful stay was last year when a small group of 13 year olds from Centre for Learning near Bangalore came to stay for three weeks. Their school is small and maintains close links with us. This means that there is a culture of awareness of, and familiarity with the Sanctuary, which is a great help. Most of the group had visited the Sanctuary previously: having the same group visit over a period of years is very helpful. The children have to live relatively Spartan lives during their stay. They use a 'pit-loo', essentially a hole in the ground in the forest. They bathe in the river. They get up at 6.30 every morning for an hour of physical exercise (yoga or kaleri, a very old Indian martial art). This may be followed by a session of bird watching. After breakfast each day this particular group then had a 3-4 hour 'forest walk' through parts of the adjoining government reserve forest. These are led by Sandy, who grew up in the Sanctuary and is utterly at ease in the forest. Probably the biggest single difficulty that *everyone* experiences during these walks is…leeches. Revolting as they first appear, they are not actually harmful and Sandy tries to insist that no one look at their feet or stop to remove leeches until he designates a 'leech-stop'. Interestingly, although every group identifies leeches as the *worst* thing about the forest, they may well have more effect in breaking down people's habitual resistance to the world than any other single aspect of our programme. To see someone so horrified by a leech that they are almost trying to get out of their own body to escape it, to see that person move to being able to calmly remove or even ignore a leech is to see someone become intimate with the world. Just as with the rain, they become no less prone to leeches than the person screaming in horror. But the world for them is different. And better.

After the walk they go swimming in the river. Some can swim well, some not at all. Again, the emphasis is on them giving themselves up, pushing limits. Many children who could not swim when they arrived can do so by the time they leave (we have a great swimming teacher). To be enveloped by the river, the forest, is to become intimate with your body and its environment, to feel the boundaries blur and loosen.

Other activities include drawing/painting, studying particular plants or animals, singing on (or in) the water tower, improvisation games (acting out scenes on the spot or making up stories on the spur of the moment): this can help break through our self-consciousness and the attempts of our minds to control everything. It encourages alertness, readiness and a freedom of mind.
There are also work sessions involving coffee picking, helping in the potting shed and so on.
On other evenings we may just sit on the hillside and watch the sun go down. What does seem helpful is to have an element of repetition: going on a forest walk day after day creates a deepening experience that is not found if the programme is overly varied. Too much variety may simply reinforce our continual grasping after new experience and can be a real hindrance to deeper learning.

There have also been a couple of four month programmes where older students have built their own huts in the forest, grown food, dug wells and lived together as a community. Many of those involved have maintained close links with the Sanctuary and most feel the experience helped to shape their lives.

The problem with the shorter stays, particularly 'one-off' visits, is that they tend to be little more than just another school outing for the children. Those who are resistant have little difficulty holding onto that resistance during a short stay. But with the longer stays something really happens. Bodies change, become more fluid and alive. Eyes soften. A quiet attention arises. Something flows.

One difficulty with any group or individual is that the Sanctuary seems so far removed from their 'normal' life. It is difficult to know what to do with one's experience there in the context of the wider world. But if this intimacy with the environment is truly touched then it begins to shape one's experience more and more. The thing that stands out on a busy city street is no longer the blare of horns and engines but the silence, stillness and immensity of the plane trees that stand in such dignified contrast.

I do not mean to suggest with all this that there is no place for academic learning in this education. Students do learn about the plants and animals, the threats to it all and so on. Last year we started a programme called the Landscape Group, a three month post-school programme focusing largely on differing landscapes, covering areas of botany, geology, reptile identification, bird surveys, right through to areas of physics and astronomy. However, if academic study is not preceded by, or at least complemented by, this immersion in the wild then there is a very real danger of it simply becoming another protective layer between our contracted selves and the true abundance of life around us. Wolfgang, the man who started the sanctuary some 25 years ago, lived alone in the forest for many years without any thought of botany or of creating the haven for plants and wildlife that the place now is. He was simply immersed in the wild and it was the immersion itself which gave rise to the idea. We cannot ask anything of the immersion. But if we trust it completely it will show us what we need to do.

BIOGRAPHY:

David Fox, Nature Education Programme, Gurukula Botanical Sanctuary, India

Drama/theatre background. Ten years working with teenagers with emotional and behavioural problems, focusing largely on drama and improvisation along with exposure to the natural world (long distance walks, bird watching, fishing etc). Now working on sense-based nature education at Gurukula Botanical Sanctuary.

Shoots with Roots: Helping community shoots make and meet roots

Charlene Forrest

Milner Gardens & Woodland: Qualicum Beach, British Columbia, Canada

Milner Gardens & Woodland (MGW) is an estate garden and woodland property in Qualicum Beach, British Columbia, Canada. It was donated to Malaspina University-College in 1996 to maintain it in perpetuity for education and the community's benefit, in Ray Milner's memory.

Located centrally on Vancouver Island, Qualicum Beach has a population of approximately 8,500. The gentle pace and climate of the immediate area and Vancouver Island itself are attractive to residents and visitors. Qualicum Beach is particularly appealing to retired residents, and has an impressive gardening community upon whom numerous awards have been bestowed.

Opened to the public as a botanical garden in 2000, MGW is now a key feature of Vancouver Island. The property's 60 acres (24 ha) of old- and second-growth woodland partnered with the magic of the 10 acres (4 ha) of "Artist's Garden" is not only rich in nature's wonders, but is also linked to important local and global social history. Margaret Cadwaladr's book, In Veronica's Garden, plays a significant role in the explanation and exposure of the property.

Now in its sixth year as a not-for-profit operation, MGW has a handful of seasonal staff, over 240 volunteers, more than 2000 members and a vast array of supporters. It educates and inspires more than 18,500 visitors per year. The poolside gift and refreshment shop, onsite volunteer-propagated Plant Sales and the Milner House Camellia Tearoom add opportunities for special mementoes and memories.

