

Section 3: Environmental Education

Co-ordinator:

Ann Pienkowski (Environmental Education Co-ordinator, UKOTCF)

The main focus of this session was to discuss ways of getting environmental education into schools curricula, how effectively to engage young people, and to identify ways in which their involvement could be widened.

To support the discussion, a draft paper was published in the Conference Handbook, and this is now published here as the *Framework Document: To help structure the discussion on Environmental Education and to use those discussions to develop further these guidelines*. This document gave participants some background, and posed questions to consider when thinking about developing curricula elements and resources.

The importance of environmental education, the need to get it embedded into the schools curricula, and some of the challenges of doing this were raised very early on, during discussions on Sunday at the Botanic Park, and continued to be raised throughout.

The session presentations gave concrete examples of successful environmental education programmes which provide good models for others to consider. The contribution by Piers Sangan on a student perspective of environmental education raised many important issues which were subsequently taken up in the panel discussion. Extended versions of these papers are published in this section.

Martin Keeley spoke about the development of his *Marvellous Mangroves* programme, and how this had not only been fully incorporated into the revised National Curriculum for the Cayman Islands, but had



From left to right:

Clive Baker, Head of Curriculum Services, Cayman Islands Department of Education

Edgar Howell, Director of Education, Turks & Caicos Islands

Piers Sangan, Student, Crown Dependency of Jersey, and Plymouth University

Thomas Hadjikyriakou, Manager, Akrotiri Environmental Education and Information Centre

Martin Keeley, Education Director, Mangrove Action Project and Cayman Brac Campus Director, University College of the Cayman Islands

Ann Pienkowski, UKOTCF Environmental Education Co-ordinator

(Photos of participants in this session by Rob Thomas & Mike Pienkowski unless otherwise indicated)

been adapted for other countries, such as Brazil and Guatemala. His “recipe” for effective environmental education had been developed over many years, and had been widely used as a model by others.

Under the direction of Clive Baker, the director of curriculum services in the Cayman Islands, a thorough revision of the Cayman Curriculum involving many stakeholders had ensured that environmental education was firmly embedded into the national curriculum of the Cayman Islands.

Thomas Hadjikyriakou spoke about the development of the Akrotiri Environmental Education and Information Centre (in the Cyprus Sovereign Base Areas) and its schools programme. Clear planning and community involvement had been essential. The success and value of this programme had been recognised by the incorporation of the Centre into the Curriculum of the Republic of Cyprus, who funded a full-time teacher to work at the Centre.

Piers Sangan, who had attended the conference in Jersey 2006 (*Biodiversity that Matters*) as a high school student, spoke about his rather poor experiences of environmental education at school. At primary school, a topic on rainforests had been interesting, although of course was not relevant to his local environment, but at secondary school environmental education was delivered through books and classroom teaching, rather than going outside and experiencing the environment. He had followed his natural interests in the environment through extra-curricular and volunteer work.

The panel discussion is summarised at the end of this section, and produced further valuable contributions and insights.



Students Dustin Bodden, Jodiann Jackson, Piers Sangan and Tashara Lewis present their comments in the final session (see Section 11).

Framework Document: To help structure the discussion on Environmental Education and to use those discussions to develop further these guidelines

Ann Pienkowski (Environmental Education Co-ordinator, UKOTCF) & Clive Baker (Head of Curriculum Services, Cayman Islands Department of Education)



Ann Pienkowski



Clive Baker

Pienkowski, A. & Baker, C. 2010. Framework: To help structure the discussion on Environmental Education and to use those discussions to develop further these guidelines. pp 117-120 in *Making the Right Connections: a conference on conservation in UK Overseas Territories, Crown Dependencies and other small island communities, Grand Cayman 30th May to 5th June 2009* (ed. by M. Pienkowski, O. Cheesman, C. Quick & A. Pienkowski). UK Overseas Territories Conservation Forum, www.ukotcf.org

The challenge facing effective integration of environmental education into schools curricula (as part of the wider education for sustainable development process) is in identifying curricula that balance the meeting of educational objectives with available resources. In addition, materials and resources should be accessible to teachers who may not be familiar with the local environment, and should be capable of being adapted to meet pupil needs. If sustainable development (including environmental education) is going to be incorporated into schools curricula, and used by already overstretched teachers, then the resources must be developed within a local stakeholder partnership, and fit in with schools curriculum and assessment processes.

The presentations and discussions within this session, and subsequent discussions, are aimed to build on previous work at conferences and elsewhere to develop a set of guidelines to support the development of effective environmental education resources.

The objectives of these guidelines are to facilitate:

- Development of a relevant curriculum framework for environmental education, including assessment
- Cross-sectoral involvement of government departments and civil society organisations in curriculum production and review
- Inclusion of teachers and other educators in curriculum review and environmental resource development
- Production of locally-based, environmental education resources
- Promotion of integration of environmental education across the curriculum.
- Increased government commitment to the use of the local environment (including its importance in a world context) in schools' curricula.

Consideration of the following questions, when thinking about developing curricula elements and resources, may be useful:

- Why is the environmental education programme or development of a curriculum element needed?
- Can this element be fitted into an existing curriculum? If not, can it be a stand-alone entity, or is wider curriculum development required?
- Who needs to be involved in the development? The involvement of the education department is essential. Consider also other government departments and officials, educators, scientists, community and civil society, businesses, etc.
- Who is available to carry out the work?
- How much time and training do they need?
- What resources (financial and human) are needed?
- What resources (financial and human) are available?
- Where might additional funding and resources come from?

- What strategies will be most effective in delivering the objectives of the programme? (e.g. curriculum development including cross-curricular opportunities, teaching and assessment materials, practical hands-on activities, field trips, teacher training)
- How does this programme fit in with existing statutory assessments and examinations?
- Should the existing statutory assessments and examinations be reviewed to take account of the environmental education element of the curriculum? If so, how can this be achieved?

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Introduction

The current context of environmental education should be seen within the *United Nations Decade of Education for Sustainable Development* (DESD), 2005 – 2014.

