

An historical perspective of changing community attitudes towards Flying-foxes in Sydney

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ABSTRACT

Conservation of flying-foxes is dependent upon a greater understanding by the general public of their role in the environment and their behavioural characteristics. Negative stereotypes and attitudes perpetuated through the media can have a detrimental impact on their conservation.

Since 1985 the Ku-ring-gai Bat Conservation Society (KBCS) has been running a bat education program in Sydney. This program aims to increase public knowledge and understanding of flying-foxes and microbats in order to improve their profile and assist in the development of more positive attitudes and a greater understanding toward bats species in general. A key feature of the program is the opportunity for people to observe at close quarters a live flying-fox with an experienced bat handler and educator.

In 1996 a study was conducted to assess the effectiveness of this education program on upper primary school-aged children. The results of this study indicated that this program increased student knowledge on bats as well as assisted in changing negative attitudes held toward them by some students.

Further studies would need to be conducted to determine whether the recorded changes were of an enduring nature.



Pymble/Wahroonga early 1900s. Photo courtesy of the Ku-ring-gai Historical Society.

Introduction

In the mid 1800s to the early 1900s it was not uncommon to spend a day out on the weekend on a shooting expedition. Mothers would pack a picnic and fathers would teach their sons how to use a rifle. The picture above illustrates shooters, including young children heading off to shoot flying-foxes in the Pymble/Wahroonga district.

Alan Leishman from the Sydney Royal Botanic Gardens has been researching Gardens' records for articles on flying-foxes to track their use of the Gardens as an historical camp site. He found an article titled 'Plague of Flying-foxes' that stated, "during the month of March we were visited by immense numbers of flying-foxes. There must have

been many thousands of them, and some of the large trees were quite black with them. We called in the aid of a number of local sportsmen, who shot large numbers, and the destructive animals were all killed or flew away in about a week from the first appearance of the swarm. It is many years since the gardens were visited by a plague of these animals.”(Botanic Gardens and Domain Annual Report 1900). This description of flying-foxes characterised by such words as ‘destructive’, ‘plague’, ‘swarm’ and ‘pests’ indicates the negative attitude attributed to them at this time.

This attitude would appear to have persisted through to the 1980s in the northern parts of Sydney when flying-foxes again received a great deal of media attention. This was due to a proposal for a housing development in a valley in Gordon where a colony of Grey-headed Flying-foxes had a maternity camp.

The debate and opinions, reported in the local newspapers from residents and councillors, indicated the misinformation and negative associations held towards bats by many people. These included such statements as the bats ‘denied fruit to the elderly and children’; that they were ‘smelly flea-infested vermin’; they ‘produce disease-ridden dung-heaps’ and are ‘a pest which has grown to plague proportions in the valley’.

As a direct result of this threat to the flying-foxes and their habitat, a group of concerned residents and scientists formed a community action group to become formally known in 1985 as the Ku-ring-gai Bat Colony Committee. Its aims were to inform the public on the ecological importance of bats and to help develop a management plan for this important breeding site of the Grey-headed Flying-fox in Sydney. This group has since been renamed the Ku-ring-gai Bat Conservation Society (KBCS). The work of this group has contributed to positive changes in the status of Grey-headed Flying-foxes in northern Sydney that are summarised below.

In 1991 a Conservation Agreement between the NSW Minister for the Environment and Ku-ring-gai Municipal Council was signed for Ku-ring-gai Flying-fox Reserve, the first to be negotiated between a local council and the NSW Government to protect a wildlife site. In 1992 Ku-ring-gai Municipal Council formally named the 14.6 hectares of bushland The Ku-ring-gai Flying-fox Reserve giving the flying-foxes a status in the community that had not been recognised previously. In 1993, the National Parks and

Wildlife Service made available \$10,000 to enable consultants to prepare a draft Plan of Management for the reserve. This plan was formally adopted by Ku-ring-gai Council in August 1995. Four years later a revised Plan of Management was signed by the NSW Minister for the Environment thus stating the importance of this flying-fox colony as prime wildlife habitat in Ku-ring-gai and promoting its regional importance as part of the habitat of Grey-headed Flying-foxes in eastern Australia.

The work of the KBCS has contributed to the attitudinal change of many of the local residents who now value having a flying-fox colony in the heart of their suburb. This change is reflected in the type of queries and comments received on the KBCS website (sydneybats.org.au). The difference between the negative stereotypes attached to bats 15 to 20 years ago can be demonstrated by an e-mail received in May 2001 from a resident whose home borders onto the Ku-ring-gai Flying-fox Reserve “we invited some friends for a bat viewing from a comfortable position at our home...[but] we counted only 6 bats leaving the sanctuary...are you able to help? Where have ‘our’ bats gone? We have read the society’s web site and we hope that we don’t have to wait until October to again see the splendour of the passing masses of bats and experience some of the older larger creatures looping through our gardens and over our deck.” One reason that such a change in attitude has occurred can be attributed to the KBCS Bat Education Program.

KBCS Bat Education Program

Since its inception the KBCS has recognised the importance that education can play in the conservation of the species. The KBCS education program has been running since 1986 and can be adapted to suit any age group from pre-schoolers through to adults. In 1988 the KBCS was accredited by the Department of Education to visit New South Wales schools from Kindergarten to Year 12. The talks, given by trained speakers and bat handlers, consist of slides and the presence of a flying-fox trained to accept close inspection by children and members of the public. Resources are received and added yearly. The educational material now includes a mounted skeleton; stuffed and mounted microbats; a tape of flying-fox calls and simple songs about bats for use with pre-school and infants children; a specially designed fuzzy felt board for use with young children; a flying-fox doll that replicates the size and weight of a live flying-fox; a suggested reading list on bats;

videos; colouring-in sheets and craft activities on bats and their habitat; a model of a properly netted orchard and a computer program on microbat calls.