The MGW children's education program, Roots and Shoots, began in 2003 after renovation of the Milner vegetable and berry patch. The MGW program was modelled after the Roots and Shoots Intergenerational Gardening Program at Elizabeth Gamble Garden in Palo Alto, California. In its first year, the MGW program paired staff and volunteer mentors with students from local Grade 3 classes (7-9 yr olds) in an 8-week onsite food gardening program.

As it shaped itself to the property and local community, the MGW program quickly developed into a woodland and garden education program for children aged 3-12. In also became a member group of the Jane Goodall Institute Roots & Shoots program. In 2005, the MGW program name was changed to Shoots with Roots (SwR). Over 1000 children per year now participate in MGW SwR activities through the: multi-visit onsite school program (Grade K-5), school break camps, group field trips, preschool age programs, birthday parties and offsite outreach programs.

Visits to classrooms, workshops and events offer interactive planting activities. Participants make two newspaper-planting pots, planting one with an annual organic vegetable seed and the other with a perennial native plant seed. They also make a Germination Window to watch seeds through the germination process, a glimpse into the events happening within the newspaper pots.

The 2006-2007 multi-visit onsite program for school classes will continue to pair students, their teachers and assistants with MGW staff and volunteer mentors during five visits throughout the school year, two in the fall and three in the spring. It will also see expansion in the number of participating classes, into the next age group (10-14 yr olds), and beyond the local school district. There will be a new level of the program for returning and older students.

In the current program, the first fall visit introduces students to the MGW property, the SwR program, and the etiquette and safety guidelines associated with each. To enhance the safety discussions, volunteers from the local Arrowsmith Search & Rescue group then walk the children through the Hug-a-Tree program, teaching them how to prepare for an outdoor activity and what to do if they get lost. Students are issued Research Nametags, which indicate that the students have an important role at MGW, and are used as both permission tags to participate in research activities and as a voucher for a free family visit after the end of the school year and SwR program. On the walk through the woodland, forest features and information are introduced. In the garden students begin to learn about horticulture, art and the social history of MGW. Each group is assigned a class project, they are tasked with designing a SwR Woodland Interpretative Sign to be installed alongside the existing (adult-focused) Woodland Interpretative Signs. The class projects are submitted at the end of the program visits.

Each of the four subsequent visits begins with safety and etiquette review, with particular emphasis on the Hug-a-Tree information given by Search & Rescue volunteers during the first visit. On their second fall visit students become Forest Detectives and begin their journey as researchers of MGW. With field notebooks, tools and guides in hand the students sleuth through the forest investigating the flora and fauna inhabitants. The importance of plants, and of knowledge of plants, is central to discussions. While students, teachers, and mentors identify native plants and discover their uses, opportunistic fauna sightings and sand trap track bed information are recorded. A remote camera system is also used to monitor wildlife activity in the MGW woodland.

The students then return in the spring for three visits. In the woodland a MGW Collection Permit is applied to each student's research tag granting them permission to harvest one native plant to prepare, mount and label for inclusion in the SwR Herbarium. Flora and fauna monitoring continues and expands as some of the less conspicuous inhabitants of the MGW woodland and wetlands are sought. In the Food garden the children prepare the beds by tilling in winter cover crops, applying compost and removing weeds with an energy that can only be envied. While they work together planting and tending the garden, they learn about organic gardening practices, plant processes and development, and teamwork. Horticulture and history are revisited in the "Artist's Garden" as its spring awakening beauty draws awe and excitement from all.

Although relatively new, it is apparent that the Milner Gardens & Woodland Shoots with Roots program is making a positive impact upon community members of all ages, and is having a profound affect upon the younger members and future stewards of the area and planet.

Biography

Charlene Forrest is the Shoots with Roots Program Coordinator at Milner Gardens & Woodland in Qualicum Beach, Canada. She has a BSc. in Wildlife Biology and did her MSc. on Industrial Fibre Hemp.

Alice in Wondergarden

Sofia Espírito Santo & Dalila Espírito Santo

Jardim Botânico da Ajuda, Lisboa

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- develop their self-awareness as responsible users;
- offer a set of experiential situations in relation to the five senses and the perception of plants' colours and shapes;
- use children's education as a mean to achieve a higher family awareness in these topics;
- show the children that it is important to continue to take an interest in ecological matters outside the garden walls and throughout their lives.

With similar purposes, the infants theatre play Alice in Wondergarden was conceived. This theatre performance was on stage at the Botanical Garden of Ajuda, during the mid-Summer of 2004, 2005 and 2006, although it had some presentations in theatres at Oeiras and at the Botanical Gardens of Coimbra and Porto.

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For one hour, the public learned many different things about the plants and how to protect the environment, let's see how, with some examples:

Dialogue between Alice and the caterpillar

Caterpillar – What distinguishes a botanical garden from any other garden??!

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Alice – I give up! Please tell me why this is a botanical garden!

Caterpillar – Every plant has a plate with its name written on it! You don't see those plates in ordinary gardens, do you?

Alice – No I don't… but all the words written on the plate are the plant's name?

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Alice – But why is it written in that strange language instead of English?

Caterpillar – Say it in English then.

Alice – Daffodil.

Caterpillar – That's right. No if you go for example, to Portugal, and you say daffodil, no one will know what you mean. But if you say Narcissus pseudonarcissus everyone will understand you because Latin is the language of botanists all around the world.

Alice – Botanists??!

Daffodil – This kid definitely knows nothing of botanic!

Rose – Botanic is the science that studies plants.

Chamomile – And botanists are the people who study plants.

Alice – OH! OK!

Caterpillar – Now comes the L. that stands for Lineu.

Alice – Lineu…

Caterpillar - Lineus was the first person to ever classify plants using a binominal name and he was the classifier of this plant. Here we have the plant's common name, daffodil, which is the way we name the plant in the UK. At the bottom, we have the name of the country or region where the plant was first seen.

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Alice – It's impossible to have a conversation with you all and I'm getting tired of it!

Mad hatter – But, you were the one that joined us! What are you doing here anyway?

