Plant Science Gardens

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ESERA 2007
European Science Education Research Association
International Conference in Malmö, Sveden
August 21st -25th , 2007

Flower Power – The Potency of Botanic Gardens in Primary School´s Plant Science Teaching

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Type of Presentation: Oral Presentation

Synopsis:

Definition of Problem

A strong decline in attention towards plants and knowledge about plants is recently observed in industrialized and post-industrialized countries. This phenomenon named "plant blindness" (Wandersee and Clary 2006) is characterized by a) failing to take notice of the plants in one's daily life, b) overlooking the importance of plants for mankind, c) lacking hands-on experience in growing, observing and identifying plants and d) failing to explain the basic plant science underlying plant growth, - nutrition, - reproduction or - ecology. With the increasing concentration of population in urban and suburban environments, our daily interactions with plants are more controlled and less diverse than at any time in the history of humankind, so students arrive at college with less direct experience of plants than in former times (Richards and Lee 2002).
But the inattention towards plants can only partly be explained with a general loss of contact and experience with agriculture and nature due to urbanization. Plants are also heavily underrepresented in informal (Science Centers, Museums, TV) and formal (school biology instruction) science education.
Plants differ substantially from most animals and therefore require more education to understand and appreciate. Although similarities exist between plants and animals, the cell, tissue, and organ levels of organisation and the ecological interactions are fundamentally different (Richards and Lee 2002).
Due to this essential strangeness teaching about plants is considered to be a challenge by most teachers in today's classrooms (Sanders 2004) and therefore plant biology is often poorly taught from kindergarten up to high school. In particular primary school teachers consider themselves incapable of teaching plant related topics because of a lack of basic knowledge about the matter (Bertsch et al. 2006).
To cope with a low confidence level teachers use different strategies such as a) teaching as little of the subject as possible, b) emphasizing expository teaching and underplaying questioning and discussion and c) avoiding all but the simplest practical work that could go wrong (Harlen 1999).

In addition, Tranter (2004) has recently observed, that 'in too many schools, the wealth of living or once living organisms which pupils are required to study is often reduced to little more than the geranium and the potato'.
At the same time the number of guided tours, especially those for primary school classes, is constantly rising in Western European botanic gardens. Botanic gardens are anticipated as places offering expert knowledge, first hand experiences and plant specimens that fascinate young children (Kapelari et al. 2006). By taking classes to visit a botanic garden teachers can

engage their learners with plants that will impact on learners' imaginations in ways that a geranium or potato cannot.
However, botanic garden tours are often guided in a way that conflicts modern research related to science learning and learning in informal contexts. Tours are often task-oriented instead of learning-oriented. They focus on facts instead of ideas or concepts and are generally lecture-based and instructor-centered. In addition, a botanic garden educator rarely knows which background knowledge pupils are provided with, when they come to the garden and what kind of post-processing they will do back in school. Studies have shown, that in order to obtain the best learning results in informal settings, pre- and post processing in school is essential (Cox-Petersen et al. 2003).

Outline of arguments:

To improve plant science education at primary school level, the EU 6th Frame Work Project: "Plant Science Gardens – Plant Science Education for Primary Schools in European Botanic Gardens" opts for good team work between schools and their local botanic gardens. Joining both institutions will improve plant science education at schools as well as learning outcomes of the educational programs conducted by botanic gardens. A visit to a botanic garden should no longer be just a nice day out within the primary school curriculum but a crucial part of science education including pre- and post processing in school.
The authors worked closely together with primary school teachers and botanic garden educators to develop the inquiry-centered education program "Plant Scientists Investigate at School and at Botanic Gardens" (PSI). This teaching tool addresses four topics: How do plants live, Food, Plants in Art and Conservation. Each topic includes 10 teaching modules. Eight are done at school and two at the botanic garden. Teachers and botanic garden educators will find background information, work sheets and various other learning activities needed to work successfully in class and at the botanic garden. A manual for the training seminars to support teachers and botanic garden educators using the newly designed materials is included.
The education program concentrates not only on scientific concepts behind the single plant related topic but also on the scientific method itself. Teaching methods focus on developing scientific thinking at a very early stage. Various techniques are used including concept cartoons that offer competing explanations to a single phenomenon, predict-observe-explain units and discussions about historic experiments. By working with the material, primary school children learn to ask scientific questions, underpin their forecasts with arguments and find evidence for their forecast by planning, conducting and evaluating simple experiments on their own. Evaluating the "How do plants live" program a significant increase of interest for individual investigations and significant decrease of interest in teacher led investigation was observed (Bertsch et al. 2007).
At the botanic garden living organisms are experienced in their "natural environment" Children can explore, observe and experiment freely. The amazing diversity of plant life is particularly obvious. Last but not least botanic gardens may allocate scientific equipment and plant material to help teachers when working at school.
We are convinced that a good relationship of primary schools with botanic gardens in combination with our newly designed teaching material can help to overcome the symptoms of the above mentioned "plant blindness" as well as the increasing depletion of living organisms in modern classrooms. Our "ready to go" teaching material provides the necessary background information to overcome the low confidence levels of primary school teachers in teaching plant science and conducting science related experiments. Inviting teachers and botanic garden educators to training seminars encourages them to discuss teaching methods, share experience and gain confidence in teaching inquiry based plant science.