Although there can be many interpretations and meanings of Education for Sustainable Development (ESD), there is a common understanding that education and learning in the context of sustainable development cannot ignore the interconnections between the environmental, social, economic and cultural aspects of sustainable development.

One of the broad aims of the DESD is to integrate the principles, values and practices of sustainable development into all aspects of education and learning, and thus help improve the quality of education and learning.

There are many different target audiences for education for sustainable development, for example: local communities who use natural resources, local leaders, community residents, government officials, private businesses and developers, land-owners, the general public, educators (teachers and teacher trainers), school children and students. There are also different strategies by which education for sustainable development can be delivered, for example: exhibits, mass media (TV, Radio, newspapers, internet), special events. As it is not possible to cover all of these, this session will focus on schools curricula and the environmental education element of Education for Sustainable Development. Some other elements are addressed in the Session on *Raising Our Profile*.

Focusing on what is being done - and can be done - in schools, many of the themes of sustainable development are already in schools' curricula under topics such as health, water, environmental protec-

tion, climate change and biodiversity. The main thrust of the *UN Decade of Education for Sustainable Development* is not to add sustainable development to an already overcrowded curriculum, where the basics of literacy and numeracy must still be taught, but to see it as an integrative, cross-curricular theme that can bring together many of the topics which schools are already expected to address.

The closing section of the UNESCO publication *Teachers' Guide for Education for Sustainable Development in the Caribbean* says:

“There is no ‘right way’ to do Education for Sustainable Development (ESD) – rather it is a process for everyone to learn, explore and innovate. The skills and values learnt along the way – to learn to know, to do, to live together, to be and to transform oneself and society – are themselves what turn a learning experience into ESD. At the same time, there are some common features found in ESD approaches. They are:

- Learning by doing
- Community involvement
- Reflection
- Real-life activities
- Problem solving
- Participation and collaboration

“Focus on what you can do.

“The key to successful ESD is for the teacher to be creative and innovative, think outside the box, collaborate with others, help students become caring and responsible citizens.”

We could all be overwhelmed by the scope of this, but we should take advice from the authors and focus on what we can do. In addition, linking to the *UN Decade for Education for Sustainable Development* could provide a strong persuasive argument for the work we are trying to do in envi-

ronmental education.

Development of a Relevant Curriculum Framework (including assessment) and Resources

Clearly, curriculum development cannot take place without the active support and involvement of the education department of the local administration.

Many places, such as the Cayman Islands, have a modern, revised National Curriculum which was developed through an extremely thorough process of stakeholder consultation specifically for the Cayman Islands (for more information go to www.brighterfutures.gov.ky). Where such a curriculum exists, there is little difficulty in incorporating environmental education both as key elements of a science curriculum, and in a more integrated cross-curricular way.

Curriculum Development, such as that carried out in Cayman, or that advocated by the UN Decade for Education for Sustainable Development, is extremely time consuming, expensive, and very difficult in places with limited capacity. Although the process of designing a curriculum from scratch is as important as its eventual implementation, this may not be practicable in the first instance. If a territory's schools programme is to be based on a curriculum developed for somewhere else, then educators, ministry and government officials, and teachers, should be given an opportunity to review this first, and adapt the curriculum to the local situation. Whilst the objectives within such a framework are likely to be relevant, the examples and teaching activities may not be. Basing schools programmes on a modern curriculum from a similar locality could be the key here.

Furthermore, cultural diversity must be taken into account. Activities and programmes within the curriculum need to be as culturally sound as they are scientifically sound. At the same time, consideration needs to be given to the local realities in which teachers find themselves and the availability, or lack of, teaching resources. Linking with regional partners to share and develop effective programmes is one way of addressing lack of capacity and resources. The recently developed UKOTCF searchable database on environmental education resources (developed with support from OTEP) will become available around the time of the conference and will facilitate sharing of information about existing environmental education

resources. This will continue to be updated as new information is received.

If curriculum development is being undertaken, as opposed to locally-based materials being developed to support an existing curriculum, then the approach recommended by the UN Decade for Education for Sustainable Development should be followed as far as possible. Curriculum developers should be encouraged to think about an integrated cross-curricular approach.

Local and statutory assessment procedures need to take account of the local environmental education component of the curriculum. If the tests and examinations the students have to take do not include reference to this area of their education, then the students are unlikely to give the area as much consideration as those areas of the curriculum on which they are being tested.

Teacher Involvement and Training

Teachers need to be involved in all stages of the development of either curriculum or resources. However good a resource is, it will sit on the shelf un-used if teachers do not feel confident in using it, and such confidence comes from involvement and training.

Effective learning

The recent UNESCO *World Conference on Education for Sustainable Development* re-stated the widely accepted effectiveness of a cross-curricular, interdisciplinary approach which would incorporate learning by doing, real-life activities and problem solving, participation and collaboration, and time for reflection. They also stated that the most effective way of delivering sustainable development objectives within the schools curriculum is to have a whole school approach.

Evaluation

The key questions for evaluating a curriculum development or resource should be formulated before the programme is started, and addressed during and at the end of development - and, later, incorporated into programme revisions. The programme's intended objectives and intended outcomes can be clearly identified, and used as a checklist.

Some questions which can be used for evaluation are:

- Have students acquired knowledge? (They do have to apply knowledge for this to count, but they have to know before they can apply.)
- Have students' attitudes and behaviours changed?
- Have students acquired new skills? Do they have the opportunity to use them? What needs to be done to enable them to?
- How these are to be measured should be part of the evaluation development.

Summary of Desired Actions (based on a “formula” developed by Martin Keeley)

- Involve local education departments, teachers and scientists (and other relevant specialists) in the development and application of the content and all materials; and test the materials in schools.
- Ensure that all the materials are curriculum-based or linked
- Include lots of hands-on activities;
- Get the kids outdoors;
- Provide classroom follow-up materials and resources;
- Teach the teachers through lots of workshops; and related follow-up tasks.
- Make the learning processes simple and fun.
- Make use of modern technology

Final Word – Focus on what you can do.