Alice – Now I don't know anymore. I wanted to start reading the book of the Adventures of Alice in Wonderland that my grandfather gave because my name is Alice, and I wanted to read it in the garden. But since my mum doesn't let me go to the garden in my neighbourhood, my dad brought me here to the botanical garden.

Tweedledee – Why don't they let you go to the garden in your neighbourhood?

Tweedledum – Is it ugly?

Alice – No, it's actually very beautiful. But children shouldn't play there because of dog's droppings.

Tweedledee – The droppings are from dogs?

Alice – Yes.

Tweedledum – And who do the dogs belong to?

Alice – They belong to people.

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Alice – Regular People… from the real world, from where I came before I entered this sort of dream…

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Beetle – and the rule of the 3 "R", do you know it?

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Alice – And how does this rule work?

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These two plays increased the number of visitants to the Botanical Garden of Ajuda in the last three years by approximately 15%.

Images

Image 1 – One of the casts

Image 2 – The caterpillar explaining to Alice the meaning of the words on the plates of each plant

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Image 4 – Music and dance are two essential elements to captivate children attention

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Playing with plants, learning for life

Ana Raquel Barata, Alexandra Escudeiro & Maria Amélia Martins-Loução

Lisbon Botanic Garden Education Office, University of Lisbon, National Museum of Natural History, Botanic Garden, Lisbon, Portugal

Education for sustainability is now a main subject at international summits throughout the world as it is considered an essential way to guarantee sustainable life quality and Nature conservation.

The Botanic Gardens primal purposes for botany studies and maintenance of plant collections represent nowadays important objects to perform education for sustainability and biodiversity conservation. Educational activities at Botanic Gardens demonstrate how plants can be a learning tool to promote ecosystems conservation and achieve sustainability as its collections represent an important stock for biodiversity. This biological richness within urban centers allows children to experiment, see and touch different plants from all over the world and therefore better understand its threats and the need to promote its preservation to achieve sustainability (Avery 1971).

These collections promote education about plant diversity, plant relations with the environment, importance for the mankind and ecosystems, to teach about native plants, about threats for plant biodiversity and the need to preserve the environment locally and throughout the world (Willison 2003).

The Botanic Garden of Lisbon is located at the heart of the capital representing not only an important green area within the urban net but also historical, cultural and scientific knowledge about plants, its importance, ecology and current threats.

In 2004, the Education Office of the Lisbon Botanic Garden belonging to the National Museum of Natural History created a new concept: the school holiday courses. These courses aim to offer the possibility for children to occupy their free time within an important educational environment such as Botanic Gardens.

Assuming that only knowledge promotes behavioural changes to develop ecological attitudes (Scoullos & Malotidi 2004), these courses use children free time to play pleasingly and learn smoothly the basics of plant ecology and conservation, aiming to achieve the practice for sustainability. While playing with each other children are invited to experiment, create and learn about a chosen theme that concerns plant ecology, environment and biodiversity preservation in a beautiful and cultural background such as the Lisbon Botanical Garden (Figure 1).

In order to motivate children to repeat the courses, week themes are always different within plant ecology and conservation subjects (eg. Flowering and Pollination; Plants and Animals: living together; Caring for Nature: Caring for Life; Native Plants Preservation).

Activities programmed on a theme allow children to learn about plants and become familiar with the Botanic Garden in a weekly program occupying elementary school students' free time, working on sustainability concepts, reusing and recycling materials through games, art work and theatre plays.

Figure 1

Courses are composed by two different class ages, each one with 15 children (4-6 and 7-13 years). The weekly themes are similar to both groups but activities and their evaluation are adapted to children's age. Courses are programmed concerning specific objectives and activities for each day assuming that the assembly of results establish the week context and general objectives within the theme. During the course children are also taught how to recycle garbage. Each day starts at 9h00 a.m. with games about plants which allow children not only to learn about the course theme but also to get acquainted and to know the Garden; at 10h00 a.m. weekday activities take place; at 17h00 p.m. activities end and parents arrive.

Guidelines about plants and environment preservation within the world and the Garden are presented just on Monday morning. Afterwards children are taken for a complete tour through the Botanic Garden regarding the weekly theme and asked to collect plant materials to use at the afternoon art workshop. Children are warned to collect fallen plant parts only, in order to keep Garden's biodiversity. Art workshops aim to exhibit children's creations about the theme within the classroom which are to be used as props for last course day play presentation. On Tuesday the activities aim at raising nature conservation awareness. Therefore, children learn about compost making, paper recycling to use in herbariums as well as to reuse materials in art work. On Wednesday and Thursday children are invited to work in groups creating a story about the weekly theme and reusing materials to construct props and scenario sets. On Friday children carry out experiments using plant materials and the microscope to observe different structures concerning the weekly theme (eg. thorns in Mediterranian plants). Each course ends with an evening play presentation to parents, family and friends about the theme discussed during the week (eg. Native Plants Preservation).

Children may repeat courses as themes are different though interconnected but always targeting to raise conscience about plant ecology, current environmental threats and sustainability.

The use of free time in different learning activities such as painting, modelling, playing pedagogical games or presenting plays involving parents and family has shown very good results at the evaluation of the activity. Questionnaires are made to the older group before and after each course to evaluate acquired knowledge on the course theme, attitudinal changes based on

sustainability principles and satisfaction on doing the course. Parents also answer a part of the questionnaire to show their level of satisfaction and confirm changes on knowledge and/or attitudes within the children and family towards the course theme and objectives (Stokking et al. 1999).

As for the younger group, they are asked everyday to draw what they have done and learned about the week theme. Parents also answer before and after questionnaires with children help.

Questionnaires and drawings allow the evaluation of course activities, the impact of the week theme and the success of the course on promoting plant knowledge and awareness to guarantee an ecological behaviour that copes sustainability.