Summary

Living organisms in general and plants in particular are underrepresented in today's science classrooms because many teachers consider plant science to be a teaching challenge.
We believe that a good relation between primary schools and botanic gardens will improve science teaching in general and teaching about plants in particular. We introduced special designed inquiry-centered teaching materials to be used in class as well as in the botanic garden. We believe that a well balanced combination of different teaching methods drives pupils to reactivate their natural instinct to explore and understand the world they are living in.

References:

Bertsch, Ch., Kapelari, S., Johnson, S., Bromley, G., Bonomi, C., Kossev, K. (2006). Hands on Botany: Building bridges between schools and botanic gardens to improve plant science education in European primary schools. *Paper presented at the 10th International Congress of Ethnobiology, Chiang Rai*, Thailand, 04-09 November 2006.

Bertsch, Christian[1]; Unterbruner Ulrike[2] Kapelari Suzanne[1]; (2007). Inquiry-centered primary science: monitoring attitudinal change towards independent investigation during a hands-on Photosynthesis project. *Paper presented at the ESERA*, Malmö 21-25 August 2007

Cox-Petersen, A., Marsh, D. D., Kisiel, J., & Melber, L. M. (2003). An investigation of guided school tours, student learning, and science reform: Recommendations at a museum of natural history. *Journal of Research in Science Teaching*, *40*, 200–218.

Harlen, W. (1999). Effective teaching in Science. SCRE Publication 142 available at http://www.scre.ac.uk/pdf/science.pdf, accessed March 2006.

Kapelari S., Bertsch, Ch., Kossev, K., Johnson, S., Bromley, G. and Bonomi, C. (2006). Plant Science Gardens - A model for improving plant science education at primary school level by creating cooperations between schools and their local botanic gardens. *Paper presented at 4th Balkan Botanical Congress*, Sofia, Bulgaria, 20-26 June 2006.

Richards, J. and Lee, D. 2002. "To see … Heaven in a Wild Flower ….": Teaching botany in the 21st century. Book Review. *American Journal of Botany.* 2002; 89:172-176.)

Sanders, D. (2004). Rethinking teaching about plants in schools: How can educators make plants visible in inspiring ways? Available at http://www.leef.org.uk/articles/article.php?id=29 accessed January 2007.

Tranter, J. (2004). 'Biology: dull, lifeless and boring? *Journal of Biological Education*, 38, 3, 104–5.

Wandersee, J. and Clary, R. (2006). Advances in research towards a theory of plant blindness. *Proceedings of the 6th International Congress on Education in Botanic Gardens*, Oxford, England, 10-14 September 2006.

Inquiry-centered primary science: monitoring attitudinal change towards independent investigation during a hands-on Photosynthesis project

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Type of Presentation: Oral Presentation

Background

"Inquiry" is a central term in the rhetoric of present science education reforms in Europe. One unifying goal of these reforms is the promotion of positive attitudes towards science and learning science. The current importance of this promotion is emphasized by the mounting evidence of a decline in the young peoples' interest in science studies and careers. Positive contacts with science at primary level have a long-lasting impact on students' interest in science whereas negative experiences at school, due to uninteresting content or poor teaching, are very detrimental to future choices (OECD 2006).

Besides the potential that is attributed to inquiry-centered teaching and learning by the science education research community (O'Neill 2004, Schwartz et al. 2004) and curriculum developers, inquiry-centered teaching is still the exception in Austrian primary school classrooms. Children in primary school have a natural curiosity for science and can easily be motivated for conducting experiments. However, many of their teachers feel uncomfortable with science subjects and lack the confidence for conducting hands-on activities in the classroom. To cope with their low confidence they use different strategies such as i) teaching as little of the subject as possible, ii) emphasizing expository teaching and underplaying questioning and discussion and iii) avoiding all but the simplest practical work that could go wrong (Harlen 1999).

In course of the EU 6th Frame Work Project: "Plant Science Gardens – Plant Science Education for Primary Schools in European Botanic Gardens" we established a working group consisting of science education researchers, teacher trainers and practioners (primary school teachers and botanic garden educators) to address the lack of authentic inquiry at primary level. We developed an inquiry-centered education program dealing with the topic Photosynthesis. 10 modules were designed, each of them lasting approximately 90 min. Two modules were conducted at the botanic garden, the others in the classroom. To achieve conceptual understanding of the topic as well as a change in students' ideas about the nature of science we distinguished between "inquiry as means" and "inquiry as ends" (Abd-el-Khalik 2004). Inquiry as means refers to inquiry as an instructional approach intended to help students develop understanding of the topic Photosynthesis. Inquiry as ends refers to inquiry

as an instructional outcome. In the project-based instruction the young learners worked in teams to formulate questions, make predictions and design investigations to test their own predictions (inquiry as means). By reflecting on their own investigations and by discussing historic experiments (inquiry as ends), insights in the nature of science were gained. This reflective stage is crucial for developing students' understanding of the nature of science (Sandoval 2003, Schwartz et al. 2004).

The education program consisting of i) a teacher pack providing the necessary background information for the teacher and hands-on activities for the students, ii) botanic garden activities, including background information for the educators working in the garden and iii) a manual for teacher training seminars, supporting teachers and botanic garden educators in using the newly designed materials will be distributed on large scale in autumn 2007.

Objectives

To present 1) primary school children's attitudes towards school science, 2) their attitudes towards independent investigation, 3) the impact of the inquiry centered teaching materials on primary school children's attitude towards independent investigation.