In 1996 the KBCS sought to evaluate the education program in order to determine what impact it was having on students knowledge about bats and their attitudes towards them. This study (Ford 1996) unearthed some interesting findings on how effective education can be on assisting to dispel myths and negative attitudes held towards bats.

The Study

Eight primary schools in the Northern Metropolitan Region of Sydney participated in the research. There were four Year 5 classes,

three Year 6 and one 5/6 composite. Their distribution throughout the Northern Metropolitan region is shown in Figure 1. A pre-test/post-test design was used as described by Bennett (1988). A quiz was developed to establish the levels of knowledge and the attitudes that students had towards bats (Appendix 1). This was given on the first visit to the classroom. The second visit, approximately one week later, involved a slide presentation on bats that stressed the importance of microbats as insect controllers and the ecological importance of flying-foxes as seed dispersers and pollinators of native trees. Included in the presentation was the opportunity for students to also meet and get close to live flying-foxes.

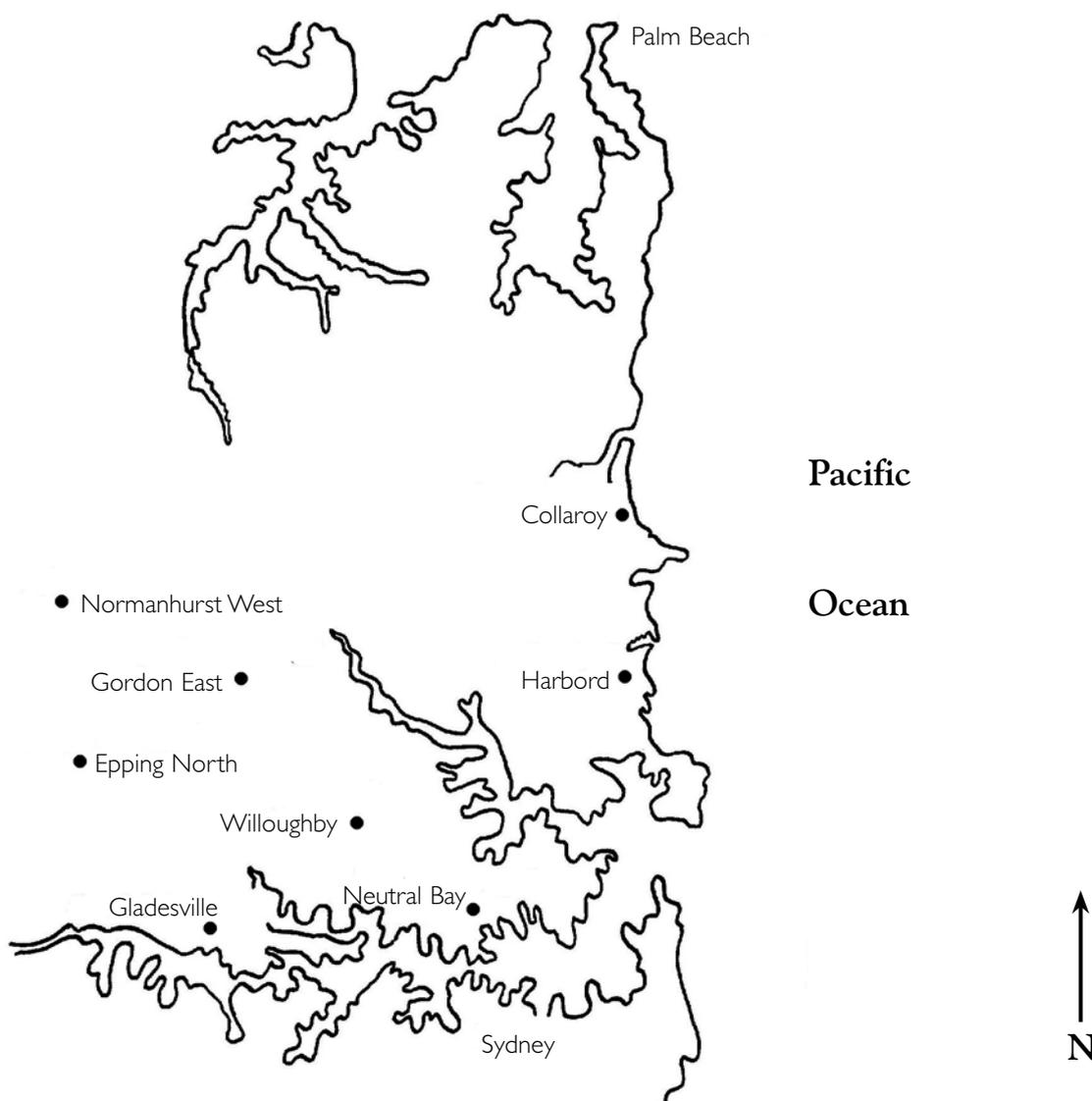


Figure 1. Location of schools studied in the northern metropolitan region of Sydney

Approximately six weeks later a post-test very similar to the first quiz was given to the students (Appendix 2), the only difference being in the three final questions. Replacing the question asking how they would feel getting close to a flying-fox was a question directly addressing how they had felt. Two new questions were also included, the first asking the students what the most important thing they remembered from the talk and a second question asking them what they enjoyed most of all about the bat presentation.