Bibliography

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Marvellous Mangroves – A Curriculum-Based Teachers’ Guide

Martin Keeley (Education Director, Mangrove Action Project; and University College of the Cayman Islands)



Keeley, M. 2010. Marvellous Mangroves – A Curriculum-Based Teachers’ Guide. pp 121-127 in *Making the Right Connections: a conference on conservation in UK Overseas Territories, Crown Dependencies and other small island communities, Grand Cayman 30th May to 5th June 2009* (ed. by M. Pienkowski, O. Cheesman, C. Quick & A. Pienkowski). UK Overseas Territories Conservation Forum, www.ukotcf.org

(Abstract written by Session Co-ordinator:)

Martin Keeley is Brac Campus Director for the University College of the Cayman Islands and Education Director for the Mangrove Action Project (MAP- a non-profit organization). He has been teaching in Cayman since 1998. He researched, developed and produced *Marvellous Mangroves in the Cayman Islands - a teachers’ curriculum-based resource guide*, in conjunction with the National Trust of the Cayman Islands, the Department of Educational Services and MAP. He has been responsible for its implementation in schools throughout Cayman and has also supervised the adaptation, translation and implementation of *Marvellous Mangroves* for the education systems in other countries including Colombia, Honduras, Guatemala, Sri Lanka, Indonesia and Brazil. There are also plans to adapt the programme for use in China. His paper describes the development of the *Travelling Wetlands Roadshow* in British Columbia and northern Washington State, and how this was built upon to develop the *Marvellous Mangroves* programme for Cayman. He describes the development process, and the steps which need to be taken to adapt the programme for use in other areas.

In developing environmental education materials and curricula, Martin stresses some key points: the need for the involvement of local teachers and linking the materials to the local curriculum; the importance of hands-on and outdoor activities, and students having fun; teacher training workshops; and materials which are easy to teach.

Martin Keeley received the National Marine Educators Association’s *Outstanding Teacher Award* for 2008. The award honours effective and innovative marine science education in the classroom. Martin was recognised for his history of outstanding performance as a marine science educator in the Pacific Northwest and the Cayman Islands.

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(Photos illustrating this article are by the author.)

Origins

Before outlining the development and application of the curriculum-based Teachers’ Guide, *Marvellous Mangroves*, it is necessary to examine the origins of the material used in the guide.

In the late 1980s a transboundary environmental organization called The Friends of Boundary Bay

(FOBB) was formed in the Fraser River Delta region of British Columbia, Canada. As the executive director of the group, it was my responsibility to not only work in advocacy to help protect this vital wetland area, but also find ways to educate the public on the importance of wetlands.

Initially, the form of education we adopted involved public education programmes using natural-

ist/interpreters to lead explorations of the different parts of the Boundary Bay ecosystem. However, after a year of this work, it soon became clear that we needed to do much more to lift the level of public knowledge about wetlands.

In 1991, 17 teachers from throughout the Boundary Bay ecosystem and from schools on both sides of the U.S./Canada border put together a working group to pool their knowledge. Using existing resources and data, and adding much of their own, the working group began work on the first Teachers' Resource Guide, *Discover Boundary Bay*. The following year, a Mobile Ecology Centre was completed to assist with field work. In 1993, the 300-page *Discover Boundary Bay* was published, after much revision and pilot projects. School programmes held with a naturalist/interpreter then began in schools around the Bay.

Building on these two resources, FOBB established the *Travelling Wetlands Roadshow* which travelled around to schools throughout British Columbia and northern Washington state. The Roadshow comprised the following:

- A 24-foot (7 m) mobile ecology centre and laboratory
- Hands-on science activities in the field
- Field exploration with a naturalist/interpreter
- Follow-up activities in the classroom
- Microscopic analysis of water
- Eco-theatre for younger students.



Mangrove bird-hunter kit

After a couple of years on the road and a major evaluation, the *Roadshow* added a supplement to the initial teachers' guide entitled *Exploring Estuaries and Wondrous Wetlands*. The teacher- and student-“friendly” guide featured a further 160 hands-on activities, useful background information about wetlands, and water quality tips and testing

ideas.

In addition, the *Roadshow* featured the following:

- A wetlands site exploration with a scientist naturalist/interpreter
- The teaching of observation skills
- Recognition of bird species and their characteristics
- Recognition of fish, mammals, reptiles and amphibians
- Awareness of habitat
- The study of aquatic invertebrates
- Collection of water samples for analysis.

For younger students, the *Roadshow* featured the Eco-theatre, designed and made by the famous festival artist Evelyn Roth. The Eco-theatre featured:

- More than 40 costumes designed to resemble wetland creatures
- A 40-foot (12 m) inflatable salmon
- Food-chain and food-web games
- Wetland storytelling inside the salmon.

The *Roadshow* was extremely successful and by 1998 had reached over 30,000 students in more than 300 schools in 45 communities throughout British Columbia and northern Washington State. The show had won many awards and had been incorporated into the British Columbia science curriculum.

The development and implementation of the *Roadshow* established what proved to be a highly adaptable formula which was then taken and developed for use in other countries. The formula can be broken down as follows:

- Full-time teachers should be involved in the research, development and application of materials
- All materials should be linked to the local and/or regional curriculum
- There should be lots of hands-on activities
- Get the kids outdoors!
- Classroom follow-up materials and resources should be provided
- Teachers should be taught through a series of teacher training workshops
- The product should be both simple and fun – and easy to teach.

Cayman and Mangroves

In 1998, my wife and I moved to Cayman Brac, one of the Cayman Islands, and I began to “Cay-



Kids with nets

manise” the formula. At the same time, I took the position as Education Director for the international NGO, The Mangrove Action Project (MAP). Obviously, the wetlands now would be in the tropics, the project would become international and the focus would be on education about mangroves.