Methods

The teaching materials were tested in four primary school classes with 84 students (43 boys and 41 girls) of ages from 9 to 11 years. The investigations in school were supervised by the teacher, investigations in the botanic garden by botanic garden educators. All lessons were filmed, student discussions transcribed and analyzed following a grounded theory approach (Glaser and Strauss 1967) using the software *Atlas.ti*.
To monitor attitudinal change we used a questionnaire consisting of a 4 point Likert scale. The scale drew on several items from the study of Pell and Jarvis (2001). The questionnaire was administered before and after the project. To test on attitudinal change the data was analyzed using the non-parametric test after Wilcoxon (Bortz 2003). To test gender bias of attitudes towards science in general and science experiments in particular we used the U- test after Mann-Whitney (Bortz 2003). The data was analyzed using the software *SPSS.*

Results

1. Attitudes towards school science

The 4th grade primary school children in our sample have very positive attitudes towards school science, even though it is not considered as being easy (Table 1). Our results suggest that children enter secondary school with a highly positive attitude towards science. A review of literature on attitudes towards science underpins these findings. A clear feature of international research is the decline in attitudes towards school science from age 11 upwards (Osborne et al. 2003). The absence of any gender difference in our sample (Table 1) does not support the view that science is a male subject at this level of education (Jones 2000).

Table 1: Interest in school science (1=I strongly agree, 4= I strongly disagree)

	Girls			Boys		
	N	Mean	SD	N	Mean	SD
I like learning science	41	1,49	,637	43	1,47	,667
Science is boring	41	3,56	,769	43	3,65	,783
Science is easy	41	2,22	,881	43	2,07	,910

2. Attitudes towards science experiments

Our results show that children especially like the co-operative practical hands-on aspects of science (

Table 2). In the pretest there is no significant difference in attitudes towards "watching the teacher doing experiments" and "doing experiments on your own". However, the pretest suggests that children are not so keen in finding out how an experiment works on their own. There is a significant difference in item 4 and 5. These findings accord with other studies (Pell and Jarvis 2001).

Table 2: Interest in different activities in the science class (1= I like it very much, 4= I don't like it at all)

How do you like	N	Pretest		Posttest	
		Mean	Std.Dev.	Mean	Std.Dev.
1 Working with worksheets	84	1,76	,75	1,77	,70
2 Watching the teacher do an experiment	84	1,19	,55	1,48**	,74
3 Doing experiments on your own	84	1,08	,39	1,06	,24
4 Teacher telling you how an experiment works	84	1,32*	,64	1,63**	,76
5 Finding out how an experiment works on my own	84	1,62*	,87	1,24**	,62
6 Working with friends	84	1,31	,56	1,37	,69
7 Working alone	84	2,26	,99	2,40	1,13
8 Making excursions	84	1,08	,35	1,00	,000

* Statistically significant difference between different items within pretest, Wilcoxon test
** Statistically significant difference between same items pre- und posttest, Wilcoxon test

3. Attitudinal change after inquiry centred lessons

After conducting the inquiry centred lessons we observed a significant change in the attitudes towards item 2, 4 and 5 (Table 2). Whereas the positive attitude towards "watching the teacher doing an experiment" and "teacher telling you how an experiment works" decreased significantly, students' interest towards "finding out how an experiment works on your own" increased significantly.

Adding up the mean scores of item 3 and 5 we get a sub-scale "student-centred investigation" that can be used as a measure for individual investigative science. Adding up the mean scores of item 2 and 4 we create a sub-scale "teacher-centred investigation", pointing towards a measure of instructed investigation (Table 3).

Table 3: Interest in teacher-centred and student-centred investigation

Subscales	N	Pretest		Posttest	
		Mean	SD	Mean	SD
1 Teacher-centered investigation	84	2,51	,95	3,11**	1,28
2 Student-centered investigation	84	2,70	1,00	2,30**	,73

** Statistically significant difference between same items pre- und posttest, Wilcoxon test

The use of the developed inquiry-centred materials - where students were asked to formulate questions, make predictions and design investigations to test their predictions on their own - led to a significant decrease of interest in teacher-centred investigations. At the same time the students gained the confidence to find out how experiments work on their own and we could observe a significant increase of interest for individual investigations. There is no gender difference identifiable concerning interest in individual investigation.

Conclusions

If we want to address the ongoing decline of interest in science among young people in general and young girls in particular, it is important to build on a positive start made in primary years as well as to identify factors that might prompt young people to reject science later. Vice versa, factors that have the potential to raise students' interest and confidence in science have to be identified and forced. Inquiry-centered teaching holds this potential. If we

want to fascinate children for science and achieve scientific literacy amongst them, extensive professional development efforts relative to inquiry are necessary.

Selected references

Abd-el-Khalick, F., Boujaoude, S., Duschl, R., Lederman, N., Mamlok-Naaman,R., Niaz, M., Treagust, D., Tuan, H. (2004). Inquiry in science education: International Perspectives. *Science Education* 88, 3, 397-419.

Bortz, J. (2003). Kurzgefasste Statistik für die klinische Forschung. Leitfaden für die verteilungsfreie Analyse kleiner Stichproben (2nd edition). Berlin:Springer.

Glaser, B. and Strauss, A. (1967). The discovery of grounded theory: Strategies for qualitative research. New York: Aldine.

Harlen, W. (1999). Effective teaching in Science. SCRE Publication 142 available at http://www.scre.ac.uk/pdf/science.pdf, accessed March 2006.