Feedback was also sought from the teachers. Teachers were also offered the opportunity of using further resources to back up the classroom presentation. A pack containing material for photocopying with easy-to-read information on microbats and flying-foxes, colouring-in project sheets, a bibliography of books on bats and some activity sheets were sent to teachers prior to the KBCS classroom visit. The KBCS recommends that the classroom visit be incorporated into a unit of work being studied. For example, classroom studies on adaptation, Australian wildlife, mammals, food chains or food webs.

Scoring

All students marked the pre-test and post-test with their initials. After all tests were collected they were coded and sorted into school groups. Students who were not present at all three sessions were discarded. Final student numbers in the study totalled 211.

It was predicted that there would be some students with literacy problems who may find the quiz format difficult. For this reason the final request in both tests was for the students to write a story, poem or draw a picture about a microbat or flying-fox. This was very helpful not only for the students but also for scoring purposes as many students had difficulty expressing themselves clearly in the written word. Their drawings, on the other hand, were highly expressive, indicating not only how they pictured these animals but also their attitudes toward them. Other students felt more comfortable writing in other mediums such as poetry, with one expressing his ideas and feelings through a rap song.

Two questions were discarded in the final analysis of the data. 'What does a bat look like?' was initially included in the pre-test as a way of introducing the students to the study topic and was not used in the post-test. 'Where do bats

live?' was not a reliable question as students responded either to a geographical location or a specific habitat.

The collected data were summarised as frequencies then converted to percentages. The question, 'Can you describe what a flyingfox/microbat looks like?' was scored into one of three categories, *don't know*, *incorrect*, *some idea*. Students had been told that an acceptable response was to write 'I don't know' to any question asked. Those who wrote 'don't know' or left the space blank were scored in the *don't know* category. *Incorrect* responses were those that contained a written error, for example, 'dog size with scaly wings'; 'glowing red eyes'; 'like a gliding possum'. Students were scored as having *some idea* even if their responses were short and not elaborated, for example, 'black with wings'. A bird could also be described as black with wings but as the response contained no incorrect information they were scored as having some idea. Those who gave only limited information sometimes had drawn a picture of their idea of a bat and this helped to determine which category to score their response.

'What do flying-foxes eat?' was a question for which six responses were identified – *don't know*; *insects*; *fruit*; *fruit and insects*; *nectar and pollen* and *miscellaneous*.

'What do microbats eat?' had five categories, *don't know*; *insects*; *fruit*; *fruit and insects* and *miscellaneous*. The miscellaneous category for both microbats and flying-foxes included such things as nuts, vegetables, leaves and meat.

'Why are microbats/flying-foxes important?' had four responses, *don't know*, *some idea* *incorrect* and *correct*. Examples of responses scored in the *some idea* category were the following: 'They are part of the cycle of life'; 'They help the environment'; 'They are part of the food chain'. These responses were not incorrect but were considered to be too general to be scored as correct. Examples of *incorrect* responses include the following: 'There is not many of them left'; 'They can fly'; 'They hang upside down'; 'they are rare'. It must be noted that these examples of responses generally came in the first quiz before the KBCS presentation.

The questions relating to how students would feel or did feel getting close to a flying-fox were scored as either *positive* (cool; great; interesting; exciting); *negative* (frightened; scared; it might bite); *neutral* (normal; O.K.; weird) and finally

positive/negative (frightening at first but then O.K; scary but exciting).

‘What did you enjoy most about the bat presentation? Was assigned three scored responses, *the bats, the slides, everything*.

‘What was the most important thing you remembered from the bat talk?’ proved to be an extremely difficult question to score. The responses are discussed in the results.

Results

The overall results indicated that students in the study learnt more about the difference between microbats and flying-foxes and their ecological niche after participating in the education program. There was also a positive change in a number of students who initially felt negatively toward bats although this was not as marked as the gains made cognitively.

Table 1. Responses to the questions

1. “Can you describe what a flying-fox looks like?”						
	Don't know	Incorrect	Some idea			
Pre-test	29	25	46			
Post-test	7	2	91			
2. “Can you describe what a microbat looks like?”						
	Don't know	Incorrect	Some idea			
Pre-test	73	6	22			
Post-test	15	2	85			
3. “Why are microbats important?”						
	Don't know	Incorrect	Some idea	Correct		
Pre-test	77	8	4	11		
Post-test	25	20	5	50		
4. “Why are flying-foxes important?”						
	Don't know	Incorrect	Some idea	Correct		
Pre-test	71	7	16	7		
Post-test	35	8	8	49		
5. “What do microbats eat?”						
	Don't know	Insects	Fruit	Fruit/insects	Miscellaneous	
Pre-test	51	25	14	5	6	
Post-test	13	66	10	4	5	
6. “What do flying-foxes eat?”						
	Don't know	Insects	Fruit	Fruit/nectar/pollen	Fruit/insects	Miscellaneous
Pre-test	28	3	46	2	11	8
Post-test	30		52	37	7	2
7. “How did you feel getting close to a flying-fox?”						
	Positive	Negative	Neutral	Positive/negative		
Pre-test	61	16	14	9		
Post-test	65	10	15	8		
8. “What did you enjoy most of all about the bat presentation?”						
Seeing and getting close to the flying-foxes			85			
Slides			4			
Everything			5			
No response			6			

