JOURNAL OF THE INTERNATIONAL ZOO EDUCATORS ASSOCIATION – NUMBER 43 – 2007

IZE journal

Researcher for a day

The scientific method as a learning model

Following visitors and what it tells us

A note from the IZE President

Stephen McKeown

CHESTER ZOO | UNITED KINGDOM

As I write this the G8 summit is taking place in Germany with climate change as the big issue on the agenda. The threats posed by man-made (I hate that awful word 'anthropogenic') climate change are such that it has finally topped the international political agenda and even those who have proved resistant to agreeing to reduced carbon emissions finally seem to be coming around to the mainstream way of thinking. We shall see.

Over the past few years, a number of zoos, including my own I am proud to say, have made a formal commitment to sustainability by obtaining the International Environmental Management Standard ISO14001. I won't go into the details of what it involves because you can find that information elsewhere but I would commend it to you as an excellent way of demonstrating to your colleagues, visitors, partner organizations, funding bodies and so on that we are practising what we preach.

The joint WAZA/IZE Conference taking place in Adelaide from 19-23 October 2008 is shaping up under the co-ordination of Adelaide Zoo Education Officer John Gardner who is also, of course, IZE Regional Representative for Australia/New Zealand. Please do try to join us in Adelaide as it promises to be an excellent conference in a very attractive location. I've been talking to John about the possibility of reducing the carbon footprint generated by all these people travelling to Australia and we are hopeful that we will come up with a plan to do just that.

A topic raised recently by IZE Vice President/President Elect Tom Naiman was that of conference proceedings and whether we should continue to produce them as we have in the past. His proposal is that henceforth we should publish a special edition of our Journal after each conference featuring a selection of papers, testimonials from sponsored attendees, report from the President etc. The rest of the Board seem to support this as I do myself but it would be interesting to hear from the members so do email or write to me if you have a view on this, or indeed any other IZE matter.

September the 6th this year marks the 35th anniversary of IZE. For an association to survive that length of time says a lot about the ongoing loyalty and commitment of its members. I would like to thank all of you for being part of IZE and helping ensure that education is increasingly recognized as one of the most important tools for achieving conservation. Sir Peter Scott, Founder Chairman of WWF, said many years ago, 'The conservationist's most important task, if we are to save the Earth, is to educate.' It is all of our responsibilities to demonstrate the truth of his remark.

I wish you all well in your activities and look forward to seeing as many of you as possible in Adelaide!

Editorial

Natasha Silva

ARTIS | ROYAL ZOO AMSTERDAM | THE NETHERLANDS

Thanks to all who responded to our 2006 Online Journal Survey! The results show that the Journal new-style is well received. However, there is always room for improvement. Some of your suggestions have already been incorporated. Your feedback will further direct the form and content of future issues.

The 43rd edition of the IZE Journal once more reflects the multifarious tasks and activities of zoo educators worldwide. Besides programme development and project reports, the 2007 journal includes interesting articles on evaluation, campaigning, policy development and training. Interestingly, they are not only written by zoo educators. The contributors include a registrar and keeper, a research assistant, a primary school teacher, a zoo director, and also museum specialists – all whom have a special interest in conservation education and each bringing his or her own disciplinary and professional perspective. Perhaps this reveals a definite expansion of the scope of zoo education. Are we perhaps at the beginnings of a more holistic relationship with other (zoo) disciplines? For some zoos this is already a fact. The interest in our field of work is definitely broadening. The journal survey certainly taught us that our readers are not solely zoo educators.

Greetings to our readers. I hope that you enjoy all the inspiring articles in this year's edition. Remember, the contents depend on member support so do not hesitate to make a personal contribution to the IZE Journal 2008!

I wish to warmly thank all contributors to the IZE Journal 2007, as well as the editorial board and Silvia Geser at the IZE Central Office for their good work and support.

Tshepi Mbele with a Bearded dragon *Pogona vitticeps*

Photo © Karin Edmondson

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MISSION
The IZE is an association dedicated to expanding the educational impact of zoos and aquariums worldwide. Its dual mission is to improve the education programs in the facilities of its members and to provide access to the latest thinking, techniques, and information in conservation education.

The IZE Journal is a medium for promoting the IZE mission and highlighting conservation education trends, initiatives, efforts and achievements of IZE members.

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Establishing
a WAZA/IZE Education Committee

by Laura Mumaw WAZA EDUCATION COMMITTEE LIAISON | MELBOURNE-PARKVILLE | AUSTRALIA

Laura with a wombat.

At the WAZA meeting in 2006 in Leipzig, IZE President Chris Peters and I discussed making changes to the structure of the WAZA Education Committee, which we then discussed at the Committee meeting. These changes were to reflect the role of IZE in representing zoo educators worldwide, the role of WAZA in globally uniting zoos, aquaria, and like-minded organisations to live sustainably and conserve biodiversity, the partnership between the IZE and WAZA, and the challenges of maintaining momentum on our shared objectives through the year.

A draft charter setting out the function and membership of a new, joint WAZA/IZE Committee was presented at the IZE Pretoria meeting for further input and then to WAZA Council at the WAZA Council 2007 mid-year meeting.

Like the IZE Board, the WAZA Board welcomed the Charter as a means of clarifying the nature of the IZE/WAZA relationship and identifying specific areas of shared activity.

We are now in a position to finalise the Charter (see highlighted box) in discussion with the IZE Board and establish our first WAZA/IZE Education Committee.
A specific recommendation from the WAZA Board was that we better describe what we mean by "education", in the broad sense we understand it to be, in the preamble of the Charter.

I look forward to finalising the draft Charter soon with IZE Board members. Education is arguably the strongest strand of our efforts to create a sustainable future rich with life and diversity. Establishing the WAZA/IZE Education Committee is another powerful step in effectively harnessing our efforts and securing continuity and momentum to achieve our shared vision.

The Children's Zoo in Chiba Zoological Park

by Hiroyuki Takahashi REGISTRAR AND KEEPER | CHIBA ZOOLOGICAL PARK | JAPAN

Chiba Zoological Park was established in 1985. It is 33 hectare, and the collection of animals is about 150 species and 780 specimens. The Children's Zoo of Chiba Zoo was renewed in 2002. The theme of our Children's Zoo is "Let's feel it – the connection with life – ". This area is about 7,500m^2. It has about 30 species including domestic animals such as horses, donkeys, miniature-pigs, goats, sheep, mice and guinea-pigs, and wildlife such as Humboldt penguins, capybaras, macaws, Aldabra giant tortoises and prairie-dogs.

The features of the Children's Zoo are:

1. A school program: the elementary school, kindergarten, nursery school and the school of handicapped children use this area as contact with animals. This program is very popular with pupils and infants.
2. A hands-on exhibit: "the comparison of animal's babies sizes", "the comparison of animal's footprints", and "the comparison of characteristics of animal's bodies". The children enjoy touching and turning over the panels, so this type of hands-on exhibit is really fun for them.

Draft Charter for WAZA/IZE Education Committee

Recognising that

- *Zoos and Aquariums have a unique and powerful role in educating and empowering communities to live sustainably and conserve biodiversity;*
- *Note: Define Education;*
- *Education of all kinds is highly determined by cultural and contextual factors;*
- *IZE represents zoo educators worldwide and as such is an education arm of WAZA;*
- *WAZA unites, at a global level, zoos, aquaria, associations and like-minded organisations and individuals to achieve a sustainable future and in-situ conservation of biodiversity.*

The WAZA/IZE Education Committee will provide a global forum to:

- *Facilitate communication and linkages between individual zoos, aquaria and regional and national zoo associations in education programs;*
- *Support the development of education policies in all member zoos, aquaria, regional and national associations, and share information about them;*
- *Support and stimulate innovation and best practice in our education programs in zoos and in communities;*
- *Support and facilitate best-practices training and development for zoo and aquarium educators, especially in the developing world, including IZE membership and attendance at IZE conferences;*
- *Develop, assist and promote initiatives to assist people in living sustainably;*
- *Develop, assist and promote education initiatives and programs which support in-situ conservation of biodiversity, particularly those linked to conservation programs recommended as priorities by CIRCC, WAZA's Conservation Committee and CBSG;*
- *Support and develop methods to evaluate the effectiveness of formal, informal and community based conservation education programs;*

Membership of the Core Group of the Committee will include:

- *Nominated WAZA Council Member (Co-Chair)*
- *IZE President (Co-Chair)*
- *Interested WAZA and IZE representatives*
- *Regional Association representatives*

Membership of the Committee will include:

- *Interested WAZA, IZE and regional association members, some of whom are in the "core group"*

Meetings would be held in association with IZE, WAZA and regional association meetings, as determined annually by the core group.

3. The letter to the animals: there is a post, to which the children write a letter to the animals that they touched or got interested in. The children's letters are posted on a wall for all to read. Their letters reveal what they have learned, how they feel about their experience and what the children particularly enjoyed. These letters prove to be a very important source of information on the children's experience, which we incorporate in the redesigning of our educational programs.

The 21st century zoo should carry out the function of an environmental education, especially education for sustainable development, so the roll of the Children's Zoo is all the more important as a place of communicating to the sense of wonder of life!!

The "contact corner" at the Children's Zoo.

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Conversations with Birds

by Louise Gordon | EXECUTIVE MANAGER MARKETING AND EDUCATION | JOHANNESBURG ZOO | SOUTH AFRICA

Southern Ground Hornbill (*Bucorvus leadbeateri*).

There are very few visitors who run up to any Zoo staff and excitedly ask: where are the black eagles, the blue cranes, the ground hornbills or any other bird. Their queries are normally focused on the more charismatic animals such as lions, monkeys, chimpanzees and snakes. This is a challenge that we as education staff face every year during our Sasol Bird Fair. (Sasol – a global energy company, headquartered in Johannesburg – is the sponsor of the fair as well as a bird book written exclusively for use in Johannesburg Zoo and fun sheets for 3 levels of schools to be used in the Zoo or at schools.). How to make children excited about birds and associated bird topics. One of our tricks is to have some of our contact animals on display, which consist mostly of reptiles, mammals and one bird. These are used as the "bait" to attract the children's attention so that you can then launch into your conservation message about birds.

This year I had the envious task of teaching children about bird ringing – a topic that has very little appeal for most except avid birders. Then why teach it, is the next question. The number of wrong answers observed whilst walking through the Zoo as to why birds have rings around the legs, prompted the education lesson. The lessons take place on this particular day only in celebration of the National Bird week and after the Fair, on a bookings basis. Lessons of this nature are intended for primary school groups only aged 7-12 years. The lessons are short and last for duration of 25 minutes only. The same lessons are repeated for 10 groups of approximately 200 learners at the same time.

Mike Harman, our Curator of birds demonstrating the adaptations of an owl (Eurasian Eagle Owl *Bubo bubo*).

Where to start was the next challenge. A wedding ring on my finger was a good enough conversation starter. This resulted in some hilarious chitchat as I actually wear 5 rings and some of the children wanted to know if I was married five times? Next came the question of why birds wear rings and we spoke about the various reasons of ringing birds and the particular system used in Johannesburg Zoo of ringing female birds on the left leg and males then obviously on the right leg. This was a secret, which they could share with their parents in identifying the sex of birds as they toured the Zoo. The use of different coloured rings for large flocks is used to differentiate between individual birds. The open rings are used for species from other institutions or for individuals that you want to identify. The closed ring system is to indicate that the birds were hatched in our Zoo. It is then possible for a bird to wear more than one ring on its leg. If it was hatched in our Zoo and we want to identify it as an individual in a large flock it will wear a closed ring and will wear a coloured open ring on the same leg. When you actually know what you are looking at and why the birds have rings and on which leg, it gives you access to a lot of knowledge about the birds in the Zoo. In other words, it can make you look quite clever amongst your peers.

The best part of the lesson was the measurement demonstration. A volunteer was called to be the bird of the lesson. Wingspan, wing, beak and total body length was measured on my human bird. Weighing was demonstrated and then I could ring my bird. I used Zoo identity tags for the ringing – bright green bands with Johannesburg Zoo printed on them. My human

An Eurasian Eagle Owl (*Bubo bubo*) and Southern White-faced owl (*Ptilopsis granti*) with senior learners who attended the bird fair.

bird was then set free and could fly away. One of the teammates had to go and catch my bird and could return it to Johannesburg Zoo. The finding of its way "home" proved to be quite easy because of its identifying ring. Most learners identified pet identity tags, human identity documents and name tags as the same kind of principle although nobody weighed and measured us for additional information. The lesson was well received and full of fun as it was interactive as a learner was ringed, set free and caught by his/her classmates. The lesson was outdoors and learners were very excited with wild cries of catching their classmate before he/she flew away. Some learners remarked that it might be a good way of identifying young children to prevent them for getting lost in large areas such as the Zoo.

During the Bird Fair day we teach a variety of lessons of which the bird ringing is just one example. Close to two thousand children are taught on this particular day and the lessons are focused on bird identity, the various kinds of birds and their adaptations, nutritional needs, different habitats, the role of water and other natural resources in the lives of humans and animals as well which plants to cultivate in your garden to attract garden birds. It is a very busy programme and one wants the learners to take some new facts home.

Prior knowledge of a topic is essential to scaffold or build your new information upon. The use of wedding rings is a well-known human habit and most children will know what it means if you talk about it. To start off with a well-known topic makes it easier for children to accept and assimilate knew knowledge. When they cannot associate new knowledge with anything in their experience, it takes far longer to gain and retain new information. We as educators are often so enthusiastic about what we know and what we want to share that we often forget to assess prior knowledge or to start off with a well-known fact. Once the conversation is started, you will enjoy a more effective education session, even if it includes your human bird.

The Sasol Bird fair takes place once a year at the Johannesburg Zoo. We have just celebrated the 6th Birdfair and this year was the first time that it coincided with the National Bird Week. Sasol sponsors the National Bird week and supports Birdlife South Africa in general. It was decided to do the Fair in the same week as the National Bird Week to raise awareness for birds on a national level. The theme for 2007 was marine, estuary and fresh water ecology. For 2008 the Fair will be held during the weekend of 2-4 May and the theme will be owls. It is a 3-day event of which the Friday is the day specially focused on schools. The weekend days are focused on families and bird enthusiast with free lectures on birds, nest box building activities, bird products such as food, books, nests, feeding boxes and many more available. You can even book a special birding weekend at a private lodge with bird guides. During the evenings we present a night tour with a dinner for those who want to view the night birds in the Zoo. The Fair is offered at a reduced entrance rate for the weekend only as we would like to raise awareness of birds in as many families as possible. It is highly successful and we are very excited to house it again in May 2008.

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Chimpanzoo
at Johannesburg Zoo

by Luke Duncan MASTERS STUDENT | UNIVERSITY OF THE WITWATERSRANDS | SOUTH AFRICA

Chimpanzoo is a research initiative that was started in 1984 by the Jane Goodall Institute (JGI) aimed at studying chimpanzees in zoos and other captive settings. The project is run by volunteers, researchers, students and caretakers, all of whom contribute data to a growing international database of chimpanzee behaviour, maintained by JGI. The project is run all over the world, with behaviour research being conducted on approximately 130 chimps at participating zoos and other captive institutions.

Under the mandate of JGI, and in collaboration with the University of the Witwatersrand and the Johannesburg Zoo, the Chimpanzoo project extended to South Africa for the first time in 2006. I began the project as part of my Masters research in animal behaviour. The research is being funded by JGI (who received funding from Howard Buffer Foundation for this specific project) and has two aspects to it. Firstly, it aims at introducing behavioural enrichment. This means placing feeding devices in the chimpanzee's enclosure aimed at occupying the chimpanzees for longer, while encouraging the animals to utilize areas of their enclosure that they don't use that frequently. Secondly, the study investigates the merit of using high school student volunteers for the collection of behaviour data. The project also uses volunteers from JGI's Roots and Shoots organisation; an environmental education program that aims to create awareness in young Africans about environmental and conservation issues.

Two Johannesburg high schools were selected, from which volunteers could be chosen to participate in this exciting initiative. The 18 volunteers were selected from both Northcliff High School and Beaulieu College and were all between the ages of 16 and 17 years. Once the selection was finalised, the first Chimpanzoo seminar was held on Saturday, 26 August 2006.

The Chimpanzoo volunteers practising their behaviour observation.

Photo © Helen Place

The seminar was hosted at the Johannesburg Zoo, by Professor Neville Pillay, of the University of the Witwatersrand, and myself. This first seminar was attended by the volunteers from Northcliff High School and was aimed at informing them about the project and their role in the data collection. The seminar began with a talk from Professor Pillay about scientific research and the nature of animal behaviour studies. The volunteers were very enthusiastic and participated readily.