Work began to adapt the materials developed for the Pacific Northwest for mangrove habitats. This required studying mangroves and learning how they function, testing the activities to see if they would work with local Caymanian students, carrying out *in-situ* explorations in lieu of a naturalist/interpreter (of whom there are very few in the wider Caribbean), and tying the product into the local Cayman curriculum.

Several local teachers on Cayman Brac were recruited to use the activities and other materials in their classrooms and the field to ensure that they “translated” to mangrove wetlands. In addition, local Caymanian materials were incorporated into



Oil-spill clean-up game

the materials being used – one example being the glass-bottomed view glass used by fishermen to detect fish.

An analysis of the Cayman Islands curriculum also took place to ensure that the materials produced covered the topic area objectives outlined in the curriculum. While the major focus was on the science curriculum, other areas such as social studies, art, maths and music were included. An outline of the curriculum links was developed and ultimately published in the final resource guide.

The *Mangrove Teachers Resource Guide*, finally published and launched in early 2000, contains a total of five interlinked units. Their titles are:

- All about mangroves
- Mangroves as habitat
- Human impacts on mangroves
- Exploring mangroves
- Making change.

Each individual unit contains the following:

- An introduction containing factual and detailed background information
- Fact-sheets and accompanying illustrations
- Several supporting hands-on activities with details instructions
- Illustrations to support the activities.



Tasting Black Mangrove

The essence of the activities is that the materials involved are simple and easily available locally (either cheap or used household products). They are carried out prior to a field-trip and follow-up classroom activities. Field-trips are essential to reinforce the knowledge learned in the classroom and, in the absence of a naturalist interpreter, the teacher can carry out this role with a little training and observational skills. The trips themselves can be carried out on-land in mangroves, or in a boat

traveling through them. Some teachers take their students mangrove snorkeling, which is possibly the best experience of all.

During the field-trip, students collect water samples. (If a plankton net is available, it can be very helpful gathering microscopic species of mangrove water life.) These samples, together with as much detritus as possible, are taken back to the classroom where they are examined under the microscope. Students identify and draw the different small invertebrates and other life-forms that they find. This examination reinforces lessons learned about food-chains and food-webs. If possible, a small camera can be mounted on a microscope and the images transmitted to a TV monitor for maximum impact.

The school's computer lab is also used for reinforcement of the data learned in the classroom and field, and students are able to conduct supplementary research and compose papers outlining their findings.

For younger students, festival artist Evelyn Roth provided a 40-foot (12 m) inflatable shark, and designed and built 34 costumes representing plants and critters that inhabit mangrove wetlands. Students learn animal movement, play food-chain games (i.e. chase and devour each other!), and finally go inside the shark for exploration and to hear a story about mangroves and wetlands.

Following the publication of *Marvellous Mangroves* in the Cayman Islands in 2000, several teachers workshops were carried out initially through the Education Department, and later through the Cayman Islands National Trust joining forces with the department. These workshops not only involved learning about how to use the



Project development field-trip, Old Providence, Colombia

resource guide, but the teachers also had to carry out several of the activities themselves to reinforce this level of learning, and show how easy it is!

Spreading to other countries in the region

In 2001, Fanny Howard, the Education Co-ordinator for CORALINA (The Corporation for the Sustainable Development of the Archipelago of San Andres, Old Providence and Catalina), based in the San Andres archipelago of Columbia, visited Cayman Brac. There she spent a week in a detailed review of *Marvellous Mangroves* with a view to a Spanish version being adapted for use in the archipelago. Areas where specific adaptations were needed were clearly defined, and staff in CORALINA began the translation and adaptation process.

The process involved what has become a standard formula for the introduction, development and implementation of the mangrove curriculum internationally. The following areas need to be reviewed and introduced into the localized version of *Marvellous Mangroves*:

- Research into the local resources
- New flora and fauna added and changed
- Localisation of mangroves – species, location etc.
- A review of the availability of materials for activities regarding their cost for teachers
- New illustrations
- A review by marine and, where possible, terrestrial scientists
- A review by local teachers
- Publication of the guide.

In January of the following year, a joint MAP/ CORALINA workshop was carried out for 34 teachers from Old Providence Island in the archipelago. The 3-day workshop became the blueprint for similar workshops held, and the translation and adaptation of *Marvellous Mangroves* continued throughout the world. The curriculum-based workshop involved a mixture of activities, as well as a field-trip on the morning of the final day. The afternoon was given over to teacher presentations of mangrove-related projects they worked on during the earlier part of the workshop – everything from poems to puppet shows.

The activities which were conducted were taken from each of the different units in *Marvellous Mangroves*. Interestingly, the activities most popular with students also proved to be most popular



Adapting the programme in Sri Lanka

among the teachers. They all use simple and very easy to obtain materials. These activities included:

- **Detritus Tag** which covers the food web, producers and consumers, predators and prey and bioaccumulation
- **Migration Headache** which involves learning about birds, their habitats, migrations and flyways
- You can tell what birds eat by their **Beaks and their Feet**
- **Food Webs** plant/animal relationships and human impacts
- **Oil Spill Clean-Up** human impacts on mangroves and the consequences of our dependence on oil.

The field-trip to nearby McBean lagoon involved boat-rides, hikes and species identification (plant and animal) as well as some “listen and learn” activities. On their return, the teachers gave presentations of the work they had developed during the workshop, including poetry, short stories, posters and a play. With these activities they were also able to develop resources they could use in their own classrooms.

Wider use of the programme

MAP’s goal is to adapt and introduce the curriculum, in partnerships with local NGOs and Education & Environmental Ministries throughout tropical and sub-tropical coastal regions. To date, the mangrove curriculum/teachers’ resource guide has been requested by teachers’ groups and NGOs in more than 20 nations. The translation and adaptation process, however, is long and arduous, as it is necessary to assure that material in the guide relates specifically to the region where it will be used. For example, the Caribbean version could not simply be translated into a local language for use in African nations, as the curriculum covers not

only mangrove ecosystems, including topics such as migrating birds, shellfish and other related species, but also human impacts, and so each adaptation must be geared to a specific region.