This work has shown relevant results in terms of taught concepts and attitudes concerning an active participation of more than 200 people, including children, their family and friends attending the Lisbon Botanic Garden's holiday courses in 2005. Moreover, the number of children that are willing to participate increases every year, as well as those wishing to repeat the experience. Courses evaluation results validates the programmed activities and methods towards their objectives and have shown that permanent family group awareness about the importance of plants, as well as ecosystems preservation, is a potential effective way to promote Nature conservation and sustainability within a social behaviour framework.

The positive impact demonstrated by the results of these activities indicates that it should be repeated as many times as possible. The idea was born in 2004 and since then it has grown heading for future development. Holiday courses at the Botanic Garden of Lisbon are now very important events within Lisbon community bringing more urban people to know the Garden and to adopt new ecological attitudes to achieve sustainability as they play with plants to learn for life.

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Is education enough to protect natural resources?

Dr. Juan de Dios Muñoz

Oro Verde Botanic Garden, Entre Ríos National University, Argentina

Raising public awareness of the importance of natural resources is one of the most important outputs of education nowadays. Although it was understood since long ago when man discovered the intimate relation between plant and human life, environmental education has only recently been accepted as a must at the level of primary and secondary schools, as well as in universities.

UNESCO has outlined many times the importance of making professionals of all branches aware of the importance roles they have in the sense of teaching and promoting the rules and techniques of sustainable development. It is specially relevant to train teachers to expand this knowledge as early as possible with the belief that environmental education is not one more subject to be taught, but it must be included at all levels and at all ages.

Botanic gardens play an important role in public education promoting early attitudes towards life respect, especially regarding the importance of plants.

The Oro Verde Botanic Garden is situated on the campus of the Faculty of Agricultural Sciences of the University of Entre Ríos, near the city of Paraná, Argentina. Recently created and still being developed, it is one of the Argentine botanic gardens supported by the partnership "Investing in Nature" and appointed to develop different targets. Specifically among different outputs, the Oro Verde Botanic Garden must develop a model for the delivery of university botanical education, which can be implemented at other universities in Argentina.

"Investing in Nature" is a partnership between four organizations**:** HSBC Banking Corporation plc., BGCI, Earth watch and WWF, with financial support from HSBC. The specific aim of the BGCI participation is to "establish the value and importance of the world's plant species in sustainable development and for the global environment, and build a self sustaining network of the world's botanic gardens, in which they are able collectively and individually to (a) undertake rescue operations of threatened plants ensuring their long terms protection, and (b) contribute to sustainable development supporting economies livelihoods and the environment."

Simultaneously, a Memorandum of Understanding outlined the terms of a Partnership agreed between BGCI and the Oro Verde Botanic Garden with the aims of**:**

- promoting public understanding of the relationship between the plant world, humanity and the rest of nature.
- generating awareness of the value and importance of the world's plant species in sustainable development an for the global environment.
- aiding in the conservation of Argentine native plant diversity, and
- assisting botanical gardens and arboreta throughout Argentina, as living museums, to ensure that plants are recognized as the world's greatest natural resource and that they are adequately managed for the future.

A botanic garden benefits not only the University where it is located, buy the city, the country and the whole world. The new Argentine constitution protects natural resources and guarantees

every inhabitant the right to live in healthy environments, that botanic gardens sponsor and protect.

Increasing degradation of the planet has caused preserved areas, national parks and botanic gardens to acquire unparalleled importance, not only environmental and scientific, but social and political.

Recently, by Provincial Law Nº 8967, the Oro Verde Botanic Garden was included in the network of natural Protected Areas and put under the auspices of IUCN and UNESCO, as a result of which its importance has increased.

Ideally, botanic gardens, to fulfill their objectives, should accomplish "in situ" and "ex situ" plant conservation, especially regarding threatened species, as well as have an officially registered herbarium and an *Index Seminum* (a seed collection for international interchange). Both, an "in situ" garden and a seed collection, are being maintained at the Oro Verde Botanic Garden. A germplasm bank is also desirable and has been projected.

It is our aim to create an important research institute capable of sharing responsibilities with other gardens of the world regarding scientific, educational and social objectives.

The creation of a botanic garden also has political and cultural relevance, especially because the province of Entre Ríos has only one botanic garden (Oro Verde) designed and registered according to BGCI recommendations, that included a study of the number of potential visitors and its corporative image (items to be used and sold in the garden, created by fourteen teams of advanced students of the Graphic Design Faculty, Buenos Aires University).

The garden already has educational programs for pupils of different levels (Primary, Secondary and University students), and will certainly be useful to different sciences taught in the University, as well as to create an integrated circuit with a nearby national park.

Floristic diversity is very rich in the province of Entre Ríos and is considered second in importance after the north-west and north-east native forests, with about 2100 species of plants.

People have no knowledge at all about native plants uses. Similarly, botanists have little information about the biology and phenology of theses plants. Therefore, it is absolutely necessary to teach about their importance as well as to create nurseries to investigate and preserve them.

Uncontrolled deforestation due to increasing agriculture demands the development of an important garden, not only to undertake research and education, but also to advise the government about laws to protect and rescue what is left of native vegetation in the country, especially to save threatened species "in situ" and "ex situ", as well as to create seed banks.

The whole world accepts that sustainable development is the only solution to keep the planet alive, with plants as the main source of energy and life.

With the help of well known specialists in different branches of plants sciences that work in the Faculty of Agricultural Sciences of Entre Ríos National University, it is expected to develop a garden as an institute that will undertake conservation, research and education, in connection with the world garden network.

However, education on its own is not enough to achieve protection. To protect natural resources it is necessary to develop partnerships, not only including ecological groups, but all branches of production, as well as offering economic incentives to encourage sustainable development. Decrees banning the destruction of natural resources without stable government regulations to control its management have proved to be useless.