After a short break and some time for the volunteers to get to know one another, I gave a talk on the project itself and how it would all be carried out. I explained what they would be doing with the project and exactly

Joyce, one of the youngsters in the group, playing on part of the rope system set up for the chimpanzees in their enclosure.

Photo © Sarah Richmond

how we, working together, were going to contribute to the current understanding of chimpanzees in captive environments. I also explained how they would be systematically documenting the behaviour and space use of the chimpanzees with data sheets. These sheets are made of a table with different behaviours and a time scale. Through this it's possible to record what behaviour the animals are performing at regular time intervals. To look at the space use of the animals, the enclosure was divided into zones, so each volunteer was given a map of the enclosure and the volunteers also record this on their sheets.
Once my talk was over, we went to the chimpanzee exhibit to practice this. The volunteers were broken up into groups of two or three and, with me shouting for them to sample at the appropriate times, they gave it a try. After 10 minutes of sampling, the volunteers were done, and many of them remarked that they had really enjoyed it!

A second Chimpanzoo seminar was hosted in September 2006 at which both Prof. Pillay and I gave our talks again as a refresher for the volunteers. This time, however, both high schools' students attended. At this second seminar, the volunteers received Chimpanzoo t-shirts as well as all the material that they would need to carry out the chimpanzee behaviour observations for the project, including clipboards, pens, drawing pads and writing pads. The enthusiasm at the second seminar was just as evident as at the first and the volunteers were very keen to get started.

The volunteers have proven to be incredibly bright and have caught on to the job required of them without hesitation. Their enthusiasm is also a great encouragement and I anticipate that they will fulfil their role as Chimpanzoo data collectors.

As part of the Chimpanzoo project, the volunteers were asked, at a later stage, to write a poem, essay or draw a picture that would express how they felt about the project. The responses were nothing short of overwhelming. They expressed a great appreciation to JGI for including them in the project and to Prof. Pillay for going to speak to them about the project. They were also thrilled to have been given the opportunity to be involved in a project that will make a difference in the way that animals will be cared for in captive environments. However, this is not the only benefit that Chimpanzoo will bring in its wake.
The project will undoubtedly contribute to our understanding of the behaviour of chimpanzees in captivity, but it will also contribute to our understanding of both the physical and psychological needs of these animals. The information gained from this research will be added to the Chimpanzoo database, for researchers from all over the globe to access. It will also contribute to the growing scientific literature on the behaviour of animals in captivity.

The project will not only benefit science. It will highlight key issues in the welfare of the chimpanzees, and from it, recommendations may be drawn with regard to solutions to these issues. The volunteers stand to benefit through coming to a better understanding of scientific research as well as gaining knowledge both in the research field and in the husbandry of apes in zoos. Undoubtedly, the Johannesburg Zoo and JGI will receive exposure for their involvement in this initiative, as will the University of the Witwatersrand, and more importantly, their contribution to the welfare, upkeep and conservation of a species that while so similar to humans, teeters on the brink of becoming seriously endangered.

For general information on Chimpanzoo please visit www.chimpanzoo.org

For more information on Chimpanzoo at Johannesburg Zoo please visit www.janegoodall.co.za

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The scientific method as a learning model

Schools web and educational and investigation centres

by Xus de Miguel Vallejo TEACHER | MUNICIPAL SCHOOL PATRONAT DOMÈNEC | BARCELONA
and Carmen Maté García EXECUTIVE DIRECTOR | BARCELONA ZOO | SPAIN

Barcelona Zoo is always open to imaginative proposals which have as the objective the diffusion of knowledge. The Zoo readily collaborates with other social-educational institutions in order to gain knowledge in differing pedagogical objectives including those involving community level, social or global development, not solely animal-centred topics.

So it came that Barcelona Zoo embarked on a special project with the Escuela Patronat Domènec and their pupils aged 5 to 6 years, in which they studied the chimpanzee group. The learning model which we developed targeted the scientific methodology which is characterized by direct confrontation, with no mediators, from the subject with the object to study. This learning model guarantees the development of creative and cooperative thought. It assures the development of all the aspects of the personality – the intellectual as well as the affective – and that of respectful individuals, committed to the environment and the people that belong to its social surrounding.

In short, in this project pupils studied the same subject. They observed and developed hypothesis. They hereby learned to concentrate on a specific subject for a longer period of time and develop an affinity with the subject being studied. The pupils then came together to discuss what they had observed and concluded. The result was that the pupils had made totally different observations of the same reality and had also drawn totally different conclusions. They hereby learned that it is necessary to develop a system to determine what 'the truth' is and at the same time come to realize that there is no such thing as 'the truth'. The pupils learned to be critical thinkers – also of one's own observations and interpretations. They additionally learned that there is a necessity to consult with one another and that interaction leads to the development of knowledge. Not only did this project help to develop the pupils' knowledge and scientific skills, together with knowledge they gained appreciation.

How does it work?

A relationship is established between the pupils and the subject or reality that is meant to be acknowledged. It demands the development of a number of attitudes and capabilities. For instance, the capacity to concentrate for long periods of time on the individual or the fact – physic or social – that becomes the centre of interest at a certain point, to follow its evolution throughout time and to oppose it afterwards with classmates. Through such a confrontation the pupil comes to realize that the same fact can be understood in different ways by different people. These differing views of the same fact or observed reality – as well as the resulting interpretations – makes one realize that "the other one/the other thing" exists in a world which is governed by its own

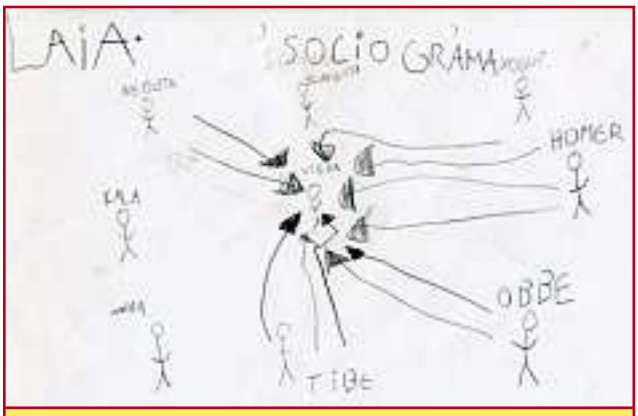
rules and does not necessarily coincide with what each one has imagined. This is the turning point to necessity of knowledge and respect. And only then do we question "why?". Asking "why" shows us, precisely, the conscience of what one knows.
On the other hand, the capacity to question oneself about reality means to take a first step towards intellectual and affective autonomy. When facing the questions which have arisen through the observed the reality or item to be studied, the subject is able to imagine many possible explanations and the autonomy level rises. The conscientiousness that the imagined hypotheses are but just a few among all possible ones becomes evident when pupils share their findings and ideas. Such collaboration helps to improve the abilities of the pupils to reason, value, review previous ideas and change them.

The knowledge which is incorporated results from the confrontation with the same – in a context where the person teaching plays a very important role – and not by the knowledge of an "authority". The teacher helps his/her pupils to build and apprehend the world from the freedom of thought and from the respect of the other, as a condition of evolution itself.

A worldwide learning model?

We want to stimulate an atmosphere of exchange and confrontation of ideas, of expectations, of feelings and of interests, which is already a reality at the Patronat Domènec and which enables children to build knowledge as they are sharing it, and to expand their thinking to other physical and wider ambits.

We want our pupils to acquire knowledge while they interact with boys and girls from other parts of the world, touching themes or contents that can be of common interest at a certain moment, or not. Developments that, being parallel, will be shared if we use ICT as our best ally; ways of starting off from our differences and building bridges with languages – oral, written, audiovisual, artistic, musical, mathematics-, will make bonds with equal and common interests and expectations. A road that will need to overcome barriers – physical, cultural, of gender, of age or economic – that avoids that each boy and girl and each youngster turns into, within his/her equals, a true speaker in the process of getting to know the world and to giving it a reason.



Project Goals

- To spread the learning model based on the scientific methodology in order to generate knowledge from observation and questions about reality that it necessarily raises.
- To encourage the development of knowledge arising from the clash of ideas, feelings, hypothesis, research and information designs, between peers of different parts of the world.
- To give rise to creative and cooperative thinking from the very first years of primary school.
- To develop skills and personal attitudes which promote a global code of ethics, which respects the environment and is committed to social reality.

This project is but a mere example of how it works between the Patronat Domènec and Barcelona Zoo. Our intentions are to create a network of schools and education and research centres (e.g. zoos, museums) which manages to generate common interests that materialize in joint projects to be developed during a school year in different parts of the world with different cultural backgrounds; a network that triggers exchange processes between students and also between teachers, which allow them to follow hand in hand the path to a kind of knowledge which fosters a global code of ethics, respectful with the environment and committed to the social reality.

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Evaluating the Impact of a Conservation Education Program

in the Kalinzu Forest Reserve, Uganda

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"Environmental education does not work!" That's the argument of many field conservation workers. In fact, a recent article (Struhsaker et al. 2005) stated that environmental education programs in African protected areas had no relationship to conservation success or even positive attitudes from local people. Fundamental to this analysis is the perception that all environmental education programs are equal in terms of increasing knowledge and changing attitudes and behaviors. However, not all education is equal. This may be an assumption among environmental educators, but it is simply not true.

So when are all environmental education programs not created equally? How do we know if an environmental education program is increasing knowledge or if it positively affects attitudes and behavior? Frankly, the only way to know for sure is to conduct formal evaluations. Formal evaluations in an informal education setting can be extremely challenging to accomplish, but the value of this information is undeniable. Here, we report on a formal evaluation of a conservation education program conducted at the Kalinzu Forest Reserve (KFR) through a partnership between the National Forest Authority of Uganda, the Uganda Ministry of Education and Sports, Jane Goodall Institute – Uganda, and Disney's Animal Kingdom.

The Program

The education program at KFR was focused on delivering four key messages and pro-environmental actions that a Primary Five student, elementary school grade five in the U.S., could take. Between May and November 2004, 847 Primary Five students from 18 rural schools near KFR were brought to the reserve to participate in the program. Students were transported in groups of 12 to KFR where they participated in the four hour program. Upon arrival, students were lead into the interpretive center where they were administered the pre-program evaluation (see below). Following completion of the evaluation, students participated in an education program that was focused around four key messages (Table 1).

Table 1. The four key messages of the conservation education program at Kalinzu Forest Reserve. These key messages were used to help us identify our five evaluation questions for the program.

KEY MESSAGES
1. KFR is home to a diversity of plants and animals.
2. Kalinzu is an important forest for our community, now and in the future.
3. Habitat conservation is necessary to protect the future of plants and animals.
4. Each of us is a guardian of the forest.
EVALUATION QUESTIONS
1. Name two animals that live in the Kalinzu Forest.
2. Name two environmental problems in the Kalinzu Forest.
3. List two ways you can help wildlife and the environment.
4. What do you like most about the forest?
5. Which word best describes the forest?

Students participating in guided forest walks where they learn about the ecology of the forest environment.

Students participated in four activities and a forest walk designed to increase environmental knowledge, engender positive attitudes toward the environment, and encourage pro-environmental behaviors. The program was centered on five modules:

1. The size of Africa
2. Wildlife diversity
3. Adaptations to the forest
4. Threats to the forest
5. Actions children can take to help wildlife.

The Evaluation

Students were presented with a paper-based five-question evaluation (Table 1). The questions were designed to assess knowledge, attitude, and behavior about the environment in general and KFR in particular. Questions were read aloud in English and Ruyankole by the instructors. Students wrote their answers in either English or Ruyankole. Students were given an identical post-assessment survey upon completion of the program. Answers written in Ruyankole were translated into English by the forestry staff.

To assess the improvement in performance for Questions 1-3, evaluations were summarized at the school level ($n = 18$) for the proportion of students that provided two correct answers for the questions. Additionally, at the school level we calculated the proportion of students that reported a positive attitude in Question 5. We assessed Questions 1, 2, 3, and 5 by using a paired-samples t-test. We categorically summarized responses to Question 4 in the pre- and post-conditions. To evaluate the relationship between attitude and knowledge/behavior, we generated contingency tables for responses at the student level and calculated phi-coefficients to determine if positive attitude was related to knowledge level or behavior in either the pre- or post-program conditions.

The Results

Following participation in the program there was a statistically significant increase in the number of pupils that could correctly identify animals that lived in KFR ($t17 = -8.92$, $P < 0.001$) (Figure 1). There was also a qualitative change in answer types. While "monkey" was the most common answer in both conditions, there was a marked decrease in the number of responses relating to domestic animals and savannah dwelling animals, such as "elephant", "zebra", and "giraffe", after the program. Additionally, there were several new correct answer categories, including "insects" and "lizards".

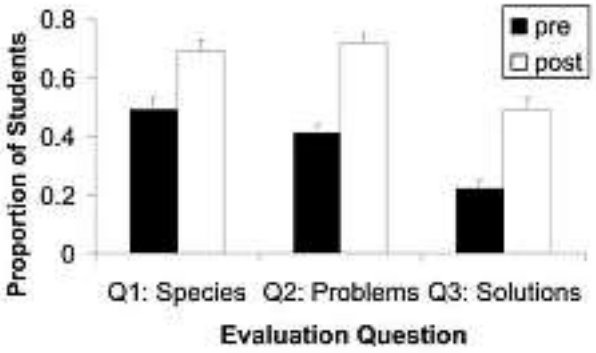

Figure 1. The mean proportion and standard error of students from each school who were able to correctly answer questions one through three increased after participating in the education program.

After completion of the program there was a significant increase in the number of pupils who were able to name two environmental problems ($t17 = -8.309$, $P < 0.001$) (Figure 1). Deforestation-related problems remained the most common answer, along with soil-related issues, including erosion and excessive digging in the forest for tubers and medicinal plants. The lack of safety in the forest, and lack of material resources in the area were common answers during the pre-survey, but the number of these responses decreased dramatically after the program. After completing the program there was a significant increase in the number of children that were able to name pro-environmental behaviors ($t17 = -8.304$, $P < 0.001$) (Figure 1). The most common answers in the post-program survey were decreasing cutting and burning of the forest, providing food, water, and medicine for wildlife, planting new trees, and decreasing hunting and pet-trade pressures on wildlife. There was also a significant decrease in the number of responses for behaviors that were impractical for children, including building more forest preserves and making more laws.

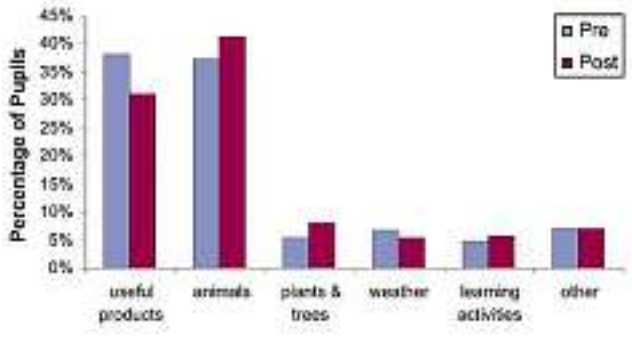

Figure 2. After the program there was a slight increase in the number of children who reported that they liked the animals in the forest over the fact that the forest provided useful products. There was also an increase in the number of children that reported that they liked plants/trees and the educational activities of the program.

The responses pupils gave for what they liked most about the forest were grouped into distinct categories (Figure 2). These data show that children most enjoyed animals and the useful products that the forest provides. Although these two categories reversed their rank in the post-program assessment, the change in responses was relatively small and both categories remained much higher than all the other responses combined. For Question Five, when choosing the word that best describes the forest there was a small but significant increase in the number of positive responses following participation in the education program (pre: 72% vs post: 83%, $t17 = -6.072$, $P < 0.001$).

Finally, in an effort to determine the relationship between attitude and knowledge, we correlated attitude in the pre- and post-program evaluations with performance on Questions 1-3 (Table 2). In the pre-program evaluations, positive attitude was associated only with being able to name 2 environmental problems. In the post-program evaluation, having a positive attitude was related to both naming environmental problems and naming environmentally responsible behaviors.

Table 2. Correlations indicate the relationship between positive/negative attitude and knowledge as assessed by Questions 1-3 in the program evaluation. Values in table represent Phi-coefficients (n = 847 for all tests).

	PRE-PROGRAM ATTITUDE	POST-PROGRAM ATTITUDE
Question 1	- 0.038	- 0.002
Question 2	0.087*	0.078*
Question 3	0.023	0.083*

* indicates $P < 0.05$

Students were transported to and from the forest reserve via a mutato or passenger van.

What is the value of evaluation?