Furthermore, cultural diversity must be taken into account so that activities and programmes within the curriculum are as culturally, as they are scientifically sound, while at the same time considering the local realities in which the teachers find themselves and the availability, or lack of, teaching resources. Following the well-established and extremely successful principles found in environmental education programmes such as Projects WET and WILD, MAP is working to spread the curriculum in concentric circles outside of the Caribbean in order to ensure that adaptations are logical and cumulative.

Since 2002, adaptations and introductions have taken place in seven countries. The blueprint or formula for the introduction of the curriculum into each country follows a standard pattern, with room for flexibility. I work in partnership with MAP’s regional coordinator and local environmental NGOs to form a Working Group (WG) which includes local teachers, scientists and educators. It is MAP’s experience that educators must be involved in adapting the materials to suit their own, local curriculum. By integrating it with existing local science, social studies, and/or language arts curricula, MAP is able to ensure that the materials and teaching techniques are used in the classroom on a regular basis. In Sri Lanka, for example, MAP’s local partner, the Small Fisheries Federation (SFFL), brought in university biology professors who were able to work on getting local school-leaving examinations (GCE – the British system) to develop a section covering mangrove ecology in their science exams. This form of institutionalisation will outlive individual efforts as teachers recognise they must teach content related to mangroves as part of their jobs!



Teachers practice food-web exercise in Honduras



Guatemala teachers' field-trip in mangroves

MAP stresses the need for local NGO partners to hire or appoint an education coordinator who will be responsible for the overall co-ordination of the project in their respective country, and who will work closely with the MAP Regional coordinator. Initially, this means working with MAP to secure in-country matching funds and/or services. Once funding is secured and the WG is established, a workshop is scheduled to meet with me to determine the focus and basic content that will be required for the adaptation of the curriculum. The WG then coordinates the translation and adaptation process, culminating in the publication of the materials to be used in the education system.

In 2002 and 2003 the curriculum was adapted and translated for introduction into Honduran schools, in collaboration with MAP partner NGO COD-DEFAGOLF (Comite para la Defensa y Desarrollo de la Flora y Fauna del Golfo de Fonseca). Three workshops were carried out in San Lorenzo in western Honduras for some 77 teachers. Twenty-six schools have introduced the curriculum.

Concurrently, it was adapted for the Colombian-owned San Andres/Old Providence Archipelago in the southwestern Caribbean with partner CORALINA. Following the first workshop in 2002 (previously described) over 80 teachers attended subsequent workshops run by CORALINA, which has introduced the curriculum into 18 schools in the archipelago. The same year in Sri Lanka, MAP worked with local NGO partner SFFL to introduce the curriculum to that country. The Sri Lankan workshops attracted a cross-section of 40 teachers and other specialists, and some 30 schools have to date been recipients of the mangrove curriculum. In 2010, MAP will be returning to San Andres and its partner CORALINA for an evaluation and re-

introduction process of the curriculum to the Archipelago and also to the Caribbean coast of mainland Colombia.

In 2005, Guatemala became the fifth country in which MAP has worked on the curriculum adaptation, collaborating with local NGO Amigos Del Bosque. The curriculum has been introduced to some 90 teachers during three workshops held on the Pacific coast of Guatemala (April, June and September, 2006). The first workshop was carried out by myself, and the second two by Amigos del Bosque staff working with teachers who had been trained in the first workshop. The curriculum has been introduced to some 16 schools primarily in western Guatemala.

Plans are underway (and funding has been secured) for the curriculum to be introduced to eastern (Caribbean) Guatemala and Honduras in 2010. This will be carried out with the same local partners as previously, and will also incorporate a full evaluation (based on the classroom observation and teacher interviews) of how the curriculum is being implemented in the schools of both countries, seeking suggestions for changes and improvements.

Some very large countries

The sixth and largest country so far is Brazil, and, for three years, MAP has worked with its key partner, Instituto Bioma Brasil, to adapt the mangrove curriculum/teachers resource guide for use in Brazil, home to the second largest area of mangroves in the world. The project has received both regional and national support, and is being introduced in four states with the full participation of the Brazilian Ministry of the Environment. An on-going process has been established for the continued introduction to different educational



Honduras teachers' workshop

partners, with evaluation a continuing part of this process. To date, teacher workshops have been held primarily in Espirito Santo state for some 70 educators, and 26 schools have incorporated the curriculum in their programmes of study. A national workshop was conducted in June 2009, involving 27 specialists and teachers from nine states and Brasilia. To date (late 2009), more than four states and over a dozen cities have indicated that they will incorporate the mangrove curriculum into their programmes of study in 2010. Work is underway with the federal Ministry of Education formally to incorporate the programme into the national curriculum.

In early 2009, I was invited by the Director of the Zhanjiang Mangrove National Nature Reserve (ZMNNR), Mr. Lin Kangyin, to visit southern China to discuss the introduction of MAP's mangrove curriculum into China. In July 2009, I spent four days with Mr. Lin and his staff of the Reserve, visiting the mangrove and associated wetland areas under its control, outlining the methodology behind the curriculum, and conducting a mini-workshop for staff, and a dozen local school teachers and their children. At the end of the visit, an agreement was reached to work together to introduce the curriculum into Chinese schools. Work is already underway at the ZMNNR's Education Department to translate the English version into Mandarin.

Established in the mid-1990s by Zhanjiang Municipality, the Zhanjiang Mangrove National Nature Reserve covers some 20,000 ha in total, including all coastal mangroves in the region. In 2002, ZMNNR was listed, under the Ramsar Convention on Wetlands, as one of China's 21 Wetlands of International Importance. The Zhanjiang Government has taken steps on almost every level – including

regulations and frequent monitoring and enforcement procedures – to protect mangrove habitats and related wetland areas. Working in conjunction with the Dutch government for the past seven years, the mangrove directorate of the ZMNNR has become an established and successful institution, with extensive educational resources, visited by both public and school groups. However, they have not been able to incorporate an educational programme into the school system, and have requested MAP's assistance to translate and adapt its mangrove curriculum for use in regional schools.