The responses to the question “**What was the most important thing you remembered from the bat talk?**” proved very difficult to categorise. Of the 153 students who did respond, thirty-four comments related in some way to the ecological importance of bats, for example, ‘microbats control insects; flying-foxes regenerate forests’; ‘bats pollinate flowers’. Thirty-five remarked on an issue that related in some way to their welfare, for example, ‘you need to contact WIRES if one is on the powerlines’; ‘you shouldn’t keep them as pets’; ‘we have to save the forests to save the bats’. Twenty-eight responses related to bat facts. Examples are ‘they are the only mammals to fly’; ‘flying-foxes and microbats are different’; ‘they have a hand-wing’; ‘microbats are as big as your little finger’; ‘flying-foxes sight is twenty times better than ours’; ‘microbats use echo-location to find their food’. Twenty-two responses commented on observable behaviour such as ‘how they sucked the juice from the fruit and spat out the pulp’; ‘the way they eat upside down’; ‘the way they pooh the right way up’; ‘how big their wings were when they flapped them’. Sixteen students had some myth or misconception dispelled for them, for example, ‘bats are not blind’; ‘bats are not scary animals’; ‘they will not come out to hurt you’. Eleven just felt the experience of seeing the bats was the most important thing they would remember from the talk. Similarly five students wrote ‘everything’ or ‘all’ and finally four students responded that the most important thing they remembered was information given on reproduction.

This appears to highlight the individual differences in interest that each student has towards a particular topic. Such interests may influence what information they are most likely to retain. For some students it was the facts that were important, others the observable behaviour and the opportunity to get close to a living animal, while another group felt that having some negative preconceptions corrected was what had been most important.

Closer analysis of the individual classes showed significant differences between those that actually incorporated the KBCS visit into a unit of work and those classes that simply had the KBCS presentation as a one-off experience. One Year 6 class at Neutral Bay Public School and two Year 5 classes at Gordon East and Harbord Public School had incorporated the KBCS visit and presentation into a unit of work being studied in the classroom over a number of weeks. Classes that did not incorporate the visit into a unit of work being studied suffered considerable confusion understanding the differences between microbats and flying-foxes six weeks later. These classes were less able to remember the facts about these animals after the presentation. The classes where there had been considerable reinforcement through project work, artwork, activity sheets and book reading stood out from their peers who only participated in the KBCS classroom presentation.

Comparing the Year 6 class from Neutral Bay Public with the two other Year 6 classes at Willoughby and Gladesville Public School, highlights the differences in every category.

Table 2. Differences between classes that incorporated the KBCS visit into a unit of work and those that used the presentation as a one-off experience.

1. “Can you describe a flying-fox?”				2. “Can you describe a microbat?”			
	Don't know	Incorrect	Some idea		Don't know	Incorrect	Some idea
Neutral Bay				Neutral Bay			
Pre-test	36	16	48	Pre-test	80	8	12
Post-test	0	0	100	Post-test	4	0	96
Willoughby				Willoughby			
Pre-test	18	29	53	Pre-test	59	12	30
Post-test	3	0	97	Post-test	15	0	85
Gladesville				Gladesville			
Pre-test	46	9	46	Pre-test	100	0	0
Post-test	9	5	86	Post-test	9	9	82

3. "What do microbats eat?"

	Don't know	Insects	Fruit	Fruit/ insects	Misc.
Neutral Bay					
Pre-test	48	16	28	8	0
Post-test	0	96	0	0	4
Willoughby					
Pre-test	50	36	7	9	3
Post-test	12	68	6	3	12
Gladesville					
Pre-test	59	0	14	5	23
Post-test	27	27	32	0	14

4. What do flying-foxes eat?

	Don't know	Insects	Fruit	Fruit/ insects	Fruit/ nectar/ pollen	Misc.
Neutral Bay						
Pre-test	16	0	56	16	4	8
Post-test	0	0	36	4	60	0
Willoughby						
Pre-test	15	3	65	15	0	3
Post-test	3	0	41	3	53	3
Gladesville						
Pre-test	23	9	55	0	5	9
Post-test	5	5	64	5	0	9

5. "Why are microbats important?"

	Don't know	Some idea	Incorrect	Correct
Neutral Bay				
Pre-test	68	12	8	12
Post-test	8	8	12	72
Willoughby				
Pre-test	62	12	18	9
Post-test	27	3	12	59
Gladesville				
Pre-test	86	5	5	5
Post-test	50	5	14	32

6. "Why are flying-foxes important?"

	Don't know	Some idea	Incorrect	Correct
Neutral Bay				
Pre-test	64	20	16	0
Post-test	0	3	4	80
Willoughby				
Pre-test	59	9	18	15
Post-test	50	3	9	38
Gladesville				
Pre-test	86	5	9	0
Post-test	63	14	9	14

7. "How did you feel getting close to a flying-fox?"

	Positive	Negative	Neutral	Positive/ negative
Neutral Bay				
Pre-test	52	24	4	20
Post-test	76	8	8	0
Willoughby				
Pre-test	62	18	12	9
Post-test	68	9	2	9
Gladesville				
Pre-test	59	14	8	9
Post-test	64	9	23	5

A similar result was found comparing the Year 5 class from Gordon East Public School and the Year 5 class from Harbord Public School that had done extension work on bats after the presentation with two other Year 5 classes that had not followed with any other project work. (Table 3)

Table 3. Year 5 comparisons between Harbord and Gordon East Public School with North Epping and Collaroy.