Education evaluation is important because it provides objective information about the program. For example, overall knowledge gain in this program was substantial and baseline performance levels of these children were related to complexity of the knowledge. For example, while half of the students were able to name two animals that lived in the reserve prior to the program, only 20% were able to name two environmentally helpful behaviors. This finding is consistent with other research on environmental knowledge of African youth (Ali 2002; Johnson-Pynn and Johnson 2005). Thus, future education programs in this area can be aimed at building a more complex understanding of the natural world through the effective use of goals and key messages that inform and engage people. This approach differs from the presentation of complex ecological projects and issues, the more common approach used by field conservationists to educate and communicate their research results to local people.

Students showed an overall positive attitude toward the environment and positive attitude appears to be related to performance on the more complex environmental issues, such as threat and actions. Children in this study also show a high degree of ecophobia and a large percentage of children expressed fear relating to the forest and the dangers it harbors. Additionally, students appeared to have a utilitarian view of the environment. Thus, attempts at building environmentally responsible behaviors should focus on not only increasing knowledge but also creating positive attitudes. Also, future programs should consider the existing environmental attitudes of the children in this area. This information would have been unavailable without a formal evaluation.

We have utilized the findings from this study to provide feedback to the forestry staff who conducted the program to enhance their communication with the children. As such, the findings were used to improve the program. Additionally, the findings have been used as empirical evidence for the National Forest Authority as to the value of the program. These results have generated a great deal of support from Ugandan governmental agencies. Additionally, these data can be used by educators as evidence of past success when seeking other funding sources for programs. Finally, these data allow us to better prepare future programs to impact knowledge, attitude, and behavior of children in Uganda.

It is estimated that less than half of tropical education programs achieve their objectives (Norris and Jacobson 1998), and there is a growing call for evaluation of environmental education programs (Vaughan et al. 2003). We advocate a change in the paradigm of environmental education in tropical Africa toward an emphasis on goal-based key messages that are understandable and useful to the audience and evaluation of all education programs to determine if these goals are being met. It is only by the formal evaluation of education programs that we can be sure we are meeting our goals. Additionally, formal evaluation can provide information to improve the administration of these programs. Education is one of the best tools for engaging people about wildlife and ecosystems, and only through evaluation can we know if our education programs are accomplishing what we say they are.

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Students used interactive props during the education program to learn more about the relationship between animals and the environment.

Werribee Open Range Zoo takes sustainability education to Zimbabwe

by Rachel Lowry ACTING TEAM LEADER | DISCOVERY AND LEARNING | WERRIBEE OPEN RANGE ZOO | AUSTRALIA

Contemporary learning theories tell us that environmental education delivered without an action component can create eco-phobia amongst future generations. So how do we teach students visiting our Zoos about global issues such as the bush-meat crisis or poaching without disempowering them?

As the education team at Werribee Open Range Zoo searched for answers to that very question, the Tikki Hywood Trust, a Non Government Organisation based within Zimbabwe was seeking answers to a complementary question. The Tikki Hywood Trust (THT) research, breed and rehabilitate Zimbabwe's 'lesser known' species such as the Pangolin, Lichenstein's Hartebeest and Serval. In 2006, Lisa Hywood, a Zimbabwean and founder of the THT asked herself whether the trust could be doing more to ensure the survival of Zimbabwe's lesser-known species. Fortunately, Lisa realised that the answer to her question was simple. To assist Zimbabwe's wildlife she would need to work with Zimbabwe's people.

In May 2006, Lisa Hywood approached Werribee Open Range Zoo (WORZ) seeking assistance. The Tikki Hywood Trust wanted to establish an education program that would promote sustainable behaviours within local communities situated alongside THT animal release sites. One year later an insitu conservation education project called Kusanganisa was established within three pilot schools located in rural Zimbabwe. Kusanganisa means connect in Shona, and was developed as a partnership between THT and the education team at Werribee Open Range Zoo. Having received initial support from Zoos Victoria's Friends of the Zoo, Rachel Lowry (Team Leader Discovery and Learning at WORZ)

was able to visit Zimbabwe in 2006 to assess the needs and resource requirements of the communities wanting to get involved. The program that was developed takes a coordinated approach to sustainability education, and supports teachers by assisting with the development and delivery of an integrated curriculum from grade 0 to grade 7. The enthusiasm of the teachers based within the schools was overwhelmingly positive. However, it was evident that the teachers would require training for the project to be implemented successfully. In February 2007 two of Zoos Victoria's educators (Rachel Lowry and Katie Pahlow) returned to Zimbabwe to conduct teacher training and deliver the resources required to implement the program.

Since the teacher training in February, each of the three schools have set-up or increased the size of their market gardens, and have undergone training run by the Tikki Hywood Trust to increase their gardens' productivity. Compost heaps and fruit orchards have also been established and two schools have begun rabbit breeding. Fuel briquette machines have now been placed within each school, allowing students to make fuel briquettes from leaf litter as an alterative to native trees. The ultimate aim of the project is to equip Zimbabwe's future generations with the skills and capacity needed to depend on sustainable food sources. Chicken and Guinea Pig breeding will therefore also become features of the program when funds become available.

Twenty eight teachers, two game scouts, and 1100 students participated in the teacher training conducted by Zoos Victoria staff. The participants were introduced to a three-phased approach to environmental education that is designed to promote the acquisition of skills, knowledge and behaviours.

PHASE 1 – CONNECT (Grade 0 – to Grade 3)
Building connections between children and wildlife

PHASE 2 – UNDERSTAND (Grade 4 – Grade 6)
Developing deeper understandings of our natural world

PHASE 3 – ACT (Grade 7)
Providing students with the skills needed to live sustainably

Werribee Open Range Zoo (WORZ) has managed to secure the wages for three local game scouts who will continue to train, monitor and assess the success of the program. The THT has secured the support of Zimbabwe Parks and Wildlife Management Authorities, allowing the Grade 3 students from each school to enjoy and view their native wildlife free of charge each year within local game reserves. The resources developed and donated by students visiting Werribee Open Range Zoo will be distributed to Zimbabwe twice a year thanks to the generosity of the SAVE Foundation Australia.

With the support of Zoo staff, volunteers and visitors the WORZ Discovery and Learning team were able to reach their ultimate goal; to deliver learning experiences within the zoo that facilitate connections and actions on a global scale. What began as a venture to link Australian children to global issues, has now evolved into the Kusanganisa *in situ* education program, a program with the potential to inspire change well beyond our border.

If you would like further details regarding this project then please email the author.

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Researcher for a day

at the PUC Minas Museum of Natural Sciences, Belo Horizonte, Brazil

by Cristiane Cäsar and Letícia Guimarães EDUCATION OFFICERS | PUC MINAS MUSEUM OF NATURAL SCIENCES | BRAZIL

At the PUC Minas Museum of Natural Sciences, Belo Horizonte, Brazil, children learn how the work of a researcher is and undertake extracurricular educational activities. They can engage in similar activities to a palaeontologist, an archaeologist or a biologist, through the Project 'Little Researcher'.

The project has been underway since 2003, developed by the education team of the museum. Its goal is to extend the science classes beyond the traditional classrooms. Children from 6 up to 12 years old can participate in the educational activities of the project.

About the Museum

PUC Minas Museum of Natural Sciences has one of the most important scientific fossil collections of South America. Its palaeontology collection has more than 60,000 fossils, including plants, invertebrates, fish, dinosaurs, birds and mammals. The highlights of this collection are the mammals of the late Pleistocene period (around 10,000 years ago), such as armadillos and giant ground sloths. The museum also has collections of archaeology and of the living fauna of amphibians, reptiles, birds and mammals, especially from the Cerrado (Brazilian savannah) biome.

The motivation to create the Project 'Little Researcher' was to find an interesting and stimulating way to show these collections to the children who visit the museum. This project is a tool to promote interaction between the museum and children. The goals of the project are:

- To stimulate learning and cultural leisure.
- To stimulate children's interaction and interest with the information they get during their visit.
- To talk about environmental issues.

A palaeontological excavation workshop.

A visit to the museum exhibits.

A workshop on cave painting.

Activities of the Project 'Little Researcher'

We offer three thematic options for the Little Researcher: palaeontologist, archaeologist or biologist. According to the theme there are specific activities.

Visit to the museum exhibits

Children have a guided tour in the exhibits where some fossils or stuffed animals are presented.
A discussion about the work of the researchers and museum professionals: from the finding of fossils and animals until they can be exhibited. Moreover, during their visit children are stimulated to value and to contribute to the preservation of the historical, natural and cultural patrimony.

Trail of the Armadillo

Children are involved in a walk through our connecting forest to investigate the local flora and fauna and they receive information from our guides about the importance of caring for the environment. During this activity the children are equipped with binoculars, a magnifying glass and given a researcher's waistcoat to wear. Furthermore, we realize some educational dynamics with the children. In the dynamic 'Web of Life' each child becomes a character of the ecosystem and learns the importance of balance between all the natural elements. The 'Perception Dynamic' focuses younger children: with blindfolded eyes they touch trees, flowers and plants to develop their tactile perception.

Palaeontological Excavation Workshop

In this workshop children learn how to find fossils using tools such as scoops and brushes: we have a large sandpit where we bury fossil replicas. After each discovery the children are encouraged to find out from which animal the piece belongs just like a paleontologist.

Workshop on making fossil replicas

Another workshop involves the making of fossil replicas using plaster, and the children are enlightened as to how they are used in the museum exhibits while the original fossils are preserved in the scientific collections for studies. After making the replicas children can identify the pieces they made by comparing them with the pieces presented in a didactic paleaontology kit.

Workshop on cave painting

This workshop has as its main goal to present cave paintings to children and to stimulate their creativity by producing their own paintings using natural paints made of vegetable materials. They learn about the prehistorical people who lived in the State of Minas Gerais, where we are located, and how they used the cave paintings to tell their story to future generations.

Visit to the research laboratories and the scientific collections

A guide takes the children to visit the research labs and collections. They can see how the collections are organised and meet a researcher who explains to them the importance of the research currently being done and answers their questions. After the visit, children are encouraged to write about what they have learned.

Through these activities we provide an educational experience, which derives benefits from the active participation of the children. ‹›

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Following visitors and what it tells us

The use of visitor tracking to evaluate 'Spirit of the Jaguar' at Chester Zoo

by David Francis (Research Assistant), **Maggie Esson** (Education Programmes Manager) **and Andrew Moss** (Education Officer) EDUCATION DIVISION | CHESTER ZOO | UNITED KINGDOM

At the 6th International Symposium on Zoo Design (2005), in Torquay (UK) it was promulgated that the major developments in zoo design in recent years have been in exhibits aiming to engage and inspire the public in new and exciting ways (Innovation or Replication? 2005). This trend for designing exhibits with visitors in mind has been coupled with an interest in finding out how visitors behave in and respond to zoo exhibits.

Looking at some of the exhibits that have been built in recent years, 'Congo Gorilla Forest' at Bronx Zoo ($43 million), 'Masoala Rainforest' at Zurich Zoo ($42 million), 'Gorilla Kingdom' at London Zoo ($10.4 million) and 'Realm of the Red Ape' at Chester Zoo ($7.1 million) reveals that the designing and building of themed and immersive exhibits is now a multimillion pound industry. It is therefore understandable that zoos should want to try to determine whether such exhibits are successful in meeting their objectives. Part of that understanding is to study visitor behaviour.

Visitor Studies

Evaluation of teaching and learning practices, both formal and free-choice, is becoming an increasingly important part of the zoo educator's role. The World Zoo and Aquarium Conservation Strategy (WAZA 2005) states that it is "… essential that zoos and aquariums use a variety of methods to evaluate the impact of their education and training programmes." EAZA's recent decision to join the Visitor Studies Association (EAZA News 2007) reflects the growing interest in understanding how visitors behave in Zoos and Aquariums. An additional consideration is that almost every funding proposal for education support requires a statement about how a project will be monitored, evaluated and reported. This article takes an in-depth looks at visitor tracking, a methodology which can be used to study visitor behaviour in zoo exhibits and be added to the educator's evaluation tool box. Visitor tracking typically involves unobtrusively tracking visitors around an exhibit to determine three indicators:

- the dwell time of the exhibit
- the attracting power of exhibit elements
- the holding power of exhibit elements

Exhibit elements include animal enclosures and pieces of interpretation. Typically this method can be best applied to indoor, linear exhibits.

Visitor tracking is a useful methodology from an educational perspective because studies have demonstrated a positive correlation between visitor learning and the time visitors spend in exhibits (Balling & Falk 1980; Raphling & Serrell 1993; Borun et al. 1996). Furthermore, the use of dwell time to quantify visitor experience remains a widely accepted methodology within the field of visitor studies and potentially allows for the comparison of different exhibits between institutions (Ross & Lukas 2005).

In comparison with museums the frequency of visitor tracking studies undertaken in zoos has been sporadic, and certainly no study exists on the scale of that undertaken by Serrell (1998). This study comprised 110 different museum exhibits (14 of which were in zoos and aquariums). From her findings Serrell looked for universals of visitor behaviour across museum exhibits and then attempted to develop criteria by which the success of an exhibit can be judged (Serrell 1998). Those studies that have been undertaken by zoos typically exist in isolation and because they lack a universal methodology are not comparable across institutions (Bitgood & Benefield 1987). For example if visitor tracking studies do not define the size of the exhibit area, using dwell times to make comparisons between studies becomes irrelevant.

This study suggests a methodology that may be applicable for zoos and aquariums wishing to undertake visitor tracking research. If more zoos undertake such research a database of visitor behaviour in zoos and aquariums can be created and from universals of visitor behaviour can be determined, for example the average number of pieces of interpretation visitors are likely to stop at, or the amount of time we can expect visitors to spend in an exhibit of a specific size.

'Spirit of the Jaguar'

The visitor tracking study we are using to illustrate our methodology takes place in the 'Spirit of the Jaguar' (SOJ) exhibit, an indoor, one-way exhibit at Chester Zoo (UK). SOJ was built in 2001 at the cost of $4 million and has an indoor visitor area of 315.6m^2. The interior consists of two themed areas, the larger savannah zone and the smaller adjoining rainforest zone, each zone contains a glass-fronted enclosure housing a solitary jaguar. Both zones contain integral species in separate enclosures. Integral species act to illustrate biodiversity, reminding visitors that flagship species are part of an assemblage of species in an ecosystem. They also provide an alternative animal experience should the flagship species not be visible. During the study the integral species in SOJ were poison arrow frogs (*Dendrobates* sp), butterfly goodeids (*Ameca splendens*) and leafcutter ants (*Atta cephalotes*).

Visitor Tracking Methodology

A sample size of 300 visitors were tracked in August and September 2005. These weeks fall within the school summer holidays when the exhibit experienced a heavy visitor density.

We applied the following data collection methodology:

- The researcher was out of zoo uniform and in "plain clothes" to allow unobtrusive observation of visitors.
- The researcher counted the visitor density in the exhibit before tracking began. The researcher then selected the third visitor group to pass through the entrance to ensure each group was selected randomly.
- Upon entering SOJ, the first member of the visitor group to make a definite movement towards an exhibit element was selected as the representative member of that group.
- Once selected the visitor was tracked around the exhibit and their movements recorded on a map of the exhibit (figure 1).
- Visitor behaviour was recorded as the subject moved around the exhibit. The principal behaviour recorded was whether an individual stopped at an exhibit element. A stop was defined as when, "a visitor stops, with both feet planted on the floor, and head or eyes pointing in the direction of the exhibit element for 2 to 3 seconds or more" (Serrell 1998). A visitor returning to a previously visited exhibit element was not counted as an additional stop.
- The holding power for each exhibit element the visitor stopped at was recorded. Holding power was defined as the length of time a visitor was stationary and looking at an exhibit element (Bitgood et al. 1986).
- When the selected group member left SOJ the exit time was recorded.
- Visitor density was counted once the selected visitor left the exhibit.
- The researcher returned to the entrance of the exhibit and repeated the process for the third visitor group to enter the exhibit once the researcher was in place.

Figure 1. 'Spirit of the Jaguar' contains 39 exhibit elements.

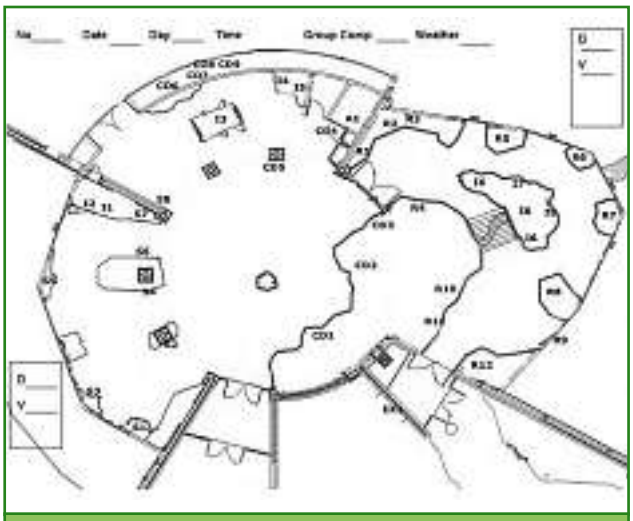

EXHIBIT ELEMENTS			
Flagship Species Enclosures	Integral Species Enclosures	*Interactive Interpretation	**Non-Interactive Interpretation
2	3	18	16

* Interactive interpretation includes video monitors, soundboards, flip panels, scent signs and signs which incorporate tactile models.