Argentina lost 70% if its native forests in the last 70 years. The Official National Census of 1935 made an inventory of 1.100.000 km^2 of the country covered with native forests. At the present time, according to the results displayed by the updated Official Forest Census of the National Secretary of Environment and Sustainable Development (2002), only 330.000 km^2 still exist, due to uncensored tree felling devoted mainly to favour the expansion of agriculture. The country wealth was not only derived from stockbreeding and agriculture but from natural resources that made us famous in the world. However, it has changed according to the results shown in official reports, giving a good account of destruction.

As it was mentioned, in 1935 39% of the nation was covered with native forests; nowadays it does not reach 12%. The diagnosis is striking and the reasons not too many. Not the whole population is to be blamed, but a handful of powerful men and companies willing to add more and more land to practise agriculture. One of the most terrible problems of the country is the disordered growth of deforestation. As no benefits are granted for farmers that respect sustainable development, tree felling expands day after day. However, although each province of the country has power to decide over its natural resources, the national government can promote legislation to assign territories of the country for different uses, but it is not put into practice. Right now, areas immensely rich in biodiversity are being destined to soybean production, regardless of how ephemeral its profits may be.

Not only biodiversity is being destroyed, but also important rural communities, cultures and ancient crops, and above all, unemployment has grown greatly leading to rural depopulation. Native forests are our primary wealth. Plant and animal biodiversity are absolutely rich regarding genetic, environmental and economic matters. Among other precious benefits, forests prevent soil erosion, great floods, droughts, climate changes, and what is most important, biodiversity takes shelter in them. The report warns that deforestation has led us to the loss of 40% of plant and animal species. Many trees are threatened with extinction, among others *Araucaria angustifolia* (pino Paraná) in the province of Misiones; *Tabebuia* spp. (lapachos), *Amburana cearensis* (palo trébol) and *Chenopodium* spp. (quinoas) in the NW jungles of the Yungas; *Bulnesia sarmientoi* (palo santo) and *Schinopsis* spp. (quebrachos colorados) in Chaco; *Fitzroya cupressoides* (alerce), *Austrocedrus chilensis* (ciprés de la cordillera) and *Araucaria araucana* (pehuén) in the South.

The view is distressing and it is not related to the past only. Each year big areas are deforested and daily, hundreds of denunciations are reported. Greenpeace denounced that natural reserves are being sold to grow soybean in the province of Salta. The most severely damaged zones are placed in the NW and NE of the country, as well as in the Chaco forests. One of the main consequences of deforestation is turning green areas into deserts. What is worse, when deforested land is destined to pastures, excessive grazing turns it into a desert. This is more notorious in the South. No regulations have been provided regarding forest management. Tree felling seems to be absolutely normal and once the land is degraded it is abandoned. Planning is a must, but reality shows a completely different view. Sustainable production is necessary and expected, but not at the expense of the remaining spots of natural life.

What is worse is the destruction of natural habitats for transgenic soybean production that is not even used for human nourishment in Argentina, but to feed cattle in developed countries, and the exportation of nutrients that will lead to soil exhaustion. Eighty per cent of natural reserves have no rules to preserve the ecosystems and protected species. Regulations are inefficient and disorganized. Various organizations have denounced lack of official to establish adequate control and sustainable strategies in the long term. The province of Entre Ríos is one of the most severely affected by hydric erosion and deforestation. In 2003 the Faculty of Agricultural Sciences of Entre Ríos National University began a research asked for by the provincial government to determine the remaining areas with native forests. The Teledetection and Image Processing Group of the Faculty and the Oro Verde Botanic Garden shared the research and showed by comparison with a previous report that in the last seven years over 600.000 hectares of native forests disappeared in the province. As a result of these dramatic conclusions the government sanctioned an emergency decree banning deforestation in all its territory.

Although severe penalties were established for its infringement, deforestation continued, as they were not put in practice. The present government abolished this decree, buy a legal appeal was presented by many ecological groups and won. After a long struggle an agreement was established between the provincial government, non governmental organizations and agricultural entities. It was decided that properties with well cared for native forests in the province would be free of tax up to a maximum 300 ha. Although recently applied, it seems to be a better policy than banning deforestation or simply trusting in education. The efforts of Non Governmental Organizations and Botanic Garden need the government support, otherwise they are useless.

The Oro Verde Botanic Garden was asked to present a detailed report of the reasons for preserving native forests that were taken into account by the examining magistrates. The future of these new announcements is perhaps the most unknown question. We had 105 million hectares of native forests in the country. Today there are 33 million hectares. In between there are only 70 years. It is clear that there in no time to waste.

Biography

Muñoz, Juan de Dios: Agricultural Engineer; Doctor of Pharmacobotany and Pharmacognosy (University of Buenos Aires); Professor of Botany and Director of the Oro Verde Botanic Garden in the Faculty of Agricultural Sciences, Paraná, Entre Ríos National University, Argentina.

The Kashmir University Botanical Garden (KUBG): Role in education, public awareness and conservation

Prof. Ghulam Hassan Dar

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1. Introduction

Established in 1961, the Kashmir University Botanical Garden (KUBG) is situated at 34°.09´ N latitude, 74°.50´ E longitude, 1,580m (a.s.l.) altitude, and has recently been annexed with a high-altitude (2,500m) extension at Gulmarg. Presently it spreads over an area of about 12 acres and receives an average annual precipitation of ca. 70 cm. Within the Garden is located a Centre of Plant Taxonomy (COPT) that houses the Kashmir University Herbarium (KASH), as also a Ladakh Laboratory.

Major portion of the Garden grows wild flora of the Kashmir Himalaya, though some captivating lawns are maintained to add to it an aesthetic feather. The facilities of Glass House, Hot House, Pot House, and Poly Houses also exist. For growing various types of plants, the Garden has well-defined sections, such as Coniferatum, Deciduous-tree plot, Shrubbery, Rosary, Rockery, Lily-pond and Canal, Salicatum, Medicinal-plant section, Endemic-plant repository, Bulbous-plant section, Rosaceous-fruit section, and Protected grassland, etc. (Figure 1, Plates 1-2).