1. "Can you describe a flying-fox?"				4. "What do flying-foxes eat?"						
	Don't Know	Incorrect	Some idea	Don't know	Insects	Fruit	Fruit/ insects	Fruit/ nectar/ pollen	Misc.	
Harbord				Harbord						
Pre-test	30	67	7	Pre-test	41	4	45	4	0	7
Post-test	7	0	93	Post-test	8	0	26	0	67	0
Gordon East				Gordon East						
Pre-test	19	22	59	Pre-test	26	15	22	26	7	4
Post-test	0	0	100	Post-test	0	0	30	15	56	0
North Epping				North Epping						
Pre-test	46	21	42	Pre-test	29	4	42	8	8	8
Post-test	0	4	96	Post-test	12	0	60	12	4	12
Collaroy				Collaroy						
Pre-test	32	24	44	Pre-test	60	0	28	8	0	4
Post-test	24	12	64	Post-test	12	0	60	12	4	12
2. "What does a microbat look like?"				5. "Why are microbats important?"						
	Don't Know	Incorrect	Some idea	Don't know	Some idea	Incorrect	Correct			
Harbord				Harbord						
Pre-test	78	7	15	Pre-test	78	4	15	4		
Post-test	7	4	89	Post-test	26	19	4	52		
Gordon East				Gordon East						
Pre-test	59	7	33	Pre-test	70	0	7	22		
Post-test	15	0	85	Post-test	18	4	7	70		
North Epping				North Epping						
Pre-test	71	0	29	Pre-test	92	4	0	4		
Post-test	29	0	71	Post-test	75	0	13	13		
Collaroy				Collaroy						
Pre-test	88	8	29	Pre-test	100	0	0	0		
Post-test	20	8	72	Post-test	20	4	24	52		
3. "What do microbats eat?"					6. "Why are flying-foxes important?"					
	Don't know	Insects	Fruit	Fruit/ Insects	Misc.	Don't know	Some idea	Incorrect	Correct	
Harbord					Harbord					
Pre-test	45	22	15	4	11	Pre-test	74	0	26	0
Post-test	15	79	0	7	0	Post-test	11	22	0	70
Gordon East					Gordon East					
Pre-test	44	41	7	0	7	Pre-test	52	11	33	4
Post-test	4	82	7	7	4	Post-test	15	11	4	70
North Epping					North Epping					
Pre-test	42	42	13	4	0	Pre-test	83	0	13	4
Post-test	29	46	21	4	0	Post-test	54	0	0	46
Collaroy					Collaroy					
Pre-test	84	0	0	0	16	Pre-test	92	4	4	0
Post-test	12	32	28	16	12	Post-test	60	4	32	4

7. How do you feel getting close to a flying-fox?"

	Positive	Negative	Neutral	Positive/negative
Harbord				
Pre-test	56	19	4	15
Post-test	70	7	7	15
Gordon East				
Pre-test	74	7	15	7
Post-test	59	11	30	4
North Epping				
Pre-test	8	21	33	8
Post-test	54	25	13	8
Collaroy				
Pre-test	72	12	16	0
Post-test	52	16	12	8

Discussion

Numerous studies in the environmental education literature have highlighted the importance between increasing knowledge about an environmental topic/issue and focusing on the attitudes and values held by the students (Ballantyne and Packer 1996; Zimmerman 1996; Iozzi 1989). Knowledge and attitudes appear to be intrinsically linked, requiring teachers to formulate programs that address both the cognitive and affective components. This was not always the orientation as earlier work in the field tended to consider the attitudes/values outcomes of instruction as being more important than cognitive ones (Gabel *et al.* 1980; Moyer 1977). Historically there have been studies that have concentrated on both the impacts of either knowledge or affect on student participation in environmental education programs. Some of these studies did indicate that increasing student knowledge resulted in a positive correlation with students values and attitudes (Moore 1981; Fortner and Teates 1980; Cohen 1973) while conversely other studies such as those conducted by Kinsey (1979) and Holtz (1976) revealed that increasing knowledge alone did not significantly change student attitudes and values toward an environmental issue.

The current approach appears to reinforce a more holistic view that recognises the importance of integrating environmental knowledge, belief and affect, as neither a knowledge-based approach nor a values-education approach in isolation is adequate to fulfil the aims of environmental education (Ballantyne *et al.* 1996).

The KBCS's bat education program attempts to obtain a balance between increasing students' knowledge on bats and addressing their attitudes towards them by giving students the opportunity to meet a live flying-fox. Fenton (1985) has expressed the view that one of the main problems facing educators trying to improve the image of bats is the fact that most people have never had the opportunity to actually meet one. He sees live bats as an essential component of an educational talk that can enhance understanding of their biology and behaviour. Feedback from the teachers also reinforced the importance of including a 'complete' package that is informative and instructional as well as offering students the opportunity to have their fallacies about bats challenged through meeting a live animal. The assumptions made by the KBCS have always been that misconceptions and myths held towards these animals would be dismissed once students had been given the correct information combined with seeing, observing and getting close to a live flying-fox.

Attitudes are intrinsically linked to the way in which we all behave and respond towards people, issues and situations. A negative attitude can endure into adulthood and it can also have implications for the way in which we learn and the actions and behaviours that we undertake.