** Non-interactive interpretation is defined as signs which consisted of text and images only.

The frequency distribution in figure 2 is skewed to the right. This right skewed distribution is typical of that found for visitor dwell times in exhibits (Serrell 1998).

The skewed nature of the distributions mean that the median is a more accurate measure of central tendency than the mean. The median dwell time for SOJ was 341 seconds (5 minutes 41 seconds). Visit duration ranged from 29 seconds to 47 minutes 54 seconds. There was at least one jaguar visible for 60% of visitor groups tracked. The median dwell time when at least one jaguar was visible was 419 seconds and the median dwell time when no jaguars were visible was 249 seconds. A Mann Whitney test was performed and the result was found to be statistically significant ($p<0.05$).

Results

Overall dwell time

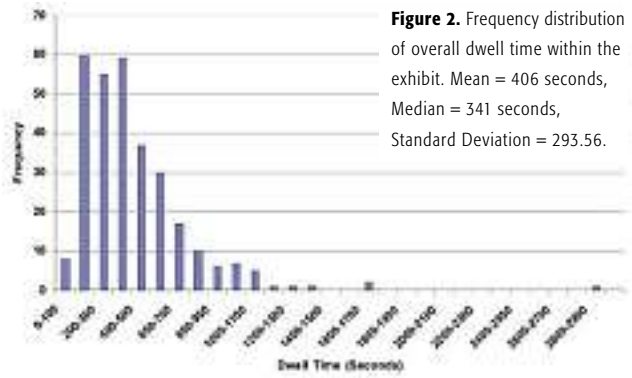

Figure 2. Frequency distribution of overall dwell time within the exhibit. Mean = 406 seconds, Median = 341 seconds, Standard Deviation = 293.56.

Stops at exhibit elements

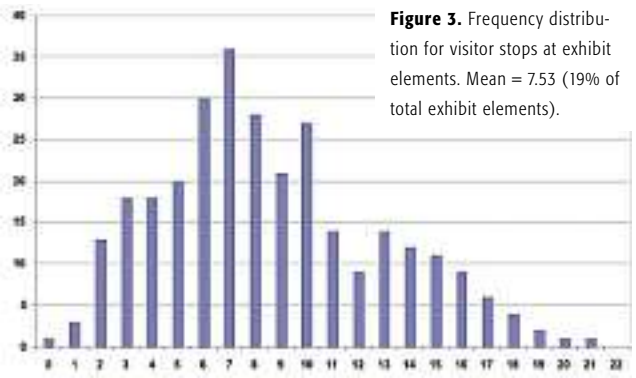

Figure 3. Frequency distribution for visitor stops at exhibit elements. Mean = 7.53 (19% of total exhibit elements).

Exterior 'Spirit of the Jaguar'.

The largest number of exhibit elements stopped at by visitor groups was 21 (53%). The lowest number of exhibit elements stopped at by visitor groups was 0. On average visitors stopped at 7 exhibit elements.

The average visitor stopped at the following exhibit elements: two jaguar enclosures (100% of total flagship species enclosures stopped at), one integral species enclosure (33.3% of total integral species stopped at), three pieces of interactive interpretation (16% of total interactive interpretation stopped at) and one piece of non-interactive interpretation (6.25% of total non-interactive interpretation stopped at).

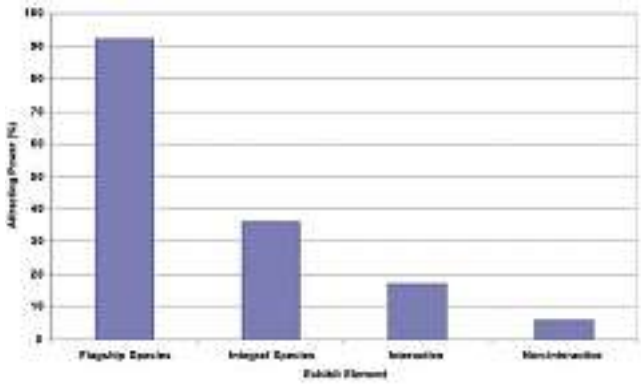

Figure 4. Mean Attracting power (the percentage of visitor groups that stopped) for the four categories of exhibit elements. Flagship species (n=2) = 92.5%, Integral species (n=3) = 36%, Interactive Interpretation (n=18) = 17.06%, Non-interactive Interpretation (n=16) = 5.87%

Attracting power of exhibit elements

Figure 4 shows that there is a clear hierarchy of attracting power with the majority of visitors stopping at flagship species and just over a third of visitors stopping at the integral species. Previous studies have shown live animal exhibits have a higher attracting power than interpretation (Ross & Lukas 2005). Figure 4 indicates that interactive interpretation has on average an attracting power three times than that of non-interactive interpretation.

Holding power of exhibit elements.

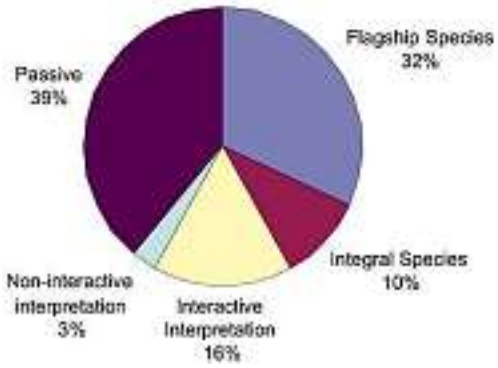

Figure 5. illustrates how visitors spend their time in SOJ.

Figure 5 shows that 61% of that time is spent engaged with exhibit elements while 39% of that time is classified as passive. Passive activity includes any activity not spent stopped at an exhibit element. The average visitor spends 109 seconds at the flagships species, 34 seconds at integral species, 54 seconds at interactive interpretation and 10 seconds at non-interactive interpretation. 133 seconds is spent passively.

Discussion

SOJ achieves a median dwell time of 341 seconds. Whether this can be considered a success for an exhibit of this size is difficult to establish without a sound sample size of other studies with which to compare it. Several studies have been conducted looking at visitor dwell time in zoo exhibits (Marcellini & Jenssen 1988; Phillpot 1996; Ridgway et al. 2005; Ross & Kristen 2005). However, many other visitor tracking studies do not report the dwell time as a median, or state the visitor area. This makes comparison between studies difficult. Only when more studies are conducted that correlate the size of the visitor area with dwell time will we be able to quantify the success of SOJ.

As well as providing us with a dwell time, this study also adds to our existing knowledge of how visitors spend their time within an exhibit. Figure 5 illustrates that a large proportion of a visitors' time in an exhibit is spent passively walking between exhibit elements. When engaged with exhibit elements visitors spend the most time at flagship species enclosures.

Few studies have looked at whether visitors are attracted to integral species. This study confirms that visitors are attracted, but to a lesser extent than to flagship species. The three integral species all had similar attracting powers, attracting around 30% of visitor groups compared to the 90% attracting power of the flagship species. This is unsurprising as large animals are thought to have higher attracting and holding powers than smaller animals (Bitgood and Benefield 1987; Ward et al. 1998).

Interior 'Spirit of the Jaguar'.

Both figures 4 and 5 illustrate that in terms of attracting visitors and holding their attention interactive interpretation is considerably more successful than non-interactive interpretation. Visitors stop at 7 (18%) of exhibit elements on average in SOJ. Of the 14 studies in zoos and aquaria undertaken by Serrell (1998) visitors stopped at on average 35.5% of exhibit elements. However, five of these were temporary exhibitions and three did not contain live animals. They are therefore atypical of zoo exhibits and more research needs to be undertaken to see if these results are representative.

Conclusion

The aim of this study is to add to our knowledge of how visitors behave within our exhibits. The objective is to use that understanding to improve existing exhibits and design new ones more effectively. We hope that this study will encourage other institutions to conduct similar studies and go on to share their findings.

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Conservation Education Programs

at the Bermuda Zoological Society

by Simieon Massey SCHOOLS' PROGRAM EDUCATOR | BERMUDA ZOOLOGICAL SOCIETY (BZS) | BERMUDA

Bermuda is located in the Atlantic Ocean approximately 700 miles off the east coast of the United States. The Bermuda Zoological Society (BZS), a not-for-profit organization, supports the Bermuda Aquarium, Museum and Zoo's (BAMZ) mission "to inspire appreciation and care of island environments." One of the ways that this mission is fulfilled is through educational programs facilitated by BZS. BAMZ is an American Zoo and Aquarium Association (AZA) accredited facility.

The Education Department at the Bermuda Zoological Society (BZS) offers a plethora of teaching activities throughout the year. The goal of the department is to encourage environmental stewardship by providing educational experiences to people of all ages, both residents and visitors. The five member Education Team shares the following responsibilities: the schools' program (courses offered to all classes in Bermuda schools), the interpretation of exhibits, a school grounds initiative entitled "Learning through Landscapes", developing and maintaining activities in the "Discovery Room" (a hands on learning centre for young children) and the publication of a variety of educational materials.

Programs

Programs designed to help teachers meet the requirements of the Bermuda Ministry of Education's Primary, Middle and High School Science Curricula are held at the Bermuda Aquarium, Museum and Zoo (BAMZ). Guided fieldtrips to nature reserves enable children to gain on-site knowledge and appreciation of reserves. Our endemic and native plants and animals are a treasure that most school children are unaware of so this is the perfect opportunity to instil in them a respect for nature. The children are transported to and from BAMZ or the fieldtrips on the colourful BAMZ bus. The former public transport bus was donated to the society and was decorated by local students.

BAMZ Bus.

The **Learning through Landscapes Bermuda** (LTLB) programs assists schools in developing their school grounds into educational resources and helps create learning areas to enhance the formal curriculum.

Teachers are encouraged to borrow **Publications, Resource Boxes and Book Bags**. The publications are a series of Project Nature Field Study Guides for

Bermuda's marine and terrestrial habitats. They include background information, identification guides for common species, field trip and simple data collection suggestions with worksheets that can be used for children of all ages. A complete set of the series is donated to schools and public libraries. Resource boxes are teaching kits on specific topics available for loan to teachers. They include books, DVDs, posters, activities, worksheets, specimens, folders of information etc. Book bags are a collection of books on a specific topic.

Teacher workshops take place on the facility and at nature reserves to highlight the educational programs available through BZS.

Discovery room.

The Discovery Room is a fun, interactive learning centre for young children and their adult companions. The room features rotating themes such as Camouflage/ Animal Coats, The sea around us, Birds and the Rainforest. Children enjoy opening 'discovery doors', putting puzzles together, examining interesting things such as feathers, shells and nests, dressing up as animals such as a bee, making paper plate caterpillars and many other crafts!

Junior Volunteer (JV) Program. This is a weekend program that takes place throughout the school year for school children aged 14 to 16. The students volunteer for one morning on the weekend with the opportunity to work in each of the areas of BAMZ – the aquarium, zoo, education, invertebrate house, and coral reef section. At the end of each rotation they participate in a fieldtrip. The graduating JV's this year will be visiting Baltimore for a week. They have a fun packed schedule of visiting the Smithsonian Natural History Museum, the National Aquarium in Baltimore, the National Zoo, the Maryland Science Center, joining a wetland conservation project at Fort McHenry and experiencing the festivities of 4 July 2007.

All of these opportunities are offered free of charge!

Camps are offered during the school year holidays, Christmas, Easter and summer. The Bermuda environment and the exhibits at BAMZ provide the rich and diverse content upon which the camp programs are based. Developmentally appropriate activities and experiences help the children to develop an interest in and knowledge of the environment and help to create the building blocks of a sound conservation ethic. "Hands-on" nature activities, animal interactions, field trips to Bermuda's special places, arts and crafts, practical conservation projects, microscope investigation and daily swimming or snorkelling under the guidance of trained staff provide a fun, safe learning experience for children from pre-school age to primary six.

Nature Encounters take place on the weekend for children and adults. Nature encounters for children cover a wide variety of topics that can be explored in depth at BAMZ. One such topic is "coral reefs". The children learn about coral reef life through songs and finger rhymes, constructing a "coral reef cake" and then eating it with great relish! Adult and family activities include snorkel tours, turtle eco-tour, guided walks through Bermuda's nature reserves and eco-tours at private islands that include swimming and a picnic lunch.

Aqua Camp Nonsuch Island.

BAMZ hosts a two day **environmental youth conference** every two years. The program focuses on teaching young people what they can do to help preserve Bermuda's environment. Delegates aged 10 to 17 years of age and teachers from all schools are invited to attend. Each conference includes Interactive Biodiversity Stations (Native and Endemic Species of Bermuda, Invasive Species in Bermuda, Uses of Biodiversity, Conservation in Bermuda (using the Museum), Marine Biodiversity (using the Aquarium & Local Tails exhibits), fieldtrips, and guest speakers.
This year field sites visited by delegates explored how we impact the environment. Sites included the John Barritt & Son Bottling Plant, Tynes Bay Waste Treatment Facility, Marsh Folly Composting Facility and Mill's Creek and the Hamilton Sewage Treatment Facility. A variety of beautiful wilderness sites were selected so the children could learn about some of the natural treasures that still remain in Bermuda and why they are important. Groups of delegates had the opportunity to cull and plant at the ABS nature reserve, collect and analyze trash at Coney Island, survey the public about their views on the environment in Hamilton, conduct amphibian research with Dr. Jamie Bacon at Cloverdale pond and build bluebird boxes and inspect a Bluebird Trail. They learned how to convey environmental messages through drama, to propagate native and endemic plants, to make a skink habitat in a garden, and to reduce a family's ecological footprint.

The **Nonsuch Island Natural History Camp** is a week long camp for a select group of students in Grade 10 or equivalent. The camp takes place on Nonsuch island 'Living museum' project. This project has become an internationally recognized example of the success that can be achieved by taking a holistic approach to ecological restoration. All invasive introduced species were removed and transported off the island by hand and the original native and endemic species were re-introduced within their original context. There are strict regulations that must be adhered to in order to protect the unique features of this reserve. Landing is restricted to guided tour groups based on written permission.

Selection for this prestigious camp is based on a student essay and science teacher recommendations. The students live on Nonsuch Island, camping out under the stars and bathing with solar showers. There are daily excursions to the mainland to study native plants and animals in Bermuda's habitats, boat trips to coral reef sites and Harrington Sound and evening lectures on Bermuda's natural history by local scientists. In the

North Rock Tank Fish Class.

words of a past counsellor, "this week of natural history and camping may be the most enjoyable and interesting week of your life!"

The **Bermuda Natural History Course** is open to Bermuda's public. Lectures and corresponding field trips are offered each week for thirteen weeks of the year and cover the basics of Bermuda's Natural History.