The education system in China is far more formal than in western nations. Classroom structure is quite rigid, and hands-on learning is in its infancy. In addition, Chinese environmental NGOs are more than a rarity, so it makes more sense for MAP to work with a recognized and established government institution in that country. Working in conjunction with the ZMNNR, a core group of local teachers is prepared to pioneer this style of teaching in Guangdong Province, and showed great interest when I conducted a mini-demonstration workshop during this visit in summer 2009. It was also obvious from the reaction of the students (mostly children of the teachers) who attended the workshop that they both enjoy and want to participate in this form of education.

There is much demand for the mangrove curriculum world-wide. A programme is in place to implement it in Indonesia through MAP's regional Asian operation there. However, as always, funding is the main driving force. With consistent long-term funding, there is no reason why this education resource cannot be used in every country that boasts of having a mangrove ecological system.



Kids in mangrove critter costumes

A partnership for environmental education in Cyprus: the work of the Akrotiri Environmental Education and Information Centre (AEEIC) in the Sovereign Base Areas of Cyprus (SBAs)

Thomas Hadjikyriakou (Akrotiri Environmental Education and Information Centre Manager, Cyprus Sovereign Base Area)



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The AEEIC was originally founded by the SBAA as a measure to help improve the awareness of the environmental importance of the Akrotiri Salt Lake Ramsar site, following the construction of the PLUTO military antennae site near the salt lake. Funded by the SBAA, the centre commenced its activities from 2004 and now forms an important component of the SBAA Environment Department's work to ensure the protection and sustainable management of the natural and cultural features within the SBAs.



From its humble beginnings as a stop-off for the visiting birdwatcher to get a better view of the flamingos on the salt lake, the AEEIC can now boast four full-time staff, and offers a range of educational programmes for a variety of audiences. Perhaps the greatest recent achievement of the centre was the decision by the Council of Ministers of the Republic of Cyprus who endorsed the membership of the AEEIC to the *Environmental Education Centres' Network of the Republic*. As a result, eleven environmental education programs are offered as part of the National Curriculum, and have now been delivered to over 20,000 school children in both Greek and English, and a Cypriot teacher has been seconded to work full time with the Centre's staff. In addition to this work, the centre is participating in several *European Educational Programmes for Lifelong Learning*, sending people abroad and organising programmes in Cyprus for environmental skills, culture and archaeology.

The establishment of the SBAs and the continued use of them as military areas following the independence of the Republic of Cyprus in 1960 is still a political issue for part of the local Cypriot community. However, the work of the AEEIC has successfully brought together the SBAA, local Akrotiri community and Republic of Cyprus Government to support positively environmental initiatives. A new larger centre, with the capacity to educate more school children and facilitate wider community involvement, is proposed for construction over the next few years.

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(Photos illustrating this article are by the author.)



Progressively larger scale images, showing (1) the position of the island of Cyprus (central), (2) the position of the Akrotiri peninsula at the southernmost point, and (3) the Akrotiri Peninsula, with the large salt lake, with the village and Centre to its southwest and the runway.

Education as a management option, maybe the most effective of all management techniques, particularly in natural areas, where it may well be the only option (Buckley and Pannell 1990)

The AEEIC was originally founded by the SBAA as a measure to help improve the awareness of the environmental importance of the Akrotiri wetlands Ramsar site, following the construction of the PLUTO military antennae site near the local salt lake. Originally it started as an Information Centre, receiving visitors to see the exhibits and to watch flamingos and other bird species in the salt lake from its observation kiosk. Funded by the SBAA, the centre commenced its activities in 2004 and now forms an important component of the SBAA Environment Department's work to ensure the protection and sustainable management of the natural and cultural features within the SBAs.



Some of the wetland types in Akrotiri Sovereign Base Area and Ramsar Site

Akrotiri Peninsula presents significant environmental importance and is characterized by diversity at all levels: life forms (flora-fauna), habitats, geology, hydrology, archaeology, history and culture. The wetland system evolving around the Salt Lake and the Phassouri Marsh has been declared as a wetland of international importance under the Ramsar Convention in 2003. It will soon be designated as a Special Protection Area under the legislation mirroring Directive 79/409/EEC and a big part of the Peninsula will be designated as a Special Area of Conservation under legislation mirroring Directive 92/43/EEC. (As policy, legislation in the SBAs generally follows that of the Republic.) Twenty-seven habitat types (twenty-two terrestrial and five marine) have been recorded in studies undertaken under the above Directives. Some are priority habitats and require immediate and strict protection and conservation.

Two hundred and sixty bird species have been recorded in the Peninsula, two hundred of which are migratory and use the area as a staging post, for wintering or breeding. Akrotiri beach is one of





Some of the diverse wildlife of the area. Left, from top: Greater Flamingo; Red Fox; Scarlet Darter dragonfly. Right, from top: Lesser Spotted Eagle; Agamid; Kotschy's Orchid

the few nesting areas in Cyprus for the Loggerhead and Green Turtles, which are endangered Mediterranean species. The flora of the area consists of hundreds of plant species, many of which are rare or endemic.

The hydrology and geology of the area is very sensitive and important. Over recent decades,



especially after the construction of the Kourris River Dam, the wetland system has been adversely affected, with serious risks to the various habitat types and coastal erosion problems. The geological history of the area presents exceptional interest. Thousands of years ago, Akrotiri used to be a separate island. With the passing centuries, the isle was connected to the rest of Cyprus through river sedimentation and tectonic activity. The southern coast of the Peninsula hosts the earliest known archaeological site in Cyprus, at a locality known as "Aetokremmos". It is a hunter-gatherer site dated to 12,000 years ago, with findings which include bones of pigmy hippos and pigmy elephants. The wider area hosts many archaeological and religious sites of later periods such as churches, rock-cut tombs (picture, left) and catacomb. The area is the

only region in Cyprus where soft basketry is practiced, a handicraft remaining almost unchanged throughout the centuries. The local people have been occupied with the traditional handicraft for centuries; basketry is one of the oldest forms of Cyprus handicraft (pictures, right).