Many examples can be found in the print and audio-visual media that portray bats as large, frightening, blood-sucking vampires. Bats are negatively stereotyped as fearful animals that live in dark, creepy, haunted houses, cemeteries or bell towers. It is not hard to see why negative attitudes develop towards bats given the numerous fictional depictions of them with blood-soaked fangs and red glowing eyes.

Responses to diagrams and words

Some students in the study who had strong negative attitudes towards bats showed a dramatic change in heart after the KBCS presentation. Examples of student drawings (Figure 2) completed for the first quiz highlight the way in which they had been influenced by media depictions of bats as evil, frightening beasts. These can be compared to their drawings on the post-test (Figure 3) that clearly demonstrate a change toward a more positive orientation to bats.

Other students felt more comfortable expressing their feelings in the pre-test and post-test quiz in a written form.

Example 1

Pre-test

Bats are ugly and scary (sic)
Oh! And awful hairy
I would not touch one
It's not my idea of fun
So my advice to everyone
Is
"Don't touch bats"

Post-test

Now I've gotten to know bats
I don't think there (sic) like rats,
They are not very scary,
Or very hairy
In fact they are very friendly.

Example 2

Pre-test

Bats fly
Bats die
They come out at night
To give us a fright

Post-test

Big bats are called megabats
And small bats are called microbats
The worst thing about bats are that people don't
like them
Some bats are COOL