New developments

Education at the BAMZ is one of our highest priorities. Interns have the opportunity to gain hands-on experience in several of the activities of a busy and vibrant informal learning institution. Interns will have the opportunity to assist with teaching and interpretation, the Learning through Landscapes program and visitor studies.
In summer 2007 BAMZ and the Botany sea turtle project in South Carolina will initiate an intern exchange program. The one week intern exchange will introduce high school students to global sea turtle conservation through management and outreach projects.
Moreover, the acquisition of a new 46 foot outreach vessel and the exclusive use of a private island will expand our education and conservation programs. The adult nature encounters will be enhanced with the use of Trunk Island. We will now be able to provide visiting classes with a half-day field trip complete with on-board lectures and practical hands-on collecting and snorkelling expeditions and we will have the ability to conduct marine experiments in the field,

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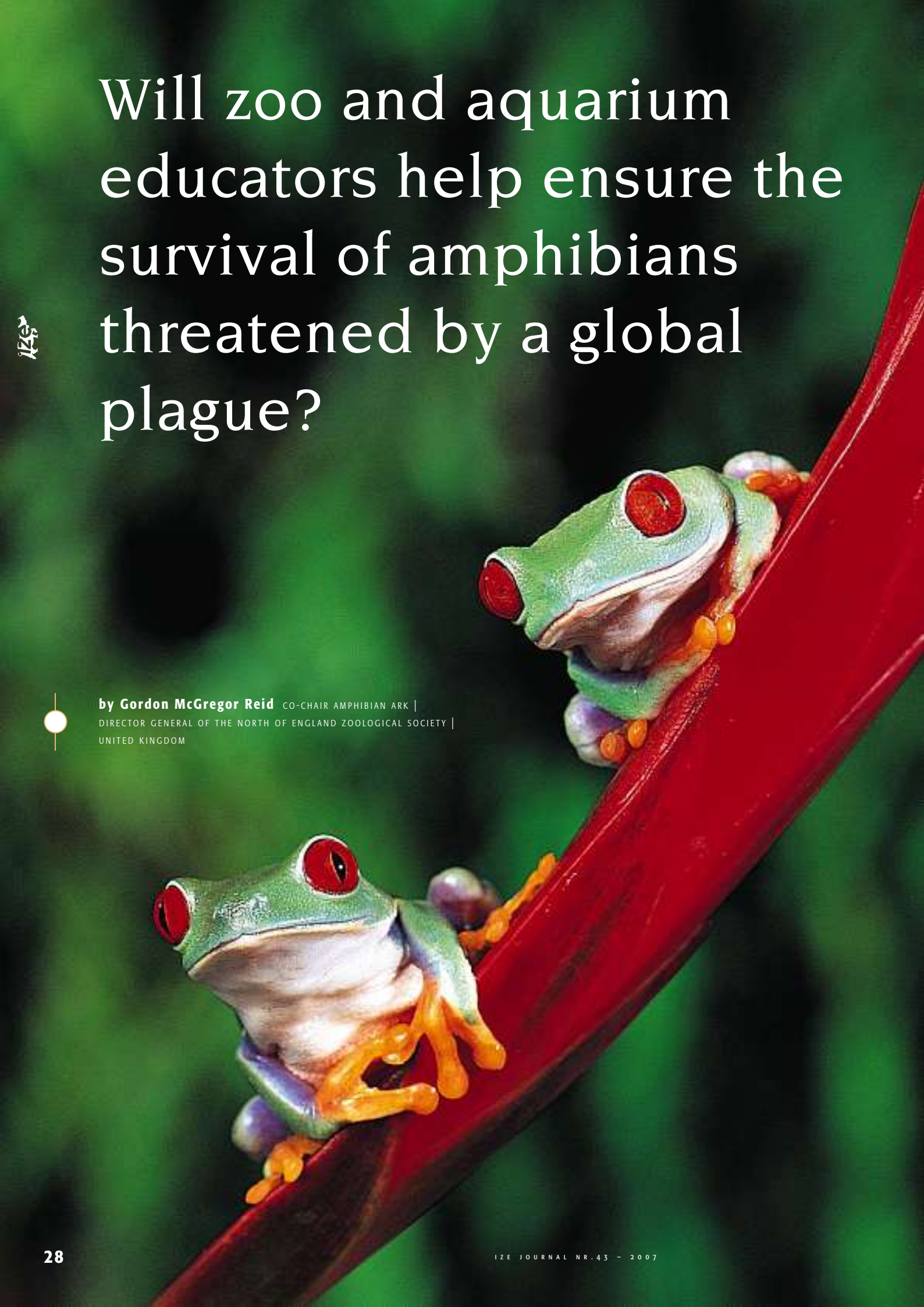
Will zoo and aquarium educators help ensure the survival of amphibians threatened by a global plague?



by Gordon McGregor Reid CO-CHAIR AMPHIBIAN ARK | DIRECTOR GENERAL OF THE NORTH OF ENGLAND ZOOLOGICAL SOCIETY | UNITED KINGDOM

Red-eyed Tree Frogs (*Agalychnis callidryas*) *Photo © Getty Images*

Many of us will have experienced the youthful pleasure of collecting frog spawn in a local pond, watching the resulting tadpoles develop and reintroducing the froglets back to their pond. For those persons who, like me, have eagerly pursued natural history throughout life this exercise is likely to have been repeated in some form or other in school, college and university – or in the zoo, aquarium or wildlife organization where we now work. In all of this there is the reassuring familiarity of an unending cycle of eggs, sperm, fertilization, embryos, development, feeding, growth, change, maturation, adulthood and mating. These main elements of the 'frog story' are, of course, general for animals with backbones, including humans, and indeed for many 'mini-beasts' with-out backbones. We are, in fact, observing an ancient developmental process in amphibians which in many respects parallels the evolution of life itself. The fascinating learning experience that we gained as children will have been fundamental to our basic understanding of the biological mechanisms for reproduction, survival and seasonality; and to later environmental insights. We can, through simple observation and understanding of frogs, toads and newts, develop a scientific and educational model for the metamorphosis of life, its persistence

Horned Frog (*Ceratophrys ornata*)

Photo © Digital Vision

in the short and long term and the necessary conditions for a prospering ecology. The 'frog story' is somehow integral to our own growing up and sense of awareness of the natural world and the health of the planet.

Let me disturb this comforting reflection and state that, without the help of zoo and aquarium educators among many others, this 'frog story' could come to an abrupt

Red-legged Frog (*Rana aurora*)

Photo © Getty Images

Photo © Douglas Sheriff/Chester Zoo

Ex situ management will play a vital role in securing the future of species such as the Golden Poison Dart Frog (*Phyllobates terribilis*).

and ghastly end. Imagine a near future world where children could no longer see frogs, toads, newts and other amphibians in the wild because they are all extinct, wiped out by a killer plague. This means dead ponds and ditches, no croaking frogs in spring in the temperate zone or at the beginning of the rainy season in the tropics, no spawn, no tadpoles … no amphibians … forever. How would you and the children and adults that you educate feel if this came to pass? Perhaps educators or others might be disbelieving, puzzled, possibly upset, sad or angry. Alternatively you might be perturbed but believe that there are many far more significant and high profile global issues to concern us and concentrate on.

Whatever the case, and independent of private reactions, this dramatic 'mass extinction' or 'doomsday scenario' is far closer to present-day reality than might at first be imagined. Amphibian populations and species are everywhere in steep decline and there is now a conservation crisis on a historically unprecedented scale. From data published by the IUCN Global Amphibian Assessment (GAA), there are currently about 2000 threatened species on the official Red List, of which 456 are critically endangered and up to 1000 in urgent need of help through rescue and recovery programs taking place outside of the natural habitat. So far, the headline figure of threatened species represents about one-third of the number recognized (6000). This is 22% of the likely total number of valid species (9000) that, on current projections, includes those yet to be discovered and scientifically described; and which category is likely to contain many critically endangered species in addition to those so far listed. At least 165 amphibian species extinctions (or 8% of those threatened) have been confirmed from 1980 to date. The great litany of difficult-to-pronounce Latin names of extinct species – such as A*telopus igniscens*, P*lethodon ainsworthi* and H*yla calypso* – disguises an absolutely tragic loss of biological diversity. This diversity encompasses wonderful forms, functions and lifestyles and is geographically and ecologically widespread. We are contemplating the loss of an extraordinary biology, biogeography and, indeed, beauty. The extinct B*ufo periglenes* was, for example, a vivid golden color in life and the extinct R*heobatrachus vitellinuus* and R. *silus* were 'gastric brooding' toads which raised tadpoles and froglets inside of their mouths.

But why should anyone be particularly bothered about the fate of small frogs and their amphibian allies even if they are sometimes brightly colored or have curious lifestyles? The short answer is that no one really knows what the ecological, economic or other consequences of this loss would be for humans and other animals. Nonetheless, likely or possible 'knock-on' effects might be an initial explosion in the numbers of particular insects, including pest species and disease carriers – a major food for frogs. One can also reasonably anticipate that the many predators of frogs and tadpoles would decline in the absence of an alternative food source. These predators include species of invertebrates, fishes, amphibians, reptiles, birds, and mammals. In both of the foregoing instances there would probably be complex second-order 'boom and bust' effects through ecological food webs.

Splendid Leaf Frog (*Cruziohyla calcarifer*)

Photo © Douglas Sheriff/Chester Zoo

While the loss of any one individual species might not be hugely consequential in the grand scheme of things, what might happen if we experience a mass extinction of all of the species now threatened? That is to say, what if we lose the greater part of one of only four classes of 'land animals' (the others being the mammals, birds, and reptiles, most of whose contained species live much or crucial parts of their lives on land). Imagine the world's terrestrial ecosystem, as a table with the supporting legs represented by the four land vertebrate classes. One of these legs is badly deteriorated and it looks as if it could give in – will the rest of the table become unstable or collapse as a result? For the entire global ecosystem (terrestrial and aquatic) we certainly have to consider the unpredictable and probably negative consequences following the loss of a major part of the biomass of many habitats; and the loss of a large part of one of only five major evolutionary units of the vertebrates (fishes being the fifth unit). Is anyone prepared to take the chance, adopt the 'do nothing' option and gamble on a positive outcome?

Oriental Fire-bellied Frog (*Bombina orientalis*)

Photo © Digital Vision

There are also socio-economic issues to consider. What, for instance, would be the social, medical and financial consequences of an increase in the incidence of human and animal malaria (the disease vector mosquitoes having previously been eaten by frogs)? Frogs and other amphibians such as axolotls are, in turn, eaten as part of the staple diet in some countries and the sustainable sale of protein-rich frog meat forms a significant part of developing rural economies. The skin of amphibians exude remarkable chemicals which may well be of considerable pharmacological and commercial significance to produce, for example, neuro-anaesthetics, wound-healing substances and potential anti-cancer drugs. Frogs are, in fact, living 'molecule mines' from which ethical and humane 'bio-prospectors' could extract many useful and beneficial compounds.

Mossy Frog (*Theloderma corticale*)

Photo © Douglas Sherriff/Chester Zoo

In terms of benefit sharing for indigenous peoples and diversifying income streams, the 'biodiversity hotspots' for frogs in tropical countries offer substantial development potential.

So what can educators do? There are certainly challenges in presenting the case for amphibians, not least because of their relatively small size and (for some) a lack of 'charisma' by comparison with the large land mammals. For those seeking educational inspiration please read the classic paper by William Conway on 'How to exhibit a bullfrog: a bedtime story for zoo men' [Curator 2(4), 1968]. As regards contemporary extinction issues the short answer is that educators urgently need to communicate this story in all its simplicity (and complexity). They need to do this far and wide to help promote positive action and galvanize resources.

The causes of the decline are multi-factorial and involve, in various combinations, the usual issues of habitat destruction, fragmentation or loss, pollution (both industrial and agricultural), over-harvesting, disease and probably the growing ecological impacts of climate change. Disease, mainly in the form of a chytrid fungus (*Batrachochytrium dendrobatidis*), is now the factor most commonly associated with catastrophic declines and extinctions of amphibian populations and species. The disease seems to be most deadly when the frogs are stressed by other factors such as excessively high temperatures. The fungus was first recognized in 1938 in the African clawed toad (*Xenopus laevis*), which is believed to be largely resistant to its effects. This clawed toad has been used in laboratories worldwide in testing for human pregnancies. With the discontinuation of this form of testing these clawed toads were everywhere released by well-meaning laboratory staff – so, it seems, spreading the fungus to indigenous species that had little or no resistance and for whom the chytrid infection could be

lethal. However, this 'out of Africa' hypothesis remains to be thoroughly tested. In any event, the burgeoning global pet trade in live amphibians has likely facilitated the spread of the disease. Most of the extinctions are likely to involve chytridiomycosis but the fundamental research to establish this still needs to be completed. In any event, this disease is now well-established and spreading in all amphibian inhabited continents and in notable islands, including the UK and Japan.

There is a global IUCN Amphibian Conservation Action Plan or ACAP (publication pending) for all stakeholders to follow. Also, the World Association of Zoos and Aquariums (WAZA) have responded to this crisis by making a formal declaration at their annual conference in New York, 2005, calling on the global zoo and aquarium community to address the amphibian crisis using their unique, specialized skills. In February, 2006, WAZA and the IUCN/SSC Conservation Breeding Specialist Group co-organized a workshop in Panama to bring together experts from around the world to formulate a detailed ex situ action plan and specific protocols in support of the ACAP. An Amphibian Ark (AArk) was formally constituted at a follow-up meeting in Atlanta, Georgia, February 2007. This established a foundation partnership between WAZA, CBSG and the IUCN/SSC Amphibian Specialist Group. The vision of the AArk is the world's amphibians safe in nature and its mission is *working in partnership to ensure the global survival of amphibians – focusing on those that cannot be safeguarded in nature.*

The AArk now has an active program of worthwhile and practical activities which includes the development of biosecure facilities to rescue and treat, maintain and breed representative populations of threatened amphibians. Associated activities are the documentation, categorization and prioritization of species, training exercises around the world and the organization of a

Morelet's Treefrog (*Agalychnis moreletii*)

Photo © Douglas Sheriff/Chester Zoo

Monkey Frog (*Phyllomedusa bicolour*)

Photo © Douglas Sheriff/Chester Zoo

global educational and awareness campaign for 2008 entitled 'Year of the Frog'. The AArk has recruited several core members of staff and has an Executive Committee and a Steering Committee representing the interests of individual zoos and aquariums, national, regional and international associations (including the IZE), museums, botanical gardens, universities and the private sector. Generous funding has come in from many sources, notably from the distinguished amphibian biologist, conservationist and pioneer zoo educator George Rabb and his friends. They have given these donations as a most fitting tribute to the life of the late Mary Rabb.

The demise of frogs is continuing to take place in pristine habitats and so it is now evident that they are not safe in the wild. For many amphibians the only immediate hope is rescue, veterinary treatment and conservation breeding *ex situ*. There remains positive but, regrettably, more distant prospects of developing a cure for this disease and also programs for re-introduction when conditions become appropriate. The amphibians are certainly prime examples of the traditional 'Ark approach' long held by zoos to be a vital conservation backstop in the event of prospective extinctions in the wild. With the strong support of the International Zoo Educators there will be global public awareness, understanding and associated support; and a far greater prospect that many species of frogs will survive for future generations to appreciate.

Zoo Education in India: Challenges and Opportunities

by Mamata Pandya (programme director) **and Meena Nareshwar** (programme coordinator)
CENTRE FOR ENVIRONMENT EDUCATION (CEE) | INDIA

India is recognized as a country uniquely rich in all aspects of biodiversity – ecosystems, species and genetic. Over the centuries people in India have had a fascination and respect for this natural heritage. The world's first recorded conservation measures, especially for wildlife, were enacted in India during the third century BC. Through the ages this concern has manifested itself through all ages and historical periods. Today there are 33 Botanical Gardens, 275 Zoological Parks, 89 National Parks, 504 Sanctuaries, and 10 Biosphere Reserves in India. In recent years, zoo education is gaining recognition as an important tool in sustainable development.

National Zoo Policy and Zoo Education

At present there are over 180 wildlife facilities which are recognized as zoos in India. These attract as many as 50 million visitors annually. They include urban, rural, literate and illiterate populations. Zoos in India are managed as per the provisions of the Wild Life (Protection) Act, 1972 and guided by the National Zoo Policy, 1998.

The Policy details the strategy Indian zoos need to adopt so that the national efforts in conservation of the rich biodiversity of our country is strengthened.

Founded in 1855, the Arignar Anna Zoological Park was the first public zoo in India.

It further highlights the need for adequate financial and technical resources for effective functioning of zoos in the country. The Policy also lays emphasis on coordination between the zoos and eminent research and education institutions on various aspects of Zoo Management. It aims at giving proper direction and thrust to the management of zoos by mustering cooperation and participation of all concerned.

The Policy also acknowledges that in a time in which wildlife habitats are under severe pressure and a large number of species of wild fauna have become endangered, zoos should not only to sustain their own populations but also augment the depleting populations of endangered species in the wild.

The Central Zoo Authority(CZA) was constituted in 1992 by the Government of India under the Wildlife Protection Act, with a mandate to assist India's national effort to conserve wildlife. All Indian zoos are required to be officially recognized by the CZA. The CZA also regulates the trade of wildlife recognized as endangered species.

The National Zoo Policy includes clear clauses with respect to Education and Outreach Activities of zoos. These are quoted below:

SOURCE: NATIONAL ZOO POLICY 1998

- Each zoo should have a well-drawn-up plan for educating the visitors as well as others in the community. Zoos shall keep a close liaison with other ex situ facilities in this regard.
- The central theme of the zoo education programme being the linkage between the survival of various species and protection of their natural habitat, enclosures which allow the animals to display natural behaviour are crucial to zoo education. Zoos shall, therefore, display animals in such enclosure only where the animals do not suffer physiological and psychological restraint.
- Attractive and effective signage methods and interactive displays to explain activities of various species to visitors, published education material and audio-visual devices are proven methods for driving home the conservation message. A formal education programme should also be pursued for strengthening the education message.
- Besides signage, the zoos shall also use guided tours, talks by knowledgeable persons and audio-visual shows for effectively communicating the message of conservation to the visitors.
- The help of universities, colleges and non-governmental organisations shall be taken to educate the students about the benefits of supporting nature conservation programmes.
- To provide the urban population with a window to nature and to serve as green lungs for the polluting environment, zoos shall extend their expertise and help to State Governments and local authorities to create nature parks extending over extensive areas near big cities.
- Zoos shall provide basic civic amenities to the visitors like toilets, drinking-water points, shelters and first-aid facilities. Ramps shall also be provided for the benefit of visitors in wheelchairs for approach to animal enclosures and other civic amenities.
- Zoos shall not provide any infrastructure for recreation/entertainment of visitors that is inconsistent with the stated objective of zoos.