The Kashmir University Botanical Garden is among the pioneer botanic gardens in the Indian Botanic Garden Network (IBGN) that was established under Investing in Nature-India (IIN-India) project of the international Investing in Nature (IIN) Programme, coordinated by the Botanic Gardens Conservation International (BGCI). A member of the Global Network of Botanic Gardens, The KUBG is a registered participant in the worldwide implementation of the International Agenda in support of plant conservation, environmental awareness and sustainable development.

2. The Kashmir University Botanical Garden: A resource and service centre

A repository of the flora of the Kashmir Himalaya, the KUBG has great value to the local population. It plays significant roles in the education, awareness and conservation of the local plant diversity, which can be summarized as follows:

2.1. Role in education and research

Ever since its inception, the KUBG has been used for educational and research purposes to provide plant materials and information about them for the post-graduate students and research scholars in this University. Researchers from other institutions also share these facilities. Its diverse plant collections also offer significant opportunity for people to experience nature first hand. Training programmes are being conducted for School and College students to educate them with various aspects of plant biodiversity in this Himalayan region (Plate 3).

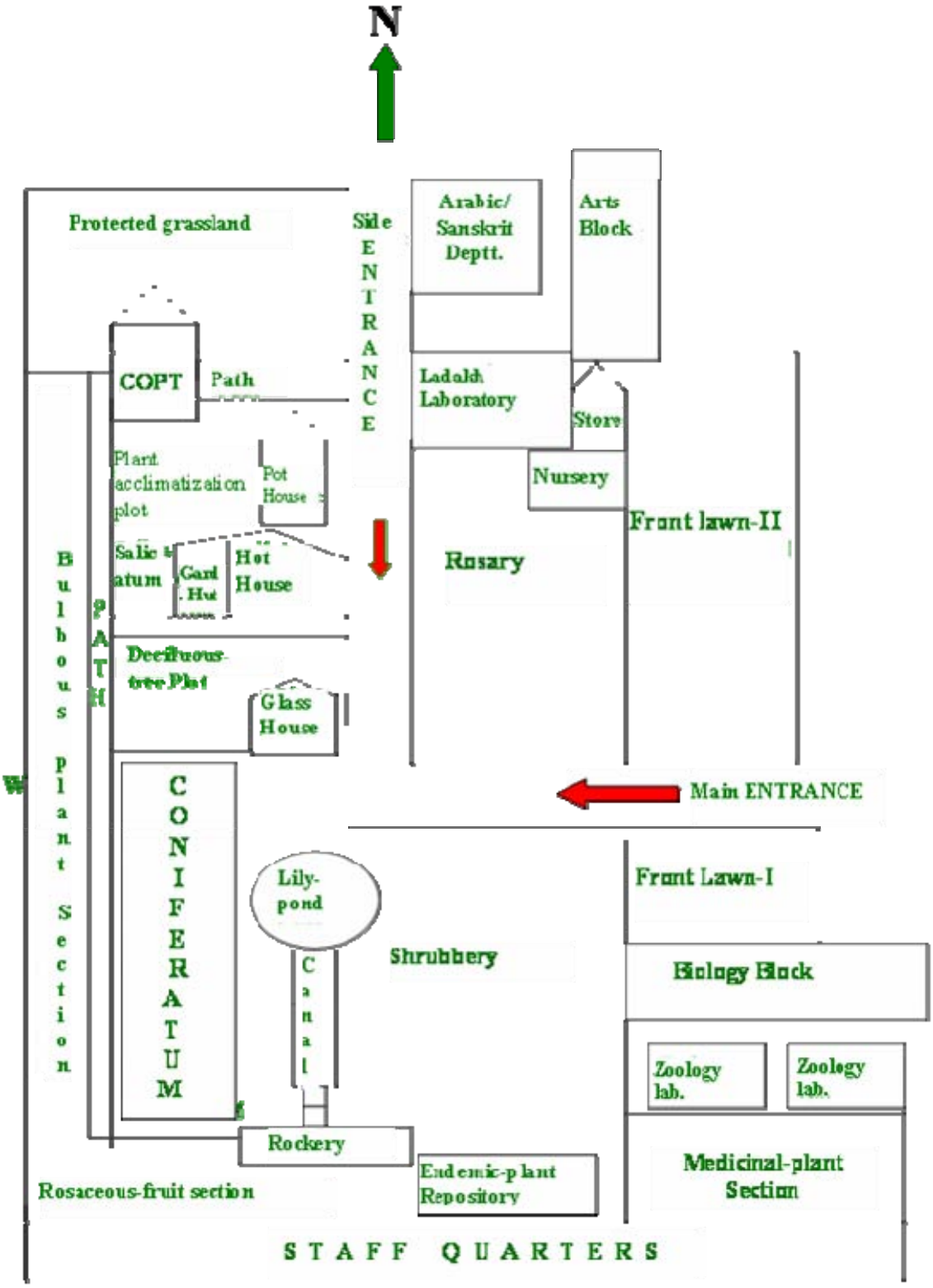

Figure 1. Layout of the Kashmir University Botanical Garden (KUBG)

Plate 1

Centre of Plant Taxonomy

Green House

Glass House

Inside view of the Hot House

Inside view of the Kashmir University Herbarium (KASH)

Plate 2

Lily Pond and Canal

***Pelargonium* spp. in Pot House**

Rockery

Shrubbery

Project Plots

Rosary

Protected Grassland

COPT, the only such institute in this region, is the major facility for taxonomic research and training, having facilitated publication of 16 books and more than 200 peer reviewed research papers on the rich flora of the Kashmir Himalaya (for details see Dar *et al.* 1995, Dar & Naqshi 2001, Dar *et al*. 2002). These publications have greatly added to the understanding of the floristic diversity of this region; they may also serve as disseminate tools for educating people during the UN Decade of Education for Sustainable Development (UN DESD, 2005-2014).