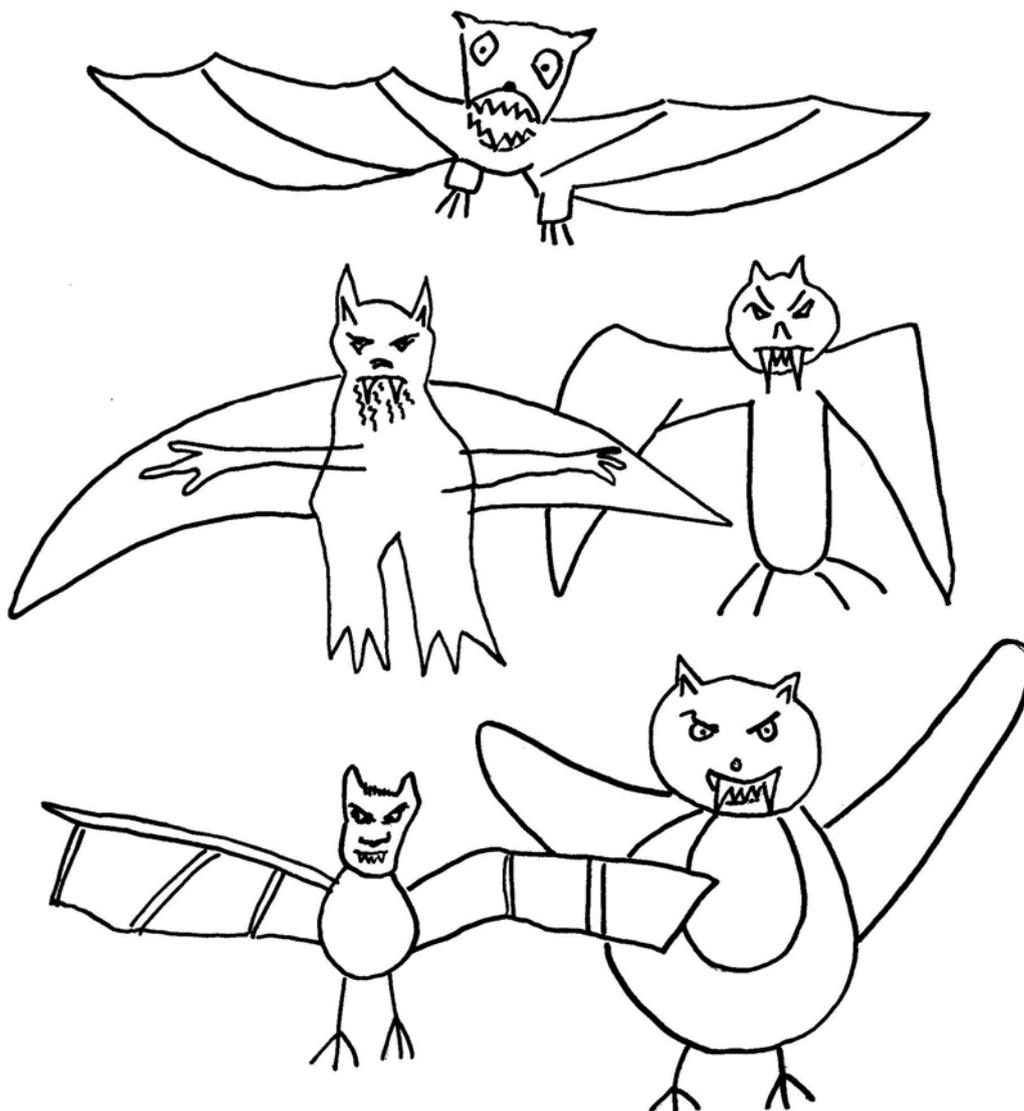


Figure 2. Examples of drawings from Quiz 1

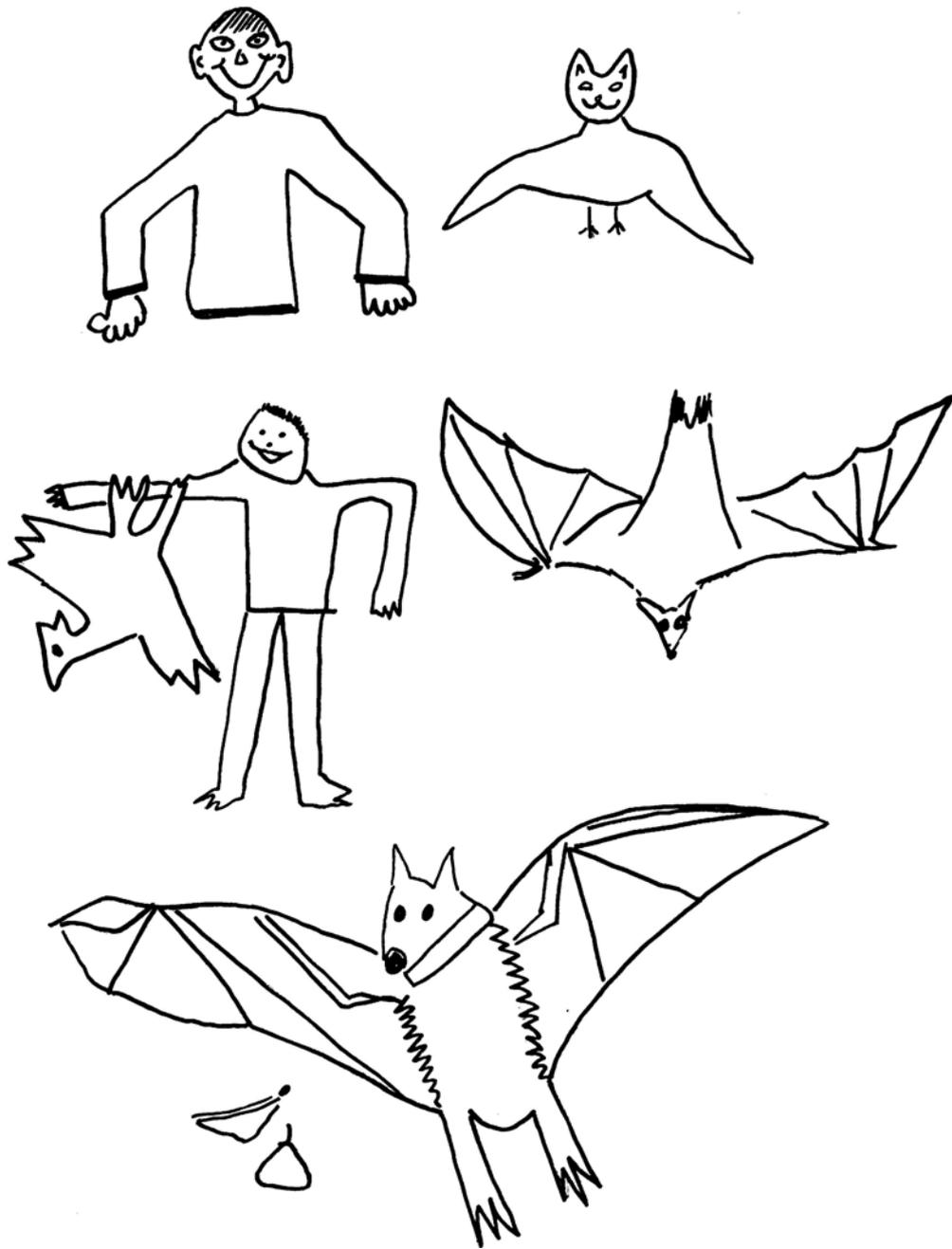


Figure 3. Examples of student drawings on Quiz 2

Teacher Feedback

Teacher responses to the question ‘What was your overall impression of the session?’ were very positive. Comments included –

- “A successful teaching and learning session. Organisation was very good. Level of interest very high, particularly as this class was streamed and this was the lower performers across the grade. Occasionally the detail component was perhaps too complex, however generally it was appropriate for students level.”
- “Well done, highly motivating, excellent general knowledge presented, good class control with interest level and expectations.”
- “It was most informative and well organised. The information was very much at the children’s level.”
- “The overall impression was that the entire segment was worthwhile and age appropriate. The children were inspired by the presentation and learnt a great deal. Some fallacies were dispelled.”
- “The session was outstanding. The organization and structure were without flaw. These Year 6 students were most interested and challenged. The presence of real animals was magical. They

certainly learned a lot as did their teacher.... Their introduction fitted in nicely with our Pacific Island study too.”

- “Well organised and structured – well suited to Year 6 students. Children enjoyed the session and were interested – I think they learnt a lot.”
- “I was very impressed with this very informative session. The presenter was extremely confident in her knowledge and presented it in an interesting and captivating manner. I feel the students gained a lot of valuable knowledge from this lesson.”

Examples of the responses to “What was the most important educational part of the visit?” were –

- “The meeting with a live flying-fox was a highlight of the visit.”
- “Seeing the live flying-foxes and the slides. This created an enormous amount of discussion and interest.”
- “Whole package complete – lead up and background material necessary to complete understanding. Hands-on particularly exciting – well designed lesson knowing that the animals themselves were to come.”
- “The complete package was necessary and valuable.”
- “Live flying-foxes probably the most interesting but slides most important.”
- “All parts made the whole. The talk was excellent. Having two people to show the animals was also excellent. The on-going resources, which included printed matter and sketches were put to good use in the classroom and the creativity offered was expressed superbly in creative writing, actual models of bats and a bat cave in the classroom.”
- “The children loved seeing the flying-foxes but equally I thought the slides were an excellent part of a very good package.”