Arignar Anna Zoological Park, Chennai is one of the largest zoos of South-east Asia.

Education and Interpretation in Zoos: Challenges

The World Zoo Conservation Strategy (1993) emphasizes that the use of a variety of educational techniques, facilities and considerations, together with knowledge, creativity and inventiveness can make zoos highly interesting, attractive and effective places for environmental, conservation and holistic life system education.

It is well recognized that living animals clearly have an enormous power of attraction and are the great and unique feature of zoos and form the very basis of zoo education. Zoos displaying live animals can capture the attention and affection of the public for wildlife and nature like no other institution.

The challenge for zoos is to provide meaningful, educational information, activities and experiences for this wide range of zoo visitors and while at the same time retaining the recreational value of the visit.

Some key areas that need to be addressed in Indian Zoos are:

A. On-site Interpretation There is a good deal of variation in the status of interpretation and educational programmes in zoos in India. Signage is of varying quality in terms of both information and design. Signage needs to be designed and developed using local skills. The text for signage needs to be developed in various vernacular languages catering to the diverse audiences visiting Indian zoos.
Interpretation centres are rare. The range of methodologies and techniques used for education/interpretation is very limited. The potential to involve volunteers and animal keepers in this area is not effectively tapped.

B. School Education Links While zoos are a popular destination for school visits, the full potential of converting such visits into enriching and meaningful education opportunities has not been adequately explored. This entails developing relevant resource material, teacher orientation, trained educational staff within the zoo and proactive outreach programmes.

C. Training and Capacity Building There is a need for more focused training and capacity building for all levels of zoo staff—from the management to the animal keepers. Developing a cadre of educators from among the zoo staff and interested individuals would greatly strengthen the education and outreach programmes of zoos. However, most zoo arrangements are constrained by shortage of resources—financial, human and expertise in this area.

D. Networking and Sharing One of the greatest training-learning opportunities is that of sharing experiences and skills with colleagues in similar facilities or situations. In the case of zoo education it is especially important for zoo managers and staff to interact with educators and interpreters as well as conservation organizations. This provides opportunities for mutual understanding of the educational potential of zoos, ideas for enhancing this potential, while also keeping in view the other mandates of the zoo as well as constraints. Such collaborations could address the requirements of getting relevant expertise for developing interpretation centres and programmes, publications, signage etc. Equally critical is identification of support to sustain zoo educational programmes and initiatives.
Exploring public-private partnerships and sponsorships is increasing, and needs to be considered seriously.

E. PR and Marketing Relations with media and attracting sponsorship have always been difficult areas.
Marketing and Publicity of the zoo and its programmes is a crucial issue that needs to be addressed in zoos.
A detailed communication strategy needs to be developed for this, and collaborations, partnerships and networks with zoo and its activities and programmes needs to be strengthened.

Towards a Zoo Education Master Plan for India

Zoos are ideally placed to encourage public support for conservation campaigns, action and political advocacy. Through focused activities, displays, campaigns and information about the choices people can make in their everyday lives, zoos can help visitors make a difference to wildlife. This role takes on an added importance in the UN Decade of Education for Sustainable Development (2005 - 2014).

The Centre for Environment Education (CEE) has been commissioned by the Central Zoo Authority of India (CZA) to develop a Zoo Education Master Plan for the Zoos of India. The process currently underway seeks to address some of the felt needs, and recommend ways to address the challenges.

Zoos in India attract as many as 50 million visitors every year.

The principal components of the Zoo Education Master Plan are:

Understanding the Visitors

Who are the zoo visitors? Why do they visit zoos? What do they expect from the visit? And what will make them come back? While developing a Zoo education plan it is vital to know for whom the programmes are being developed. A sample visitor survey/profile study is to be undertaken to understand better the composition of zoo audiences in different parts of the country, before developing any education and interpretation package/programme. This would be useful baseline data.

Interpretation

Interpretation is a tool as well as a technique for doing education and communication. The plan will suggest strategies and methodologies to introduce and enhance interpretation opportunities including signage, exhibits, enclosures and interpretation centres.

Examples and case studies will demonstrate how exhibitions, displays, visitor interactions, trails, keeper talks all provide opportunities for visitors to learn and appreciate wildlife, diversity of life, habitat needs and conservation issues and interpretation programmes aim to convey strong messages about biodiversity and conservation.

Education for the General Public

As zoos are visited by large numbers of people and form a potent mass education tool about the close linkages between protection of natural areas and maintaining the life supporting processes of nature. The plan will highlight how well-planned and appropriately designed zoos can sensitize visitors to the dangers of a hostile or indifferent attitude towards nature and inspire in zoo visitors empathy for wild animals, as well as an understanding and awareness about the need for conservation of natural resources and for maintaining the ecological balance.

Zoos are popular destination for school visits.

Interpretive signage in many zoos leaves much to be desired.

School Programmes

Children and school groups constitute a major part of visitors. Zoos can therefore, be used by teachers as places to sensitize students regarding the need for conservation of our biodiversity. As part of the plan, a variety of publications are planned for educators to facilitate how an array of biological and other themes can be explained through zoo education. These include themes such as animal adaptations, behaviour, reproduction, nutrition, and also complex subjects such as evolution and ecology.

Suggestions and guidelines will be designed for outreach programmes for school and college groups, which help them understand curricular concepts. Celebration of events like Wildlife Week, World Forestry Day, Animal Welfare Fortnight etc., school visits, training programmes, celebration of animal births, new animal enclosures talks, lectures, screening of wildlife films, live animal shows, keeper talks, conservation clubs are different kinds of outreach programmes that will be explored.

Appropriate Resource Material

Handbooks for zoo management as well as institutions doing zoo education will include ideas on a variety of resource materials like activity kits, manuals, handbooks, workbooks, charts, brochures, posters, stickers, labels etc. These will draw upon examples from around the world as well as India. Basic information on flora and fauna common to most zoos will be provided in reader friendly formats, while ensuring factual accuracy.

Training and Capacity Building

The plan will address the needs of training and capacity building programmes for zoo staff, animal keepers, veterinary staff, volunteers, teachers, and NGOs.

These training programmes aim at developing skills for education and interpretation in zoo staff, animal keepers and other personnel.

Internships and exchange programmes with zoos of the country and abroad would also be explored.

An overview and exposure to the different types and

CEE's Zoo Education and Interpretation Programmes

The Centre for Environment Education (CEE) is a national institution engaged in developing programmes and material to increase awareness about the environment and sustainable development. CEE was established in 1984 as a Centre of Excellence in Environmental Education, supported by the Ministry of Environment and Forests (MoEF), Government of India.

CEE aims at increasing the value of environmental education in zoos and other similar facilities. The thrust of CEE's Zoo Education programme is to enhance the nature experience by providing on-site information through signages, exhibits, orientation and visitor centres encouraging visitor awareness and public commitment to the cause of conservation.

CEE also develops publications and relevant zoo literature like zoo brochures, guides, manual, handbook etc. for students, teachers and also zoo visitors, and organizes training programmes for teachers and zoo staff, aimed at developing skills for using zoos as effective educational opportunities.

For more information: www.ceeindia.org and www.kidsrgreen.org

CEE Publications developed for Zoo Education Programmes.

range of programmes executed by zoos all over the world would be included.

Networking

Networking and building partnerships with like minded institutions locally, nationally and internationally is a critical need. The plan will examine the scope and strategies for liaisoning closely within and between zoos and their programmes, as well as sponsorships and lobbying for funds and grants from corporate bodies and companies.

The work on developing the Master Zoo Education Plan for India commenced in July 2006. The process includes compilation of data from zoos across the country and interactions with zoo directors and other stakeholders in zoo education, towards formulating recommendations and developing a blue print for action. The process will be completed by July 2008.

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Interpretation Centre at a Butterfly Park in a Zoo.

Even butterflies can be interpreted.

Creating an interactive marine experience

by Michelle Moodley GUEST RELATIONS GUIDE | NPC SEA WORLD EDUCATION CENTRE AT USHAKA MARINE WORLD | SOUTH AFRICA

In the NPC Sea World Education Centre at uShaka Marine World we are fortunate to have many resources available to create an interactive and hopefully lasting impression on the minds of visually impaired children. In creating this experience one has to consider a number of factors – these are young children with a limited attention span. They need focused stimulation for a limited time period (between 20 to 30 minutes) and then they lose interest in the subject, so one has to design specific experiences to capture their imagination.

For visually impaired children aged 2 to 12 years

Visually impaired children rely on their senses of hearing, smell, taste and touch. Their sense of touch is heightened and, as a result, they are very sensitive to rough or sharp surfaces. One universal fact is that children will learn while they are at play so we tried to create an indoor beach area for them to utilize in our wet lab facility.

The wet lab facility is a room in the education centre that has a tiled floor and has holding tanks for live specimens and also has all of our dry specimens that are used for our lessons and courses. Three members of staff introduce and demonstrate the tasks as needed. Besides the wet lab experience, the group is also given the opportunity to experience a general guided tour through the aquarium and attend a dolphin show. Due to the group having different abilities they can also enjoy the behind the scenes experience with the dolphin training staff.

Groups of visually impaired children have been attending the education centre for a number of years and as we have suitable specimens we can offer this experience. In fact, the NPC Sea World Education Centre at uShaka Marine World has offered experiences to all groups which have different abilities since the Education Centre was created in the 1970s.

The wet lab experience

This particular interactive marine experience, which was designed in 2005, aims at utilizing the children's current abilities and to create a memorable experience for them as they would not achieve the most benefit from our existing tour of the aquarium facility. The program is designed to be 1 hour long but depending on the attention capabilities of the children it may take 30 minutes in total.

The wet lab facility.

The pool with seawater and soft toys is located at the centre of the room, on the floor and children can sit around the pool and play. Adding some beach sand around the pool is an option, but you will find this

Children feeling for objects in the touch pool.

In our wet lab facility the following equipment is set up:

DRY TOUCH

Sandboxes –filled with sea sand

1. Treasure hunt – the aim of this activity is to dig in the sand and find the hidden items: a variety of shells of differing sizes and rubbish such as cans, packets and fishing line, which teaches them to put waste in the bin rather than littering.
2. Turtle nest – the kids get to find the eggs and hatchlings, helping children to realize that turtles lay eggs on the beach where we go to play and swim.
3. Build sand castles – if they want to, allowing them to use the sea sand and enjoy the texture.

Dry specimens

1. Shark skin – rough grainy texture like sandpaper, due to skin teeth (dermal denticles).
2. Stingray teeth – flat pavement teeth, like two rolling pins, to grind and crush food.
3. Large fish – touch scales, eyes, teeth fins and the whole body, allowing for exploration of the size of the fish.
4. Turtle – touch the hard and sometimes smooth shell, the head, and the mouth area which is like a beak for some turtles according to what they feed on.
5. Coral limestone skeleton – rough sharp edges, to teach the children about the colonial polyp animals that make up the coral.

WET TOUCH – very stimulating for visually impaired –

The caregivers remarked that touching water is a great experience so this knowledge is used in the following way:

1. Touch and smell – two types of algae in seawater for the kids to touch different textures (leafy and stringy).
2. Touch and smell and taste – pool filled with sea water holding soft plastic toys. Children have to find these animals and staff are on hand to help them to identify by characteristics e.g. how many legs does it have – crabs, eels, fish, octopus. They can taste and smell seawater using a spray bottle to create sea spray.
3. Live touch – a black sea cucumber is placed in a dish of sea water and children are allowed to touch – soft bodied animal with pliable texture.
4. Touch – box of homemade jelly/gelatin (like touching a real jellyfish). This is a definite favourite. By the end, this is a box of jelly mush – great sensation for the children to squeeze the jelly between fingers.
5. Smell and touch – fish food (sardine, redbait, mussel, squid, prawn). The children enjoy the different textures and they smell their hands after the touch.

creates a real mess when you need to tidy up. Around the pool there are sand boxes and dry touch specimens. On a counter there are items for the wet touch experience: the dish with jelly, algae in seawater, live sea cucumber and the food from our own aquarium kitchen – sardine, squid, redbait, prawn. When the kids are finished enjoying this experience they will need to clean up so a bathroom or basin area to wash up, preferably in the near vicinity is essential.

This particular activity does not include many sound effects as these children had been exposed to the dolphins and the sounds they made earlier in the day; when the children are accompanied to our back-of-house area where the dolphins are housed, they are given the opportunity to touch some of the food (fish) that can be fed to the dolphins. During this experience, they will hear the dolphins perform natural calling sounds to each other.

These activities certainly open up a whole new world to a group of visually impaired children, who may otherwise never have fully experienced our aquarium or the marine environment. They leave the facility having thoroughly enjoyed them and learnt a little more about the world around them. Although there has been no formal evaluation of the experience, the children and the accompanying caregivers (adults) have reported positive and enlightening feedback e.g. water is an effective stimulus for these children and any water based specimens are memorable.

Touching a sea cucumber.

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Iganyana Bush Camp

by Wilton Nsimango ENVIRONMENTAL EDUCATION OFFICER | PAINTED DOG CONSERVATION | ZIMBABWE

The Painted Dog Conservation (PDC) Project's purpose-built environmental education camp for school groups.

The location

Iganyana Bush Camp is surrounded by Sikumi National Forest, on the border of world-famous Hwange National Park. It was carefully built into a beautiful teak woodlands community with as little disturbance as possible, so it is totally immersed in the woods. The area is part of an intact African savanna ecosystem, where elephant, giraffe, lion, leopard, cheetah, painted dog, buffalo and over a dozen species of antelope roam free.

The facility

Iganyana is the name for the painted dog in the local Sindebele language. Iganyana Bush Camp consists of a circle of 18 student rondavels (a rondavel is a traditional African style house, usually round in shape). Each thatched-roof rondavel has 2-3 beds. Two special teacher rondavels have 1-2 beds. The camp can accommodate up to 45 students and 3 teachers. Over the dining room is a huge thatched activity deck which leads out to a platform and raised walkway into the adjacent 600 metre diameter painted dog enclosure, part of the nearby rehabilitation facility for injured and orphaned painted dogs. The bush camp office houses a 16 terminal computer lab and field guide library. An electric fence surrounds the bush camp and the Environmental Education Exclosure, a 200 by 300 metre area that allows students to safely investigate African ecology. Separate ablutions blocks provide running water, cold showers and pit toilets. Each rondavel, the dining room and the ring trail are lit with electric lights.

Students studying the teak woodlands.

Painted dogs.

Photo © Aart Visser

The educational programme

PDC's Children's Bush Camp Programme is designed to allow students to directly experience the African bush. The philosophy behind the curriculum emphasizes exploration and discovery, with hands-on activities. Classes are divided into activity groups (or packs) of fifteen or less for all lessons. Although any environmental concepts can be covered to meet the needs of individual schools, the standard bush camp curriculum covers the following concepts:

- Species
- Adaptations
- Niche
- Habitat
- Natural Communities
- Ecological Relationships and Interdependence
- Extinction
- Endangered Species
- Conservation Strategies

Painted dog crossing.