2.2. Role in plant identification

KASH, one of the largest herbaria in the northwestern India, harbours a prized collection of about 40,000 accessioned plant specimens, representing all the three geographical provinces of the State: Jammu, Kashmir and Ladakh. It acts as the main seat for authentic plant identification in this Himalayan region. Students, researchers, academicians of this University, as well as other Government Departments and Non-governmental Organizations, regularly visit this Herbarium for purposes of seeking identification and study of plant specimens.

2.3. Role in public awareness

At present, the KUBG has live collection of more than 400 indigenous plant species and about 150 exotic ornamentals. The information about its holdings is provided to the general public by way of guiding their visits and organizing on-the-field demonstrations and lectures. All the plants are labeled, helping the visitors know their scientific and local names.

Awareness programmes for the masses are organized regarding socio-economic usefulness of the plant resources, including their ethnobotany, with emphasis on medicinal and aromatic plants (MAPs). The threats faced by these plants are highlighted to the local community in order to make them appreciate and participate in achieving conservation and sustainable use of the floristic wealth.

Public awareness regarding plant richness in this region vis-à-vis its indispensability in the people's daily life on one side and the excessive anthropogenic threats posed on the fillip side is also created through meetings, discussions, and both print and electronic media (Plates 3-4).

2.4. Role in conservation

The KUBG plays a significant role in the conservation of plant resources in this region. To maintain their precious germplasm, a large number of medicinal and other economically useful plant taxa are grown in the medicinal-plant section of the Garden as well as in its high-altitude extension at Gulmarg. Agro-techniques for several of these and other potential bioprospective taxa have been developed for their successful mass propagation. Emphasis is laid on growing *ex situ* collections of Rare, Endangered and Threatened (RET) taxa of the region (Dar & Naqshi 2002), (Table 1, Plates 5- 7).

Many research projects, sponsored by various funding agencies, have been successfully undertaken in this Garden. By virtue of these projects, a large proportion of our precious plant germplasm, collected from far-off and difficult habitats, has been maintained *ex situ* in the KUBG. Three ongoing research projects in the Garden pertain to the conservation of medicinal plants, being funded by the Ministry of Environment & Forests (MoEF), Govt. of India, Department of Biotechnology (DBT) Govt. of India, and the G. B. Pant Institute of Himalayan Environment and Development (GBPIHED), Almora, India

Plate 3

National Academic Accreditation Council (NAAC) team visiting KUBG

Vice Chancellor of the Kashmir University inspecting KUBG

Minister of the State for Tourism visiting High altitude extension of KUBG at Gulmarg

Students being demonstrated in KUBG

Plate 4


International Agenda
for Botanic Gardens in Conservation

Kashmir University Botanical Garden

is a registered participant in the worldwide implementation of the International Agenda in support of plant conservation, environmental awareness and sustainable development

BGCI


The Indian EXPRESS

The Himalayan Mail

Now KU's botanical garden basks in global sunshine


Greater Kashmir


KU garden gets international recognition

Srinagar, May 9: The Kashmir University Botanical Garden (KU/BG) has got international recognition from the Botanic Gardens Conservation International (BGCI).

The KUBG would now be put on the global network of Botanic Gardens. The certificate reads "KUBG is a registered participant in the worldwide implementation of the International Agenda in support of plant conservation, environmental awareness and sustainable development".

KUBG, which was established in 1961, to spread over 12 acres, Recently, an extension of KUBG - High Altitude Experimental Garden -was established at Gulmarg. The garden has well-defined sections of Coniferetum, Shrubbery, Rockery, Bulbous plant section, Rosaceous-plant section, Medicinal-plant section, Lily pond, Protected grassland, Experimental plot (for research purposes), etc. Glass-House and Hot-house facilities exist in the KUBG which provide protection to the tropical and subtropical exotic plants during freezing winters. Two captivating lawns, used for growing ornamentals, add aesthetic feather to the Garden.

KUBG is supplemented by an internationally known Herbarium (KASH), housed in the Centre of Plant Taxonomy (CORT). KASH harbours a rich repository of about 35,000 accessioned plant specimens representing floristic bio-diversity of the whole range in Kashmir Himalaya.

At present, the KUBG represents field gene bank for about 400 native and 150 exotic plant species. A large collection of medicinal plants - particularly Rare, Endangered and Threatened (RET) - are grown in the Garden and its extension at Gulmarg, mainly for germplasm conservation and multiplication purposes. Efforts are on to enrich the Garden by growing maximum possible representations of the native floristic elements, so that it acts as a mirror of the Flora of Kashmir Himalaya. In this direction, recently research projects funded by CSIR/HRD, Almora, DST, MoEF, BGCI, UK, were successfully carried out in the KUBG. It is also being planned to use KUBG as the main institution for garden awareness and education about environment management and sustainable use of bio-diversity.


THE KASHMIR TIMES


KU's botanical garden gets international honour


Greater Kashmir

Op-Ed PAGE

Kashmir is Rich in Biodiversity: Do We Know! -I

BIODIVERSITY IN KASHMIR


Hindustan Times


Kashmir botanical garden gets global recognition

Srinagar, May 10

A BOTANICAL garden in Kashmir has got international recognition next week participate in the worldwide implementation of the global agenda on plant conservation, environmental awareness and sustainable development.

The Kashmir University Botanical Garden (KUBG) was awarded a certificate from the Botanic Gardens Conservation International (BGCI) and has been put on the global network of botanical gardens. "KUBG is a registered participant in the worldwide implementation of the international agenda in support of plant conservation, environmental awareness and sustainable development," the certificate said.

Established in 1961, KUBG is spread over 12 acres of land. Recently, an extension of KUBG - high altitude experimental garden - was set up at Gulmarg. The garden has well defined sections of coniferetum, shrubbery, rosary, rockery, saliceturn, bulbous-plant section, rosaceous-plant section, medicinal-plant section, lily pond, protected grassland, and experimental plot (for research purposes).

Glass-house and hot house facilities exist at KUBG which provide protection to the tropical and subtropical exotic plants during freezing winters. Two captivating lawns, used for growing ornamentals, has added aesthetic feather to the garden.