Jones, G., Howe, A. and Rua, M. (2000). Gender difference in students' experiences, interests and attitudes towards science and scientists. *Science Education*, 84, 180-192.

Pell, T. and Jarvis, T. (2001). Developing attitudes to science scales for use with children of ages from five to eleven years. *International Journal of Science Education*, 23, 8, 847-862.

OECD (2006). Evolution of Student Interest in Science and Technology Studies Policy Report. Available at http://www.oecd.org/dataoecd/16/30/36645825.pdf, accessed January 2007

O'Neill, D. K., Polman, J. L. (2004). Why educate "little scientists?" examing the potential of practice-based scientific literacy. *Journal of Research in Science Teaching* 41:234-266.

Osborne, J., Simon, S. and Collins, S. (2003). Attitudes towards science: a review of the literature and its implications. *International Journal of Science Education*, 25, 9, 1049-1079.

Sandoval, W., Morrison, K. (2003). High school students' ideas about theories and theory change after a biological inquiry unit. *Journal of Research in Science Teaching* 40:369-392.

Schwartz, R. S., N. G. Lederman, and B. A. Crawford. 2004. Developing views of nature of science in an authentic context: An explicit approach to bridging the gap between nature of science and scientific inquiry. Science Education 88:610-645.

World Environmental Education Congress,
Durban, South Africa
2nd - 6th July 2007

Investigating Plants and Sustainability in Botanic Gardens and Primary schools.

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Case study paper

ABSTRACT - In the context of an EU funded FP6 project, specific multicultural teaching activities, aimed at children aged 8-10, have been developed jointly across Botanic Gardens in Austria, Italy, the UK and Bulgaria. The programme focuses on plants and sustainability, investigating the concepts of plant ecology, extinction and conservation, plants as food and plants in art. Enquiry centred and active learning techniques (e.g. concept cartoons, role games, play-decide games, predict-observe-explain sessions, designing experiments), will stimulate scientific thinking at an early stage. As this will be done partly in school partly in the botanic garden, it will make a lasting impact on both learning abilities and conceptual understanding.

KEYWORDS - botanic gardens, primary schools, ecology, conservation, food, art

INTRODUCTION: THE CONTEXT

Plascigardens (Plant Science Education for Primary Schools in European Botanic Gardens) is an EU project funded under FP6 in Science-and-Society as a specific support action and runs from October 2005 to October 2007. This project has been developed jointly by four

European botanic gardens: the University Botanic Garden in Innsbruck, Austria; the Viotte Alpine Botanic Garden in Trento, Italy; the University Botanic Garden in Sofia, Bulgaria; the Royal Botanic Gardens, Kew, UK; along with the Institute of Education in London, UK.
The final objective is to develop a number of resources to deliver better plant science at the primary level, promoting young people's interest in plant science, scientific method, different ways of learning science and scientific careers. In doing so the aim is to establish a long lasting partnership between primary schools and their local botanic garden (Johnson, 2004).
The expected outputs are an enquiry centred, multilingual, multicultural plant science education tool focusing on plant diversity, that will include 4 parts: a teachers' pack, teachers resources, botanic garden activities and teacher training seminars. Parts of the programme will be conducted inside and outside the classroom and parts in the botanic garden. The target age group is 8-10.
The project has been structured in 4 stages: a preliminary analysis of the status of plant science education in primary schools, a creative stage in which an education tool is devised and structured, an active trial stage in which the materials is tested with selected schools over an 8 month period along with an evaluation from both teachers and children; a final stage producing and disseminating the teaching resources and the training materials for schools and botanic garden educators.
The first phase of the project analysed current plant science educational delivery at primary level within both schools education and botanic garden education programmes. 112 teachers in 60 different primary schools across 4 European countries were contacted. This analysis highlighted the following difficulties as far as teaching botany is concerned: lack of time, lack of expertise, uneasiness about teaching botany because specific training on these topics is rarely provided. Harlen (1999) identified a series of strategies that teachers used to cope with low confidence in their ability to teach science, including keeping to topics where their confidence is greater, avoiding all but the simplest practical work and any equipment that could go wrong. To meet these needs botanic gardens can provide expert knowledge, first hand experience and education facilities including equipment for conducting experiments (Price and Hein, 1991). However at present botanic garden educators rarely know what children already know. Usually they do not have contact with teachers and pupils before their botanic garden visit. They merely work with children who anticipate an enjoyable trip more than an active learning process (Wolins et al., 1992). Studies have shown that in order to obtain the best learning results in informal settings pre- and post-processing in school is needed (Cox-Petersen et al., 2003)

A possible solution lies in strengthening the links between botanic gardens and primary schools. Plascigarden will draw attention to the convenience of partnerships between primary schools, botanic gardens and national education authorities.

A SPECIFIC EDUCATION FOCUS INCORPORATING ENQUIRY CENTRED LEARING

The whole programme focuses on plants and sustainability, it aims at showcasing that all life depends on plants (Tilbury, 2004), investigating four key concepts: plant ecology, extinction and conservation, plants as food and plants in art (Summers et al., 2003; Sanders, 2005). Each country specifically developed one key concept and all four of them were later circulated for feedback from all partners.