Activities

Students are rotated through a series of specially designed activities in small groups. Each activity group is assigned to a specially trained professional guide for the length of the stay. Each student is provided with an activity logbook, in which they record their discoveries. Which activities are offered depends on length of stay and options chosen. Lessons and activities offered include:

- **Teak Woodlands Studies**: Through a series of scavenger hunts in the safety of the camp's Environmental Education Exclosure (EEE), students learn about ecological relationships and adaptations for survival in one of the ecosystem's most interesting natural communities.
- **Meet the Dogs**: Students use an interactive computer programme in the bush camp's computer lab to learn about the natural history and threats to survival of painted dogs. They then hike on a raised walkway through the 600-metre diameter Painted Dog Enclosure to search for painted dogs. In the Painted Dog Rehabilitation Facility, students meet orphaned painted dogs and learn about the techniques used to reintroduce painted dogs back into the wild.
- **Radio Tracking Activity**: Students learn how painted dog researchers use radio telemetry to find and monitor painted dog packs. They then use this equipment to play an advanced form of hide-and-seek in the bush camp grounds.
- **Game Drive**: Students are taught about wildlife adaptations for survival by the guide in the Hwange National Park.
- **Tree Search**: Botanical terms are learned through the use of an interactive computer programme. They then use these terms to find and identify native trees by their characteristics, viewed as adaptations to their habitat and niche.
- **Nature Art**: Watercolour techniques are practised to capture the beauty of nature in their own paintings at a nearby waterhole.
- **Solo Activity**: Students are spread out along a trail in the EEE, or along the walkway, to experience the solitude and sounds of the teak woodlands alone. Students use a "sound mapping" sensory awareness activity and poetry to attune to the beauty and complexity of the surrounding environment.
- **Campfire**: Singing and playing campfire games around the bonfire.
- **Video Night**: "Hunters in Twilight" is watched and discussed by students to learn about the research and intervention procedures used by Painted Dog Conservation project to try to save Hwange's painted dog population from extirpation.
- **Night Walk**: Having experienced the raised walkway by daylight, students now walk it in the dark to discover the nocturnal sounds of the teak woodlands.
- **Night Drive**: Students learn about behavioural adaptations to nocturnal niches on this exciting drive into adjacent Sikumi National Forest.
- **Research Techniques**: Students shadow a scientist conducting research in the area to learn about darting, radio telemetry, data collection and ethological techniques.
- **Game Walk**: Students are led into the bush by an armed and experienced guide to learn about animal behaviour and the ecology of different natural communities.

Eligible schools

Any school group wishing to participate in the environmental education programme may attend Iganyana Bush Camp. The facility is not available for tourists, conferences or types of groups other than school groups. Because one of the chief aims of the programme is to educate local communities about the factors threatening Hwange's painted dogs, some local primary schools are eligible to come to Iganyana Bush Camp free of charge. So far, nineteen schools bordering Hwange National Park attend the programme each year. Other Zimbabwean schools and international schools may attend the programme as "donor schools." Donor schools not only cover the cost of their camp experience, they also sponsor one local school's camp, thereby allowing the programme to expand to more local schools.

Author Contact Details: To find out more about the camp and the programmes, including costs, contact references in other schools, the coordination of customized experiences or to reserve the bush camp for your class, contact Wilton Nsimango at wilton@painteddog.org

For photos and more information on the Painted Dog Conservation and the Iganyana Bush Camp, visit PDC's website: www.painteddog.org

Zoo Work Experience for School Students

Expectations and Reality

by Ruth Hall EDUCATION MANAGER | ZOOS SOUTH AUSTRALIA

Studies were undertaken with senior secondary school work experience students to determine what students expected from the week long zoo work experience placement and what they actually experienced. Findings showed that some areas of the experience were significantly different from what students expected, particularly relating to the tasks keepers do and the problems the students experienced. Results have led to improvements to the structure of the program.

Background

Like most Zoos, Adelaide Zoo offers work experience placements to tertiary and secondary students. Most members of keeping, horticulture and veterinary staff supervise students on a regular basis. There are costs and benefits for Zoos in supporting work experience programs:

Benefits

- Practical assistance with some of the work routines of the paid staff
- An opportunity for supervising staff to develop communication, leadership and supervision skills through training, overseeing and guiding work placement students
- The chance for senior zoo staff to identify good, potential, future employees
- Filtering potential future applicants for zoo-related jobs by enabling potential applicants to obtain a better understanding of zoo keeping
- Generating goodwill towards the zoo in the community through the students involved and by supporting education providers
- Supporting providers of animal-related tertiary courses: this in turn assists their viability and benefits current and future training needs of Zoos SA staff.

Costs

- Safety of work experience students is paramount. Induction procedures, the nature of duties given and safe operating practice requirements may restrict or inconvenience the supervisors in their daily routines
- Administrative time needed to organize and manage the placement and to ensure that legal and insurance requirements are met may be quite time consuming
- Students who are not prepared to work safely or to follow instructions promptly and effectively can create stress, lost time and dangerous situations
- Time to organize and manage each placement is considerable.

Zoos SA, through its properties at Adelaide Zoo (an eight hectare city Zoo) and Monarto Zoo (a 1000 hectare open range zoo), recognizes the value of the unique experience it can provide for students and supports the concept of practical work experience programs for students at senior secondary and tertiary levels.
At Adelaide Zoo the Education Manager manages the work experience program for school students. The placements are very popular, so an application process is involved.
Each year over 120 applications are received and about 30 students are selected, on merit, to do a week of work experience, working on a different animal round each day.

Work experience student Amanda with the hippo keeper.

The main selection criterion is a demonstrated desire to work in animal husbandry, which is supported by past experience in this area. Generally, students who claim a love of animals, a passion for saving threatened species and a devotion to their family pets, but no other practical animal husbandry experience, will not be competitive enough to win a place in this program.

Successful students have had significant experience in several areas such as:

- working with farm animals,
- commercially breeding birds, dogs etc,
- volunteer work in animal rescue organizations and sanctuaries
- work experience in veterinary clinics or pet shops
- practical and theoretical animal work at school in "Agriculture" subjects.

These students seem to come to the program with reasonable skills and realistic expectations. They also seemed to enjoy the program immensely and few mentioned problems they had experienced.

The study

The study was designed to obtain more detailed information about what students really expected in the program and to see if their expectations were being addressed.

A survey was designed in two parts. The **Before** survey was completed before the program began, and the **After** survey was completed immediately on completion. The surveys were completed anonymously.

The areas covered in the surveys were

BEFORE	AFTER
1A. Main reasons for applying	1B. Things most enjoyed
2A. Things students most hoped to gain	2B. Most important things gained
3A. Main tasks expected to be done	3B. Main tasks actually done
4A. Main concerns about the program	4B. Main problems experienced

For each survey question students were given up to 15 options and were asked to select up to 3 items which were the most important to them.

2004 Results

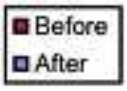
The results for three of the four areas surveyed were very easy to analyse, as the same options could be offered in the "before" and "after" surveys. However the first area was not comparable, so in 2005 the survey was repeated with part 1A changed to "Main things students expected to enjoy."

The 2004 results provided some useful information:

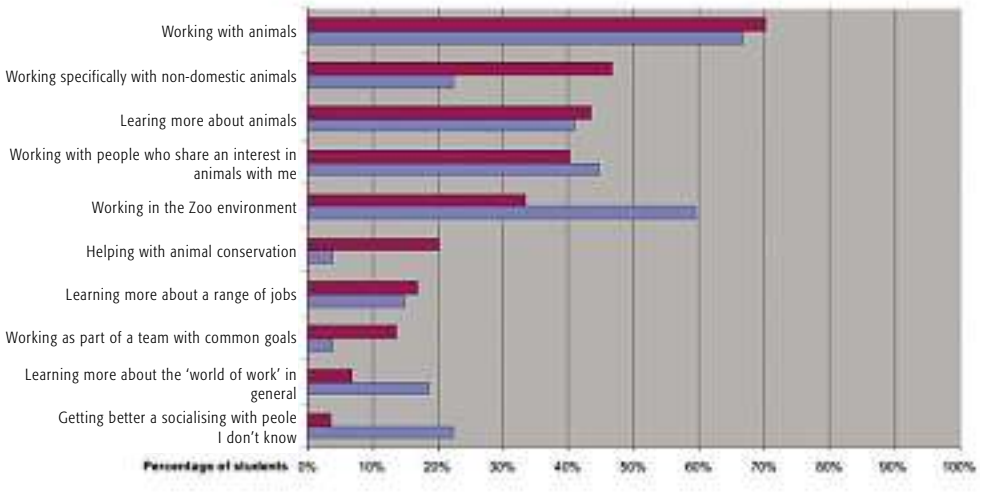
- In 2004, students actually worked in 8 animal rounds over 5 days at the zoo. One of the main problems experienced, as reported in the survey, was having to get to know and to work with so many different people. In 2005, as a result of this survey, the program was modified so students spent a full day in each of 5 areas.
- The results of the 2004 survey showed that some of the choice options in each area were unimportant to students, with none of them being chosen in the "3 most important things" by any student. These options were omitted from the 2005 survey, which then became more streamlined.

2005 Results

Graphically, these results are presented below and discussed.



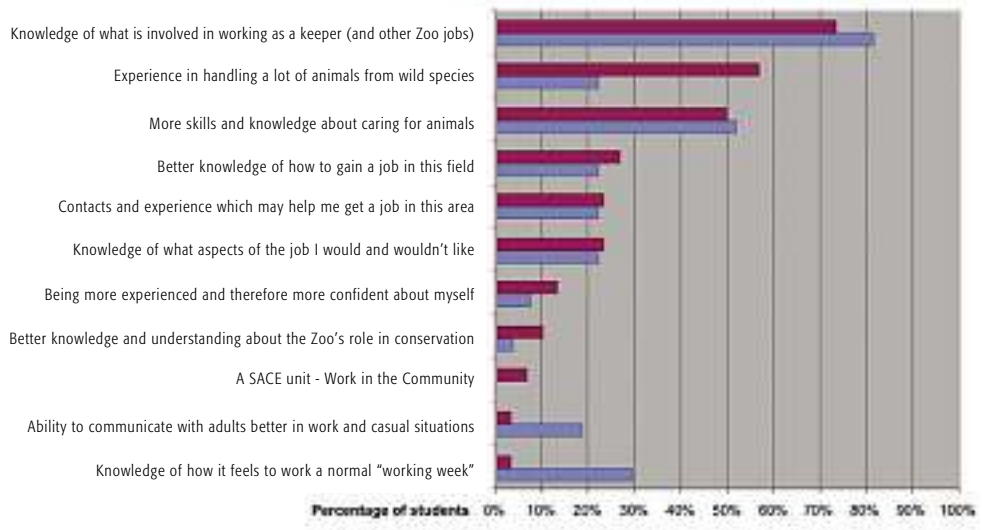
2005 Zoo Work Eperience | **What will/did you most enjoy?**



Comments:

- As one would expect, the majority of students wanted to work with animals, but working with specifically non-domestic species was an unpredicted joy for over a quarter of students.
- Working in a Zoo environment was very important for nearly 60% of students, though only half this number were expecting this to be important.
- "Helping with animal conservation" was hardly mentioned in the **Before** survey, but highly rated by 20% **After** the program – suggesting that this experience is able to change a love of animals to a concern for conservation.
- Socialising with new adult acquaintances is difficult for most school students. Nearly a quarter of students enjoyed the experience of getting better at socializing with strangers, though it was not something they had expected.

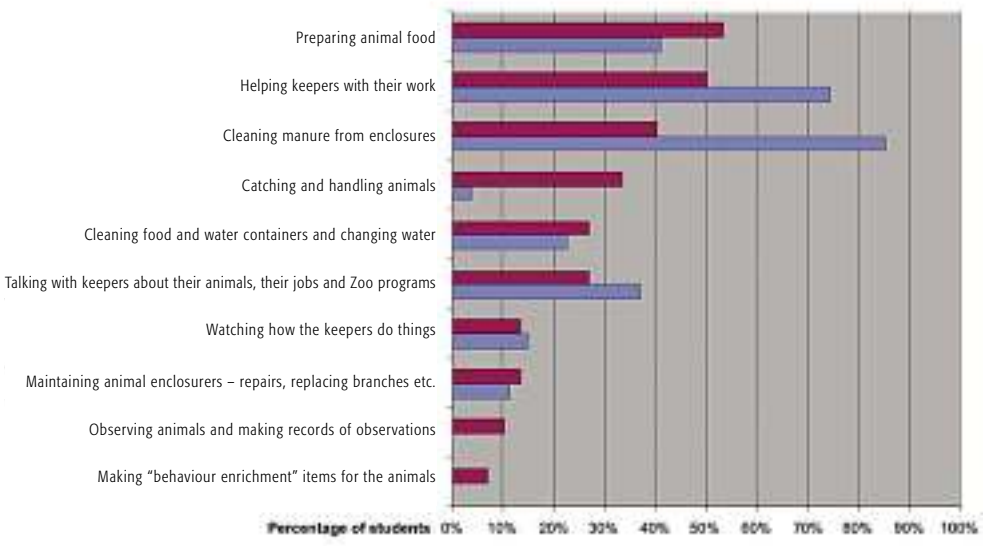
2005 Zoo Work Eperience | **What are the most important things you will/did gain?**



Comments:

- A common misconception is that zoo keepers *handle* animals frequently. Over half the students expected to gain skills in animal handling, but under ¼ found that this was one of the most important gains for them.
- Academic accreditation (SACE unit) rated very low in importance for these students.
- Again the personal development of improving communication skills and learning about the world of work were unexpected benefits gained by students.

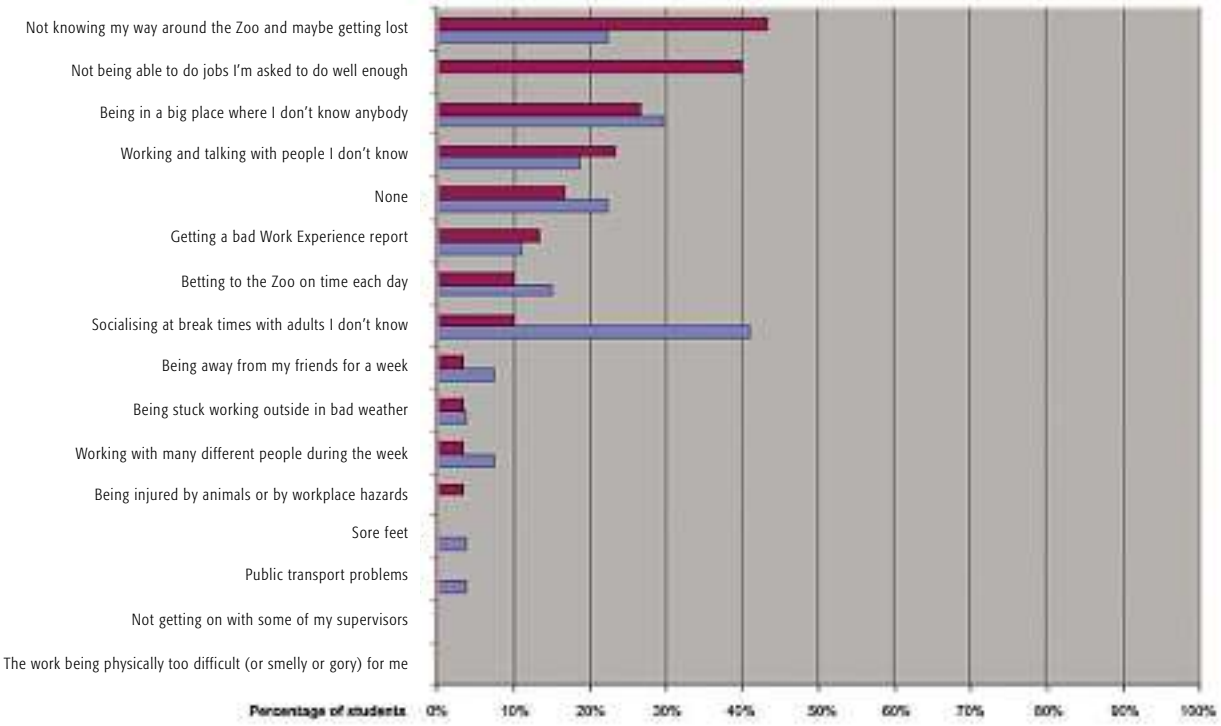
2005 Zoo Work Eperience | **What are the main activities you will/did undertake?**



Comments:

- Reality strikes! Although these students all have good previous animal management experience, only 40% thought that cleaning manure would have been one of the main activities. In fact 85% found that it was! A good learning experience for those with an over-romantic view of the job.
- Again, many students (1/3) expected animal handling to be one of the main activities, but it was for only 4% of students.