All these features formed the basis for the creation of the Centre, and the exhibits, programs and activities are tailored around them. From its first year of operation, it attracted a lot of school groups, and at the second year, environmental education programmes were offered at the Centre and in the field. The development and improvement was very fast, and the programmes were improved and enriched each year, to cope with the increasing pressure mainly from schools, but also from tourist groups, families and individuals. The facilities of the Centre comprise the following areas: exhibition and laboratory; projection and presentation room; library and study room; and a wildlife observation kiosk. The exhibition room was renovated in 2007, after a generous donation by the Cultural Foundation of the Bank of Cyprus.

The Centre currently employs four full time staff, and offers a range of educational programmes for a variety of audiences. The greatest recent achievement of the Centre was the decision by the Council of Ministers of the Republic of Cyprus to include AEEIC in the network of environmental education centres of the Ministry of Education. The network will comprise 7 such Centres all over Cyprus, and actually AEEIC is the second Centre to be included in the network. The eleven currently offered educational programmes will soon form part of the National school curriculum. As a result of this cooperation with the Republic of Cyprus, a Cypriot teacher has been posted by the Ministry of Education to work full time at the Centre.

The Centre hosts about 10,000 visitors every year, and about half of them are organised school groups. The programmes offered last between 4 and 7 hours, and cover a variety of domains. Currently the groups can choose between the following eleven programs:

1. Flora and endangered plants at Akrotiri Peninsula
2. Bird migration at Akrotiri Peninsula
3. *Natura 2000* programme and the protection of natural habitats
4. Akrotiri wetlands and their importance
5. Water, the source of life
6. Basketry at Akrotiri Community



7. Akrotiri Peninsula formation
8. Plant production at Fasouri Forest Nursery
9. Food chains at Akrotiri Peninsula
10. Marine turtles nesting at Akrotiri beaches
11. The first humans at Akrotiri Peninsula and the Hippopotamus hunting

They are offered in Greek and English, and at various levels to cover different ages and backgrounds. All programmes include an introduction at the Centre, documentary and other presentations, as well as field work with worksheets and a variety of activities. Currently, the limiting factor is the size of the building, but a plot of land has been bought recently, and plans are prepared for the erection of a new purpose-built Centre.

In addition to this work the centre is participating in several *European Educational Programmes for Lifelong Learning*, sending people abroad and organising programmes in Cyprus for environmental skills, culture and archaeology.

The work of the Centre is based on a Resource Education Plan, which incorporates all the important aspects of its activities. The main aim is to match the internal resources with general opportunities and the market environment. The ultimate objective is the contribution to sustainable development - which, according to United Nations, is about "development that meets the needs of the present generation, without compromising the ability of future generations to meet their own needs". At the Rio Summit in 1992, environmental education was described as a critical factor for the improvement of people's ability to understand and face environmental and sustainability issues. The current plan covers the period 2008-2010. It sets the vision and mission of the Centre, and then several tools are used for the analysis of factors affecting the plan, including general, market and internal environ-



Akrotiri Environmental Education and Information Centre and some of its work

ment. These are followed by a SWOT analysis, which forms the basis for the strategic choices. Then all the tools and means for the achievement of the strategic choice are examined, with the assessment of the present and desirable condition. SMART objectives are set for closing the gap between present and desirable condition.

The relations of the Centre and SBAA with the local Akrotiri Community are of utmost importance, since Akrotiri is the only village entirely within the SBAs. The proximity of the village to sensitive facilities, such as the RAF base and communication antennae, creates from time to time many issues

between the Bases and the community. It is evident that the work of the Centre, which promotes employment of local people, basketry, ecotourism and other activities in the village, supports the relations of the Bases with local communities, and increases mutual understanding.

The Centre also promotes the relationships of the Bases with the rest of Cyprus, by successfully bringing together the SBAA, the local community of Akrotiri, the Government of the Republic of Cyprus and NGO's, to support positively environmental initiatives in the area.

Student comments on experiences of environmental education

Piers Sangan



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(Abstract by Session Co-ordinator:)

This recount of personal experience of environmental education, from primary school through to high school raises issues which should be taken note of by people implementing environmental education within the school system. In particular, it stresses the need to have locally based environmental education experiences, from primary school onwards, and the importance of continuing practically-based environmental education at the secondary level.

Piers Sangan, prsangan@live.co.uk

I am one of the Jersey students, who originally came to the Jersey Conference, and I would like to say thank you for inviting me back here again. I am now studying wildlife conservation at Plymouth University. I have been asked to talk about my experiences with education and the environment. I suppose I could say that my natural interests in the environment started off when I was very young, considering that my first words were animal names, rather than anything else.

Primary school did something towards giving me an education in the environment. However, being in Jersey, the themes mainly focused around animals at the Durrell Wildlife Conservation Trust and not so much on the natural landscape in Jersey. One project I do remember from Primary School, which probably fuelled my interest in the environment more than anything else (and it was probably the only environmental project that we did at primary school) was actually on rain forests. So yet

again, nothing locally based.

All local interest came through things outside of the school system. For example, activities provided by the National Trust of Jersey, walks and events provided by the States of Jersey Environmental Department. I remember these activities as being great fun: going out, setting up moth traps, seeing what came, sitting out on the sand dunes. Great fun, great experience, and I learnt a lot.

Since ending primary school, I have had absolutely nothing within the school system about the environment, until I took environmental sciences as an A-level. The whole way through secondary school, absolutely nothing - which is, I think, quite a shame because there is potential there and we have missed out. It has been a huge gap. I have kept my interest fuelled by helping at Durrell as a volunteer so I have still managed to keep my interest going.

As I said, I then took A-level environmental science. Even then I felt it wasn't being taught properly. We sat inside most of the time reading out of a book, so even though the subject was there, the best way of teaching it was not used. Perhaps the teachers did not know how to teach it properly in a fun and educational way to get the most across. Perhaps it was the exam system that meant we sat inside learning from a book.