The four themes were selected with the participating schools. At this stage there was collaboration to develop resources for teachers and botanic garden educators. This was a bottom up approach. National working groups were also established in all four countries to work as a consultation group. This group consisted of primary school teachers, representatives of the national school board, botanic garden educators and teacher trainers. An essential feature of this process was making sure the actual activities were trialled in schools and that there was active involvement of teachers (Tizzard and Hughes, 1984).

The four themes were a starting point around which teaching and learning activities were designed that incorporated enquiry centred and active learning techniques (Sandoval, 2003). In order to stimulate active scientific thinking at a very early stage (Driver et al., 1994, 1996) the resources included concept cartoons, role-play games, play-decide games, predict-observe-explain sessions, designing experiments sessions, and argumentation.

In the **plant ecology and photosynthesis** modules special attention is placed on the role of plants as oxygen producer factors influencing plant growth and the importance of plants as starting point of nearly all food chains. Through simple experiments using candles and bell jars children find out that the air we exhale is different to the air we inhale. By discussing Priestley's historic experiment with used air the children understand not only the plants' importance as O_2 – producer but also their capability of absorbing CO_2. In a next step factors limiting or facilitating the O_2 production are investigated by using different water plants, where the oxygen given off can be observed. Children plan, conduct and evaluate experiments on their own showing the importance of light and CO_2 for the production of oxygen. To sum up the experiments on the role of plants as oxygen producers children mark the area of green space that is needed to produce enough oxygen that they themselves can live for 24 hours on the school yards.

Starting point for the development of an understanding of the factors influencing plant growth is that children find evidence that soil can not “feed” the plants, a common misconception held at this age (Wandersee, 1983; Wood-Robinson, 1991). Through different experiments in the Botanic Garden the role of water, CO_2, light, chlorophyll and soil minerals for plant growth is experienced. Food-chain-games enforce the importance of plants for heterotrophic live on earth. Through planning, conducting and evaluating most experiments on their own followed by plenary discussion not only on the knowledge produced but also on the methods used to produce this knowledge, children gain a conceptual understanding of the topic photosynthesis as well as insights into the nature of science and how scientists work.

In the **extinction and conservation** module, the children undertake a series of interactive steps that lead them to appreciate the problem of plant extinction and its global consequences. They can consider how they can contribute to plant conservation and how mankind can attain sustainable development locally and globally. Step one introduces children to the plant kingdom and encourages them to find ways to describe and illustrate different sample plants. Step two is for them to become aware of the problem of plant extinction. A specific role game has been specially designed to showcase this concept. In it the children play the part of plants receiving the nutrients, light and water they need (specific cards) in order to survive in a given number of sites. The storyboard introduces a series of events (e.g. draught, new roads, changes in land use, new protected areas) that initiate variation in the number of resources and sites. Eventually some plants will go extinct and some others will increase their presence. The third step is a discussion of the games’ outcomes to encourage children to appreciate the percentage of extinct species, the causes of extinction and the different significance of partial and global extinction. The final step is to make them think of what humankind can do to prevent extinction, with special reference the role that botanic gardens can play.

The attention naturally focuses on seed collection, safe storage, germination and cultivation. A simplified play-decide game is then introduced to make the kids aware of the special germination requirements of the different species and on how they can make the seed germinate (story cards introduce different germination behaviours). In particular the concept of seed dormancy is presented and a final challenge card requires a decision on the more likely way to overcome it (e.g. a cold period mimicking winter, a hot period mimicking summer, etc.). An additional interactive step presents seed structure and seed dispersal mechanisms. A concluding role-play game introduce the concept of sustainable development. Here the children play citizens of an alpine valley where a major skiing area is about to be developed. Different options are introduced and alternative scenarios for the development are

presented with their short and long term effects. A final decision needs to be taken and groups of citizens must argue and vote for the preferred option taking into account the long term results of their choice.

In **plants and food,** the focus is on growing plants, identifying the edible ones and their life cycle, with a special attention to the functions of different parts, pollination and germination of seeds. Sorting plant into families introduces taxonomy and classification and finally children consider healthy eating and sustainability.

For the duration of the project, selected crops are grown in schools either in school gardens or in pots so that children get to know how different edible plants are cultivated and what they look like as they grow. Children can then identify plants from evidence cards and sorting pictures of plants at different stages of growth to make plant life cycle (Malone and Tranter, 2003). Mystery stories encourage deductive reasoning with a story and evidence of environmental factors that will help to solve a problem e.g. what has prevented a pea plants producing a crop. The study of pollination is guided by observation outside the classroom and concept cartoons that contain misconceptions about what bees are doing when they visit flowers is the staring point to stimulate discussion. Evidence is also provided so that they children can explain what is really happening in the cartoon. The function of different parts of a plant are presented by means of plant puzzles, plant labels and interpretation cards asking to justify the identification of a specific plant part. Sustainability of the food market is presented through the key concept of food miles, raising awareness of the long distance fruits and vegetables might have to travel before they reach our plate.

In **plants in art** the focus is on practical, creative activities aimed at highlighting the widespread use of plant material in artistic creations. The activities range from picking and assembling leaves in artistic compositions, to paper making, preparing presents with seeds and nuts, reproducing a tree using real parts of a plants that can be picked outdoors from the ground, dyeing fabric and Easter eggs with natural dyes, construct a wind musical instrument using natural material and finding the most eye catching colours in flowers and plants. During these creative activities follow up concept cartoon and specific questions draw the pupils' attention to the material they used, the plant it came from and its specific uses. Additional steps include a role-play game in which each child plays a fruit or a vegetable and the other children must find out what they are by asking questions that can be answered only with one word. There is also an activity which focuses pupils’ attention on the symbol meaning of plans used in different traditions. Further activities require children to redesign a

popular game e.g. snakes and ladders to one in which traditional content is replaced by botanical content and representation of plants and plant related tasks.