2005 Zoo Work Eperience | **What are the main problems you foresee/experienced?**

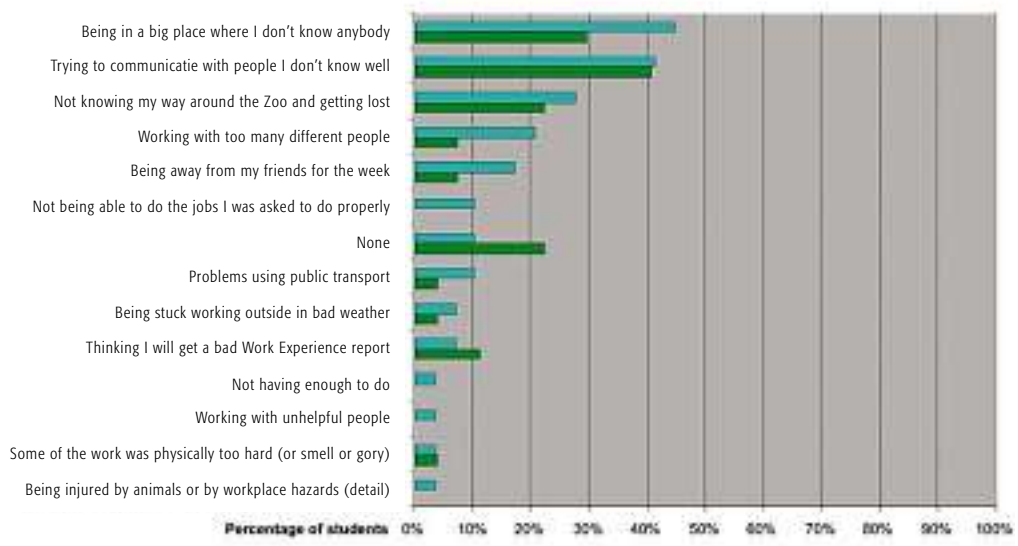


Comments:

In this area, problems that students feared were less significant than ones they hadn't considered:

- Over 40% were worried about getting lost. About half that number did in fact experience this problem. Because of the anonymous and uncoded way the surveys were completed, one cannot tell how many students were in both groups ie. They feared getting lost and then did. It would be interesting to know.
- 40% of students expected that they would not be able to do jobs well enough. **None** of them actually experienced this problem in a significant way. This was probably due to both the excellent support and judgement from the keeping staff and also the sound animal management experience these students already had. No doubt students felt more skilled and self-confident after the week was completed.
- The biggest problem, experienced by 40%, but only predicted by 10% was the social aspect of the program: socializing with adults they did not know well, and doing this with different people each day. Although it clearly was a concern, as noted in comments on earlier sections, many of the students also believed the experience helped them to develop these skills and some enjoyed the experience far more than they expected.

2005 Zoo Work Eperience | **Main problems experienced in 2004 and 2005.**



Comments:

This graph looks at the results of the **After** results in the 2 years of the survey.

In 2004, students worked 6 half day rounds and 2 full day rounds. This program provided more variety for students, but involved 3 hand-overs during the days and 3 extra sets of people to work with! Students did not complain about this situation and they were overwhelmingly positive in comments about the program, but the study did reveal the difficulties for the students in so much location change.

The 2005 results indicate that there were less problems experienced in all areas, with over 20% declaring "None".

Program changes

In 2007, the program has been expanded, with Children's Zoo staff accepting one student per week, working entirely in that part of the zoo. This has doubled the number of students able to undertake the program. Applicants were able to give preferences for the type of program worked: across five zoo rounds or all in the Children's Zoo. Already it is evident that students working in the Children's Zoo alone are thoroughly enjoying it. Some advantages of working in this section all week are:

- They work with the same staff and become very familiar with the people, site and routines
- Keepers in the Children's Zoo are very positive about work experience students and value their efforts more than some rounds, especially where the risk of injury to students or stress to animals is higher
- Animals from all major animal groups (mammals, reptiles, birds, fish, amphibians and invertebrates) are managed here
- There is much more animal handling, to condition the animals for human contact, in this section. Most students really enjoy this experience.

Conclusions

Evaluation is a useful tool for people managing educational programs. This survey provided an interesting insight into the zoo work experience program and its impact on school students. It provided more direction for Zoo Education staff in how to best induct and support students undertaking the program. The keeping staff found the information very relevant and interesting. It also reflected very well on the values and commitment of the young people taking part in this program.

ACKNOWLEDGEMENTS

The Adelaide Zoo work experience program has evolved over the years and will continue to do so. Having useful information is a way of identifying problems and indicating areas where change is required. When introducing changes which effect other people, like animal management staff in this case, survey information can be valuable in supporting the argument for the change.

The zoo work experience program depends greatly on the professionalism, goodwill and flexibility of the very busy keeping staff, Assistant Curators and Curator. All Education staff members are also involved in organising students on a day to day basis. The support of all these people is greatly appreciated.

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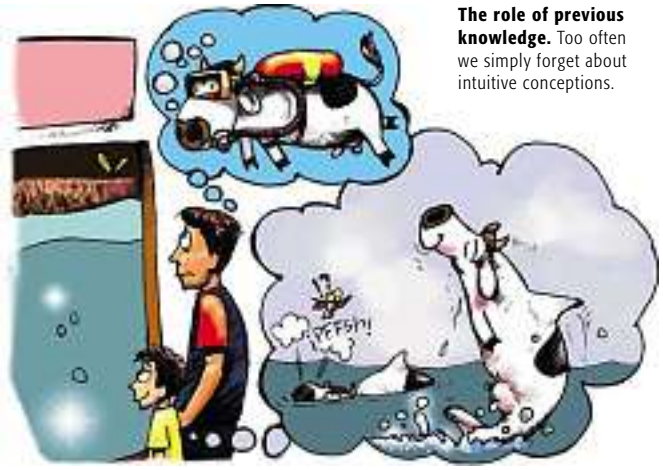
The Safari of the hidden ideas

by Reinaldo Niebles HEAD OF EDUCATION | BARRANQUILLA ZOO | COLOMBIA
and José Aparicio PROFESSOR OF PSYCHOLOGY | UNIVERSIDAD DEL NORTE | COLOMBIA

Many educators probably don't agree with the idea of the *Tabula rasa*. In fact, many people who work as educators in zoos and aquariums know that visitors bring their own mental schedule. They also know that a huge set of intuitive ideas, prior knowledge and implicit theories will be the background with which visitors will interpret the available information on their visit. These facts will also be the background with which they will use educational and interpretive devices.

Tabula rasa THE DOCTRINE OF *TABULA RASA* SAYS THAT THE MIND DOESN'T HAVE A UNIQUE STRUCTURE AND THAT ITS ORGANIZATION RESULTS FROM THE ENVIRONMENT, THROUGH SOCIALIZATION AND LEARNING. THE CONCEPT OF *TABULA RASA* IS VERY POPULAR AMONG THOSE WHO THINK THAT ANY HUMAN CHARACTERISTIC CAN BE MODIFIED WITH APPROPRIATE CHANGES IN THE SOCIAL INSTITUTIONS OR IN THE PEDAGOGIC RESOURCES. IN THE FIELD OF INFORMAL EDUCATION, TO AGREE WITH *TABULA RASA* SUPPOSES THAT THE USERS OR VISITORS OF MUSEUMS, ZOOS OR AQUARIUMS ARRIVE AT OUR INSTITUTIONS PREPARED TO LEARN OUR CONCEPTS AND MESSAGES WITHOUT CARING ABOUT THEIR PRIOR KNOWLEDGE.



The role of previous knowledge. Too often we simply forget about intuitive conceptions.

Intuitive conceptions INTUITIVE CONCEPTIONS HAVE BEEN TRADITIONALLY DEFINED AS IMPLICIT AND SPONTANEOUS PERSONAL CONSTRUCTIONS THAT WE DEVELOP IN THE BUILDING OF OUR MENTAL REPRESENTATIONS OF THE WORLD. THEY ALLOW US TO UNDERSTAND OUR ENVIRONMENT AND TO MAKE DECISIONS IN AN ADAPTIVE WAY. INTUITIVE CONCEPTIONS ARE DEVELOPED FROM AN IMMEDIATE AND DIRECT EXPERIENCE WITH REALITY, AND THEY ARE ACQUIRED FROM PERSONAL AND EPISODIC EXPERIENCES. INTUITIVE CONCEPTIONS HAVE BEEN CONSIDERED AS THE DRIVER OF THE LEARNING PROCESS SINCE THEY ARE THE GROUNDS FOR MENTAL TRANSFORMATIONS AND CONCEPTUAL CHANGE. REGARDLESS OF THEIR INDIVIDUAL CHARACTER IT IS POSSIBLE TO DETERMINE THE CONCEPTIONS OF SPECIFIC GROUPS SINCE REALITIES AND COGNITIVE OPERATIONS OF HUMAN BEINGS ARE GENERALIZABLE.

However, our certainty about intuitive conceptions and the prior knowledge of our visitors and users is not always coherent with the importance that we place on these cognitive elements when we design educational strategies. Quite often we think that the intuitive ideas are not sufficiently important, or that they are easily within our reach. Too many times we simply forget about intuitive ideas. For these reasons, an active and systematic exploration of previous knowledge of the visitors is often excluded from our design or evaluation protocols.

In the last few years, prior knowledge and its relationship to conceptual change has become more important in the panorama of cognitive studies and more specifically their influence within the context of informal education. Indeed, what the educators want is to modify the daily and superficial ideas that visitors bring to our institutions and to substitute them with other, complex and scientifically more exact ideas. In order to achieve this objective it is very important to know the nature and the influence of prior knowledge beyond the traditional "misconceptions" that have led us, over a long period of time, to minimize their importance in the learning process.

Studies on prior knowledge and conceptual change are an important challenge for zoo and aquarium educators and our design processes for educational strategies. Today, research on prior knowledge has developed a wide catalog about intuitive ideas in the diverse domains of knowledge. Nevertheless, most of these studies correspond to hard concepts related to physics, chemistry or biology. We have few investigations on social processes or complex ideas such as those related to conservation topics.

Domestic versus Wild. It is surprising that a high percentage of the sample believed that wild animals are less prone to extinction.

Misconceptions INTUITIVE CONCEPTIONS COULD REPRESENT IMPORTANT ERRORS WHICH WOULD BLOCK THE LEARNING PROCESS; FOR EXAMPLE A TAXONOMY ERROR: "THE MANATEE IS A FISH"; A PARTONOMY: "THE MANATEE HAS GILLS", OR A MISTAKEN THEORY: "ALL ANIMALS THAT LIVE IN THE WATER NEED GILLS TO BREATHE".

At the Barranquilla Zoo in Colombia, South America, we have begun a process which gives priority to the issue of prior knowledge or alternative conceptions of our visitors. With the support of a team lead by Jose Aparicio, titular Professor of the Psychology Department at the Universidad del Norte, a prominent local university, we have begun the design of a new booklet about biological extinction, and at the same time, we are evaluating the intuitive conceptions of school children who visit the zoo about the concept of biological extinction.

Some of the results show unexpected data about the intuitive ideas of children with regards to biological extinction. For example, almost the entire group of children in the sample (school children between 8 and 12 years of age) could not recognize the difference between the "death" of certain individuals and the extinction of specific taxa. It is also surprising that a high percentage of the sample (78%) thought that any extinction process is reversible. We have also verified some previous findings. For example, children "want" the extinction of certain animals such as snakes and they "don't want" the extinction of big mammals like pandas or whales. Other data are curious and they require more in-depth evaluation. For example 94% of the sample believed that small organisms are more susceptible to extinction. In fact, according to their intuitive conceptions, children think that things that we don't see can't become extinct since they are 'out of human reach'. This category includes sea animals, insects, and animals which live under the earth. Table 1 shows a phenomenographic analysis of some dycotomic categories developed from Piagetian interviews in a sample of fifty children.

Table 1. Phenomenographic analysis of some dycotomic categories developed from Piagetian interviews in a sample of fifty children about intuitive conceptions of biological extinction.

Dichotomy	Relevant results
Big vs. Small	94% of the sample believed that big organisms are less susceptible to extinction.
Visible vs. Not visible	80% of children believed that hard to see organisms (eg microorganisms) are less susceptible to extinction.
Terrestrial vs. Aquatic	More than half of the sample believed that aquatic animals are less prone to extinction.
Plants vs. Animals	62% of the sample believed that plants are practically not susceptible to extinction.
Domestic vs. Wild	It is surprising that a high percentage of the sample (43%) believed that wild animals are less prone to extinction.

Intuitive ideas about extinction. Conceptions that people have about extinction has hardly been researched and in many occasions it is influenced by inadequate conservationist propaganda.

Since conservation issues play a critical role in our educational messages, as Purrington (2005) has pointed out in edition number 41 of the IZE Journal, zoos and aquariums refer more and more to the issue of biological extinction in a direct or indirect way. However, very few times, conceptions that people have in this respect have been explored with rigour and on many occasions this is influenced by inadequate conservationist propaganda. Zoo and aquarium educators have the opportunity of capitalizing on the extensive investigation developed on intuitive conceptions to take up the challenge of exploring the issues that interest us. This could significantly influence how we offer resources and educational interpretation to our visitors. Our own exploration of intuitive conceptions about the issue of extinction has opened our eyes to the huge gulf that separates the scientific knowledge that we usually use in our messages from the conceptions used typically by our visitors. Exploring the intuitive conceptions of our visitors is a much more coherent way of being opposed to the doctrine of Tabula Rasa, and a developing experience that in our team we have called: The Safari of the hidden ideas.

Evaluating intuitive conceptions

RESEARCHERS HAVE DEVELOPED MANY VARIED RESOURCES TO EXPLORE AND EVALUATE INTUITIVE CONCEPTIONS OF PEOPLE. FREQUENTLY THIS EVALUATION SHOULD BE MADE OUTSIDE THE CLASSROOM, SINCE PEOPLE USE MORE THEIR INTUITIVE CONCEPTIONS IN SIMILAR TASKS TO THEIR DAILY PROBLEMS. SOME WAYS TO EXPLORE INTUITIVE CONCEPTIONS ARE:

TO USE QUESTIONNAIRES WITH OPEN QUESTIONS AND SIMPLE STRUCTURE WHICH WILL ALLOW FOR A FREE AND SPONTANEOUS NARRATION, E.G. 'WHAT DO YOU THINK WHEN YOU HEAR PEOPLE TALKING ABOUT THE ENVIRONMENT?'.

MANY METHODS USE THE ART OR THE FREE EXPRESSION OF IDEAS THROUGH SPECIAL REPRESENTATIONS AND ANALYZE THE ELEMENTS AND RELATIONS IMPLIED IN THE EVALUATED PROCESS, E.G. 'DRAW THE DESTRUCTION OF THE TROPICAL DRY FOREST'.

IN THE PHENOMENOGRAPHIC METHOD EACH PERSON'S RELATIONSHIP WITH THE EVALUATED CONCEPTS IS ANALYZED, AND THEN THE INDIVIDUAL MEANINGS OF PEOPLE ARE EXPLORED, E.G. 'LET'S SELECT THE THREATENED SPECIES FROM THIS LIST AND LET'S EXPLAIN OUR CHOICE'.

A VERY CURRENT METHOD OF EXPLORATION IS THE CONSTRUCTION AND EVALUATION OF METAPHORS ABOUT THE STUDIED PROCESSES. METAPHORS ALLOW PEOPLE TO USE DIFFERENT INFORMATION AND DIFFERENT CODES TO EXPLAIN A PROCESS OR PHENOMENON. IN FACT, MANY EDUCATORS USE METAPHORS TO EXPLAIN OR TO CLARIFY A COMPLEX CONCEPT.

THE CLINIC INTERVIEW, DEVELOPED BY JEAN PIAGET, IS MAYBE THE MOST WIDELY USED METHOD OF EVALUATION AND EXPLORATION OF INTUITIVE CONCEPTIONS. THIS STRATEGY IMPLIES A DEEP EXPLORATION OF PEOPLE THROUGH AN OPEN AND FLEXIBLE INTERVIEW ORIENTED BY HEURISTIC COURSES OF QUESTIONS.

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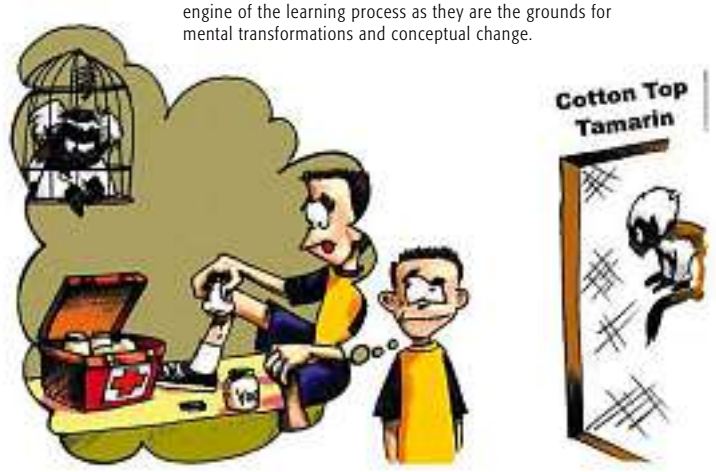
Challenges and perspectives. Our results have opened our eyes to the huge gap that separates the scientific knowledge that we usually use in our messages, from the conceptions which are typically used by our visitors.

Conceptual change. Intuitive conceptions are considered the engine of the learning process as they are the grounds for mental transformations and conceptual change.



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