But, at that time, when I was just starting A-levels, that's when the 2006 Jersey conference happened. I was one of the students who managed to come to this, and things really opened up there for me, about what else is actually happening and what is going on.

For a student, that's absolutely fantastic because I knew nothing about the UK Overseas Territories. I didn't know any of them and that conference was just a complete eye-opener. And as has been said earlier, as students there we were really interested, we were trying to get connected with the other students in the other territories and that's actually gone forward. We have got the UKOTCF discussion forum now set up, so it's a matter of trying to get students from the other territories involved. Those of us from Jersey and St Helena have been the main ones involved so far. Cayman students are now interested, so the more students that we can get involved in the discussion forum the better.

I suppose, in summary, overall, my experience of education in the environment is, it started off weak, and got progressively weaker. I had to take my own stand and get involved myself which I don't think is quite right. I can see here in Cayman that the curriculum is being changed, but it doesn't seem so much that way in many other places, which is a great shame. I hope that something will be done and more environmental education, with more resources for environmental education, will be put into schools - and not just at the primary stage but throughout the school system. Young primary pupils can do only what they are told, whereas the secondary school pupils can make their own decisions in life and they are the next wave of conservationists; so it is important not to leave them out of environmental education.

Panel discussion: What is needed for the future?

Facilitators: Ann Pienkowski (Environmental Education Co-ordinator, UKOTCF), Clive Baker (Head of Curriculum Services, Cayman Islands Department of Education) & Edgar Howell (Deputy Director of Education, Turks & Caicos Islands)

Panel Members:

Clive Baker (Head of Curriculum Services, Cayman Islands Department of Education)

Edgar Howell (Director of Education, Turks & Caicos Islands),

Martin Keeley (Education Director, Mangrove Action Project and Cayman Brac Campus Director, University College of the Cayman Islands),

Thomas Hadjikyriakou (Manager, Akrotiri Environmental Education and Information Centre, Cyprus Sovereign Base Area),

Piers Sangan, (Student, Crown Dependency of Jersey and Plymouth University)

Ann Pienkowski (Environmental Education Co-ordinator, UKOTCF)

Summary of discussion points

The discussion focused on the seven areas listed below. The discussion material has been summarised under these seven areas.

1. Transition from Primary School to Secondary School, curriculum restrictions and fitting in with examinations and exam syllabus.

Environmental Education resources produced for schools must be curriculum-linked. A cross-curricular approach is effective in delivering environmental education in a practical and meaningful way.

Opportunities for environmental education within the curriculum need identifying. Where a course includes assessment of student project work, environmentally based projects should be encouraged.

Primary schools appear to deliver more environmental education than secondary schools (although there is clearly a need for a great deal more), but this is not followed through in secondary schools. The transition to secondary school is clearly a stage where more opportunities for environmental education need to be identified. The issue of examination constraints on the upper secondary school curriculum was also discussed.

The constraints of the examination system at secondary school need to be addressed. A “top-down” approach from Departments of Education is needed to get environmental education into the examina-

tion system.

A very effective strategy which could be used at secondary school is to use the time after examinations for environmental projects, as long as these involved getting the students outside.

2. Teacher Training and workshops, and issues raised by the use of contract teachers

Teachers need to be trained to use the resources. The training sessions should be mandatory, so that all teachers become more environmentally aware. In many places a large contingent of teachers are contract teachers - so, as well as being mandatory, environmental education training needs to be part of the initial induction programme for newly appointed teachers.

Teacher training colleges need to be made aware of the opportunities and facilities available for locally based environmental education. One way of doing this is to visit teacher training colleges. Schools similarly need to be made aware of local environmental education opportunities.

3. Parental involvement, and wider public involvement

Involving parents is very important – this has the benefit of educating parents as well as the children,

and providing positive feedback, increasing the interest and enthusiasm of the children.

Extra curricula clubs which involve parents are a good way of involving and educating parents.

Education centres which were planned primarily for students should be opened to all visitors. This can be seen to work when following a student visit to such centres, subsequent visits are made by family groups

4. First-hand outdoor practical experience, and Health and Safety issues

Getting the students outside must be a key element of all environmental education – it needs to be hands-on and fun. Teaching children about their local environment is a priority.

Signage is an important part of a meaningful outdoor experience (for students and others). For example, the Ramsar site at Akrotiri, Cyprus Sovereign Base Areas, needs signs to explain the meaning of Ramsar, its Wetlands of International Importance, and its Wise Use concept. This has been agreed, but is being held up by lack of funding.

Health and Safety is an important issue with outdoor activities. It needs to fit in with local requirements, and should include an approved emergency plan.

5. Student work-experience in environmental organisations and projects

Students benefit from opportunities to participate in environmental and conservation projects, and to talk with such project teams.

Work experience programmes to release upper secondary students for attachments to government environmental and conservation departments or environmental NGOs should be encouraged. Holiday placements could be arranged if term-time release is not practical. Opportunities for careers in environmental fields could be encouraged at career fairs, and by making presentations to secondary schools. The British Virgin Islands have a successful programme of work experience, particularly linked in with Environment Month.

6. Using international events such as environment week, Caribbean Endemic Bird Festival, International Migratory Bird Day

An example was given from St Helena where schools celebrate environment week and organise an entire week around that theme. One previous theme had been climate change – projections of parts of the island being under water had had a big effect, on students and parents.

The British Virgin Islands have an environment month, which includes a science fair and cultural exhibition. Environment month is also used as an opportunity for environmental work experience placements.

Other opportunities could be linked to science fairs and cultural events.

7. Using existing schemes and resources

With limited human and financial resources, existing materials should be used, adapted and built on, where possible. However, they should always be adapted to the local situation, and be introduced to teachers through training and workshops, as already discussed.

Opportunities provided by existing science-based franchises, or commercially available science programmes should be considered. An example given was the Mad Science Franchise (<http://www.madscience.org/>)