EVALUATION, APPLICABILITY AND TRANSFER

All four topics will be trialled over an 8 month period with selected schools; they will be evaluated by both teachers and children. The assessment will not only be a formative one for the project but also a social and relational one. The effectiveness of cooperative learning approach employed and their impact on the children's self esteem and motivation (Hein, 1995; Naylor et al., 2004) will be evaluated. Specific questionnaire have been filled in before the activities begun and their results will be re evaluated at the end of the project comparing them with the questionnaires submitted after the activities. In the meantime the four different topics will be critically re-evaluated by each group and specifically adapted in each country according to the national curriculum and specific educational needs (Brady, 2003).
These final cross tested products, evaluated and nationally adapted, will be made available at the end of the project in October 2007 and will be widely disseminated in hard format and digital format via the web and via multimedia resources. The final stage will include the development of training materials for teachers and botanic garden educators for Continuing Professional Development.

CONCLUSIONS

All of those involved in this project hope that these activities will contribute to making future generations aware of the importance of plant conservation for the sustainable development of human society. Sowing in children the seeds of a sense of stewardships and the values that encourage them to care for our natural resources and plants in particular.

ACKNOWLEDGEMENTS: The authors wishe to thank the EU 6th Framework Programme for Research in the European Union for the financial support to this project under the Science and Society scheme and the very motivated primary school teachers taking part in the project.

REFERENCES

Brady, L (2003). Curriculum Construction, 2nd edn. Sydney, Pearson.
Cox-Petersen, A, Marsh, DD, Kisiel, J, Melber, LM (2003). An investigation of guided school tours, student learning, and science reform: Recommendations at a museum of natural history. Journal of Research in Science Teaching. 40: 200–218

Driver, R., Asoko, H., Leach, J., Mortimer, E., Scott, P. (1994). Constructing Scientific Knowledge in the Classroom. Educational Researcher, 23(7), 21-23.
Driver, R., Leach, J., Millar, R. Scott, P. (1996). Young people's images of science. Buckingham, UK: Open University Press.
Harlen, W (1999). Effective Teaching of Science. The Scottish Council for Research in Education, Edinburgh.
Hein, GE (1995). Evaluating teaching and learning in museums. In E. Hooper-Greennill (Eds.), Museum. Media. Message (pp.189-203). London: Routledge.
Johnson, S (2004) Learning science in a botanic garden. In Braund, M and Reiss, M. Learning Science outside the Classroom. (75-93) London: RoutledgeFalmer.
Kolb, D (1984) Experiential Learning: Experience as a Source of Learning and Development, (San Francisco, Jossey-Bass)
Malone K, Tranter, PJ (2003). School Grounds as Sites for Learning: making the most of environmental opportunities. Environmental Education Research, Vol. 9, No. 3
Naylor S, Keogh B, Goldsworthy A (2004). Active Assessment, Thinking learning and assessment in science. Millgate House Publishers
Price, S, Hein, GE (1991) More than a field trip: Science programmes for elementary school groups at museums. International Journal of Education 13, 505–519.
Sanders, D (2005) Boring botany? Rethinking teaching about plants in schools, NfER Topic 33 April 2005 pp. 4–8
Sandoval, WA (2003).The inquiry paradox: why doing science doesn't necessarily change ideas about science. Proceedings of the Sixth Intl. Computer-Based Learning in Science Conference. Nicosia, Cyprus. pp. 825-834
Summers M, Corney G & Childs A (2003). Teaching Sustainable Development in Primary Schools: an empirical study of issues for teachers. Environmental Education Research, Vol. 9, No. 3
Tilbury, D (2004). Rising to the challenge: Education for sustainability in Australia, Australian Journal for Environmental Education, 20(2), 103-114.
Tizzard, B & Hughes, M (1984). Young Children Learning. London: Fontana Paperbacks
Wandersee, J. (1983). Student's misconceptions about photosynthesis: A cross-age study. In: H.Helm & J. Novak (Eds.), Proceedings of the International Seminar: Misconceptions in Science and Mathematics. Ithaca, NY: Cornell University.
Wolins, IS, Jensen, N, & Ulzheimer, R (1992). Children's Memories of Museum Field Trips: A Qualitative Study. Journal of Museum Education, 17(2), 17-27.

Wood-Robinson, C. (1991). Young people’s ideas about plants. Studies in Science Education, 19, 119–135.

ICE 2006
The 10th International Congress of Ethnobiology,
Chiang Rai, Thailand
November 4th - 9th 2006

Hands on Botany: Building Bridges Between Schools and Botanic Gardens to Improve Plant Science Education

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1. Introduction
Botanic Gardens are important and well-respected educational and cultural resources. In particular, they serve as learning environments for school classes that take part in guided botanic garden tours. Often these tours are not integrated into a pre- and post-processing in school, so that the educational potential of the tours is rarely tapped. This study describes an ongoing project funded by the European Union that aims to promote young peoples' interest in plants in general and plant science in particular by building bridges between primary schools and their local botanic gardens.