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At present, KUBG represents field gene bank for about 400 native and 150 exotic plant species. A large collection of medicinal plants - particularly rare, endangered and threatened (RET) - are grown in the garden, and its extension at Gulmarg, mainly for germplasm conservation and multiplication purposes.

UNI


Greater Kashmir

Op-Ed PAGE

Kashmir is Rich in Biodiversity: Do We Know! -II

BIODIVERSITY IN KASHMIR

Table 1: Major RET plant taxa in the Kashmir Himalaya under ex situ conservation in the KUBG and its extension at Gulmarg.

Aconitum heterophyllum Wall. ex Royle	*Hyoscyamus niger* Linn.
Acorus calamus Linn.	*Inula racemosa* Hook.f.
Aralia cachemirica Decne.	*I. royleana* DC.
Arnebia benthamii I.M.Johnston	*Iris kashmiriana* Baker
Atropa acuminata Royle	*Ixiolirion tataricum* Herb.
Betula utilis D.Don	*Jurinea dolomaea* Boiss.
Coriaria nepalensis Wall.	*Lavatera kashmiriana* Cambess.
Corydalis crassifolia Royle	*Morus nigra* Linn.
Corylus jacquemontii Decne.	*Nepeta campestris* Benth.
Cotula anthemoides Linn.	*Picrorhiza kurrooa* Royle ex Benth.
Cyperipedium cordigerum D.Don	*Podophyllum hexandrum* Royle
Datisca cannabina Linn.	*Primula inayatii* Duthie
Datura stramonium Linn.	*Pseudomertensia drummondii* Kazmi
Dioscorea deltoidea Wall. ex Kunth	*Rheum webbianum* Royle
Ephedra gerardiana Wall. ex Stapf	*Rhododendron campanulatum* D.Don
Ferula jaeschkeana Vatke	*Rosa foetida* Herrm.
Fritillaria imperialis Linn.	*Skimmia anquetillia* Taylor & Shaw
F. roylei Hook.	*Smilax vaginata* Decne.
Gaultheria trichophylla Royle	*Taxus wallichiana* Pilger
Gentiana kurroo Royle	*Wikstroemia canescens* Meisn.
Heracleum candicans Wall. ex DC.	*Ziziphus jujuba* Mill.

An ambitious programme for the conservation of endemic plants of Kashmir is the urgent need of the hour (Dar & Aman 2003); projects are being formulated to achieve this goal. One such project, sponsored by BGCI, deals with the conservation of nine species of critically endangered endemic angiosperm of Kashmir (Table 2, Plates 8-9).

Table 2: Critically endangered endemic angiosperms of the Kashmir Himalaya grown as ex situ collections in the KUBG.

Aconitum kashmiricum Stapf ex Coventry
Aquilegia nivalis Falc.ex Baker
Artemisia amygdalina Decne.
Gentiana cachemirica Decne.
Hedysarum cachemirianum Benth. ex Baker
Lagotis cashmeriana (Royle) Rupr.
Meconopsis latifolia Prain
Megacarpaea polyandra Benth.
Saussurea costus (Falc.) Lipsch

Plate 5

Arnebia benthamii

Podophyllum hexandrum

Fritillaria imperialis

Hyoscyamus niger

Inula royleana

Atropa acuminata

Plate 6

Dioscorea deltoidea

Inula racemosa

Bergenia strecheyi

Rheum webbianum

Acorus calamus

Rhododendron campanulatum

Jurinea dolomaea

Plate 7

Gentiana kurroo

Picrorrhiza kurrooa

Ephedra gerardiana

Eremurus himalaicus

Digitalis purpurea

Crocus sativus

Paeonia emodii

Plate 8

Meconopsis latifolia

Aquilegia vivalis

Aconitum kashmiricum

Lagotis cashmeriana

Gentiana cachemirica

Saussurea costus

Plate

All these extremely rare and highly restricted local endemics were collected from the wild habitats and grown in the KUBG for purposes of regeneration, multiplication and reintroduction. The results in many of these species have been encouraging, especially in *Artemisia amygdalina*, *Saussurea costus*, *Aquilegia nivalis*, *Lagotis cashmeriana*, etc.

3. Special features of the Kashmir University Botanical Garden

- It is the major high-altitude botanical garden in the northwestern India, offering congenial conditions for growing temperate, subalpine and alpine plants.
- Has the advantage of having a Centre of Plant Taxonomy with a rich Herbarium (KASH) associated with it.
- Is developing as a significant repository for *ex situ* conservation of medicinal, threatened, and endemic plants in this remote and fragile Himalayan biodiversity hotspot.

4. Future needs of the Kashmir University Botanical Garden

The KUBG is now on the path of augmentation and development. Starting with a small piece of land mainly for growing exotic ornamentals, it has now been extended to serve as an important institution for the maintenance of plant resources, plant germplasm conservation, scientific identification of plants, public display and education in this region. Nonetheless, it is far from being an ideal modern botanic garden. The following efforts may help achieving this cherished long-term goal:

- Extending further the area of KUBG for accommodating a complete representation of plants from all the areas of this State.
- Enriching it by growing the maximum possible number of indigenous plants, so that it be a true replica of the diverse flora of the Kashmir Himalaya.

- Widening the activities of the Garden as an important institution for public education and awareness regarding environmental issues in line with the UN Decade of Education for Sustainable Development, that, in turn, is critical for the attainment of the Millennium Development Goals (MDGs).
- Strengthening the repositories maintained for germplasm conservation of RET plants, endemics, medicinal and other economically important plants, and wild relatives of crop plants.
- Develop it further as a full-fledged institution and encourage the campaigns for resource-based education.
- Strengthening the interface between this Garden and the local community.
- Development of the high-altitude garden at Gulmarg.
- Digitization of herbarium specimens in the KASH and cataloguing of live collections in the KUBG to form databases for future use.

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