2. Objectives
To present 1) the actual role of plant science in primary education in four European countries, 2) pros and cons of teaching and learning plant science in botanic gardens and 3) a model to improve plant science education at primary school level by building partnerships between primary schools and botanic gardens.

3. Medthods
To get an overview of the current position of plant science education at primary school level, we analyzed the national curricula in the four participating countries (Austria, Bulgaria, Italy, UK) using content analysis. We interviewed 112 primary school teachers in 60 different schools using structured interviews and discussed the results of the interviews with focus groups consisting of teachers, head-teachers, teacher trainers and members of the national education authorities. The information on pros and cons of botanic garden education results from the authors' experience in botanic garden education and their participant and non-participant observations during guided school tours in botanic gardens. On the basis of this information we developed an enquiry-centred education tool to foster young peoples' interest in plant science. The teaching resources are currently tested in sixteen school classes in the project member states.

4. Results
The National Curricula in the four countries do offer many possibilities to engage with plant science and plant diversity. Nevertheless, there are fundamental reasons for the lack of plant science in primary school teaching. Teaching with, and about plants is considered to be a pedagogical challenge by many primary school teachers. Teachers mention that the botanical training during their teacher training was not sufficient and therefore they are not very confident in teaching plant related topics. To cope with this low confidence, the teachers use different strategies such as 1) teaching as little of the subject as possible, 2) keeping to topics where their confidence is higher, 3) emphasizing expository teaching and underplaying questioning and discussion and 4) avoiding all but the simplest practical work that could go wrong. At the same time the number of guided school tours is constantly rising in Western European botanic gardens – especially those for primary school classes. Botanic gardens are anticipated as places offering expert knowledge, first hand experiences and plant specimens that fascinate young children (e.g. carnivorous plants, strange cacti, exotic fruit plants). Both, teachers and children, generally enjoy their visit to the botanic garden. However, botanic garden tours are often organized in a didactic way that conflicts with research related to science learning and learning in informal contexts. Tours are often task-oriented instead of learning-oriented, focusing on facts instead of ideas or concepts and are generally lecture-based and instructor-centred. Additionally, botanic garden educators rarely know whether the teacher has already conducted pre-processing or is planning to do post-processing in school. To improve plant science education at primary school level we are developing a model that emphasizes the strength of cooperation between schools and botanic gardens. Together with primary school teachers and botanic garden educators we are working on an enquiry-centred education program addressing various plant science related topics. Parts of the program will be conducted in school and parts of it in the botanic garden.

5. Conclusion
The educational role of informal learning institutions such as botanic gardens is to spark curiosity and foster young peoples' interest in science. Nevertheless, if guided tours at botanic gardens continue to implement instructor-centred and lecture-based didactic models, science learning opportunities may be missed. Partnerships between primary schools and botanic gardens bring the pedagogical expertise of primary school teachers and the plant related expertise of botanic garden educators together and can in this manner facilitate enquiry-centred, hands-on learning about plants in general and plant science in particular

Keywords: Botanic Gardens, Plant Science Education, Primary Schools

References: Cox-Peterson, A.M., Marsh, D.B., Chisel, J., & Flexer, L.. (2003). Investigation of guided school tours, student learning, and science reform recommendation at a museum of natural history. Journal of Research in Science Teaching, 40,200-218. Harlen, W. (1999). Effective teaching in Science. SCRE Publication 142 http://www.scre.ac.uk/pdf/science.pdf accessed August 2006

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Received: 2006-08-30 14:29:12
Accepted: 2006-09-01
Check: I need a Certificate of Presentation

BGCI
The 6th International Congress on
Education in Botanic Gardens, Oxford, United Kingdom
10th –14th September 2006

Title
‘Teaching across the borders’

Workshop Co-ordinator :
G.Bromley MBE (RBG, Kew)

Workshop facilitators:

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Role:
The facilitators and co-ordinator are all members of the Project Consortium for an EU Sixth Framework funded project ‘Plant Science GArdens’, developing best practice materials to improve teaching plant science at primary level across Europe

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Workshop text:
In October 2005, the EU Sixth Framework awarded funds to a collaborative partnership of four botanic gardens (Innsbruck, Austria –lead organisation; Trento, Italy; Sofia, Bulgaria; and Kew, UK) together with the Institute of Education, London, to develop a number of resources to disseminate better plant science at the primary level. This project has been running for 8 months, and has already reported to the EU the first phase, which analysed current plant science educational approaches at primary level within both schools education and botanic garden education programmes.
The second phase focussed on developing the first draft of the teachering resources for schools and botanic garden educators. It includes materials on 4 themes: food, plants in art, ecology and conservation. The final 2 phases will incorporate; trialling the materials over an 8 month period with selected schools; analysis of evaluation from both teachers and children; final production and dissemination of resources; development of training materials for teachers and botanic garden educators.

This workshop will explain the project and teaching methodology to date and has 5 objectives:

- To offer a case study on the overall development and management of a partnership project
- To evaluate the potential of the project resources for wider use by botanic garden educators
- For participants to try out new science education delivery models (use of concept cartoons and argumentation in plant science education programmes) and comment on their potential use in botanic gardens (they are already being used in schools)
- To share experiences of similar resource development
- To formulate a brief for the CPD needed by Botanic garden educators to enable them to use the resources successfully in their gardens with schools locally. (We need to know whether they have the plant resources as well as the need for training.)

The workshop will begin with a brief overview of the work to date, including opportunities for questions about management and funding proposal development. This will be followed by group sessions (4-6) where participants can chose to try out a range of the activities in the project resource materials, including exercises in using concept cartoons with children, using argumentation , resolving 'mysteries' and practical experimentation.
Comments and feedback on the application of these methodologies in botanic gardens in participants' countries will be an important part of the plenary session .
A final discussion session will enable individuals to share ideas they are developing for teaching materials. There will also be an opportunity to discuss training needs if the Plascigarden materials are to be useable in participants' gardens.
Recommendations that incorporate participant involvement in steering the project will be drawn up from comments made during the workshop session.

Workshop participants who wish to be kept informed of the project as it progresses, to receive access to the resource materials once published or who would be interested in supporting any further evaluation are very welcome. The project details will be accessible on http://www.lgfl.org.uk/plascigardens

GB June 30th 06

Networking in central and eastern Europe

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

In 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, have a special designed position for a garden educator and which favourite topics they offer.

In the German speaking part of central Europe Austria, Southern Germany, and Switzerland there are about 30 Botanic Gardens. In 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 that have at least basic interpretation through 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 right now there are two educators employed.

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 largely 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 experiences 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) has been modelled on a similar concept. 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 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 within in 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 has to choose English as the 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 Kapleari, 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. By now we agreed on following aspects:

4.1. What are the main aims we are longing for?

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

Public Relations & **Strengthen the field of nature 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 to other organisations, networks

International projects

4.2. How will *the Environmental and Botanic Garden Education Network 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, 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 organizing at least one conferene per year and the Training days for the upcoming year (theme, country), work on budget and fundraising, review memberships, set up a work plan for next year & projects, review on the coordinators duties and further work, hold elections for members of the core team, plan meetings etc.

The **Coordinator´s** responsibilities are to do the website management, collect, organize, distribute information, update membership & mailing list, post job announcements, prepare meeting, summarize them, do minutes, invitations etc, be training assistance to host location, follow the work plan given by the core planning team and write a 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 a individual membership will be possible, will be able to take part in the annual conference and training days, use mailing list and homepage, etc

4.3. How will the network be financed?

Approximately 10 000 € are needed for trainings, meetings and the Coordinators salary.

Money should be raised through membership fees, donations, EU funds or others.
The next year 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.

References:

I. Edwards, 1993, A Botanic Garden Education Network, I International Symposium on Education and Training in Horticulture, Auchincruive, United Kingdom

Secretariat of the Convention on Biological Diversity, 2002, Global Strategy for Plant Conservation, Montreal, Canada

International Congress of Mountain and Arctic Botanical Gardens Villa d'Arène & Station Alpine Joseph Fourier – Lautaret, France
September 6th -9th 2006

Teaching across the borders: a collaborative project on education for alpine botanic gardens and primary schools in 4 European countries.

ORAL PRESENTATION

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Since 1998 Viotte Alpine Botanic Garden (Trento, NE Italy), planned and designed education activities aiming to raise the awareness on plant conservation. These activities tried to engage the visitors making use of popular games and quests re-designed and re-formatted with a botanic content (treasure hunts, mastermind, domino etc.), involving the participants in hands on experiences that required direct interaction with plants or plant derived products with a creative side to it (preparing plant-made gifts, paintings, bags, dishes, pots etc..). In October 2005, the EU Sixth Framework awarded funds to a collaborative partnership involving three other botanic gardens (Innsbruck, Austria; Sofia, Bulgaria; Kew, UK) along with the Institute of Education, London, to develop a number of resources to deliver better plant science at the primary level. The first phase of the project analysed current plant science educational delivery at primary level within both schools education and botanic garden education programmes. The second stage will develop the resources for teachers and botanic garden educators, including materials on 4 themes: food, plants in art, ecology and conservation. The final 2 phases will incorporate; trialling the materials over an 8 month period with selected schools; analysis of evaluation from both teachers and children; final production and dissemination of resources; development of training materials for teachers and botanic garden educators. This paper will explain the project and teaching methodology to date. It hopes to offer a case study on the overall development and management of a partnership project, to evaluate the potential of the project resources for wider use by botanic garden educators for participants to try out new science education delivery models (use of concept cartoons and argumentation in plant science education programmes) and comment on their use and appropriateness; to share experiences of similar resource development, to formulate a brief for the CPD needed for Botanic garden educators to successfully use the resources.

IV Balkan Botanical Congress,
Sofia, Bulgaria
June 20th – 25th 2006

Plant Science Garden

Plant Science Education for Primary Schools in European Botanic Gardens

University of Innsbruck, Institute of Botany (Austria), University of London, Institute of Education (United Kingdom), Museo Tridentino di Science Naturali (Italy), University of Sofia – University Botanic Gardens (Bulgaria), Royal Botanic Gardens Kew (United Kingdom)

Plant Science Gardens is a project that targets the objectives of promoting young peoples interest in science, science education and scientific careers.
It is designed to improve plant science education in primary schools through establishing partnerships between primary schools and their local botanic garden.
An inquiry centered, multilingual, multicultural plant science education tool is prepared as an electronic and printed version.
It will have 4 parts: a Teachers` Pack, to support teachers in class,
an Activity Program implemented by the local Botanic Garden, Teachers Ressources and a manual for Teacher Training Seminars.

Plant Science Gardens focuses on plant diversity as a major theme including various subtopics which will be selected according to primary school teachers needs. Final results are expected to be presented in October 2007.

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