All the responses indicated that the complete package of information through the slides and offered resources along with the presence of live flying-foxes was necessary.

Not all the classes used the additional resources offered but those that did found them all worthwhile with one teacher commenting that “Even though we haven’t had a chance to go over the extra stencils and information you gave me they look great resources to continue a unit of work with.”

Three teachers commented that they would like to see the inclusion of a short video that they could use after the presentation in the class. Another teacher thought that along with a video they would like the opportunity to purchase posters and slides. One teacher commented that it would have been useful to have more information on the geographic areas in Sydney that bats occupy.

All teachers responded that they would be happy to recommend such a session to other teachers with one teacher specifying that it would be useful “particularly as a stimulus to environmental studies and then they [the teachers] would be able to follow up [with further work in the classroom].

Conclusion

This study indicated that when students were presented with the correct information and the opportunity to be exposed to a live flying-fox they were able to reassess their previously held negative viewpoints and produce a more positive attitude toward bats.

In recent years many scientists have published their understanding of the value and role that education can play in managing the environment. Saunders (1990) has even suggested that ‘no ecologist or conservation biologist should miss the opportunity to educate people about the issues involved in our degrading environment. They should be prepared to talk to any group who is prepared to listen to their message’. Saunders (1990) recognised the importance of education directed not only toward school children and community organizations but also education that targets business groups and politicians, those that are most politically influential and whose decisions determine what route we will take on environmental issues. Education is particularly important where the general public has a high level of ignorance or misconception about an issue. Bat conservation falls into this category.

A major factor hindering the conservation of bats is the incorrect perceptions and stereotypes of them with associations to darkness, terror and evil. Education, such as that developed by the KBCS, developed to counteract these views by providing factual information on their role in the functioning of a healthy ecosystem, has been proven to help dispel the myths, prevent their demonization and most importantly act as a cornerstone to their conservation.

Education and conservation are intrinsically linked. The KBCS has shown that community attitudes toward flying-foxes can be changed through education and this ultimately has provided protection and increased the profile of these much-maligned animals in the northern

region of Sydney. As flying-foxes are a nomadic species, the initiation of such an education program along the eastern seaboard may assist in reducing the conflicts between communities and flying-foxes and eventually help to protect their diminishing habitat.

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References

- Ballantyne, R. and Packer, J. 1996** Teaching and learning in Environmental Education: Developing Environmental Conceptions *Journal of Environmental Education* 27 (2): 25-32.
- Bennett, D.B. 1988** Four steps to Evaluating Environmental Education Learning Experiences *Journal of Environmental Education* 20 (2): 14-21.
- Cohen, M. 1973** Environmental Education versus Environmental Attitudes. *Journal of Environmental Education* 5 (2): 5-8.
- Fenton, M.B. 1985** Introducing People to Bats. *Bats* 2 (2) Bat Conservation International.
- Ford, D. 1996** Bat Education: Student Outcomes and Future Directions. Unpublished Masters research project, *Graduate School of the Environment, Macquarie University*.
- Fortner, R. and Teates, T. 1980** Baseline Studies for Marine Education: Experiences related to Marine Knowledge and Attitudes. *Journal of Environmental Education* 11 (4): 11-19.
- Gabel, D., Kagen, M., and Sherwood, R. 1980** A Summary of Research in Science Education – 1978 *Science Education* 64 (4): 512-515.
- Holtz, R. 1976** Nature Centres, Environmental Attitudes and Objectives. *Journal of Environmental Education* 7 (3): 34-37.
- Iozzi, L.A. 1989** What Research says to the Educator, Part One: Environmental Education and the Affective Domain. *Journal of Environmental Education* 20 (3): 3-9.
- Kinsey, P. 1979** A Study of the Defensibility of Environmental Attitudes: Instrument Development and Experimental Testing of Defensibility Related to Knowledge. *Dissertation Abstracts* 39 (10): 6046 – A.
- Moore, R. 1981** Energy Related Information – Attitude Measures of College Age Students. *Journal of Environmental Education* 12 (3): 30-33.
- Moyer, R. 1977** Environmental Attitude Assessment: Another Approach. *Science Education* 61 (3): 347-356.
- Saunders, D.A. 1990** The Landscape Approach to Conservation: Community Involvement, The Only Practical Solution. *Australian Zoologist* 26 : 49-53.
- Zimmerman, L.K. 1996** Knowledge, Affect and the Environment: 15 Years of Research. (1979-1993) *Journal of Environmental Education* 27 (3): 41-43.

APPENDIX I Quiz I Questions

1. What does a bat look like?
2. Where do bats live?
3. Can you describe what a flying-fox looks like? (size, colour, face, teeth, eyes etc.)
4. Can you describe what a microbat looks like?
5. What do microbats eat?
6. What do flying-foxes eat?
7. Why are microbats important?
8. Why are flying-foxes important?
9. Have you seen a microbat? Yes No
10. If you have where did you see it? (you may circle more than one)
At the zoo; in a film; T.V.; in a book; school talk; in its own environment; other
11. What did you think about the microbat?
At the zoo....
In the film....
On the TV....
In the book....
At the school talk....
In its own environment....
12. Have you seen a flying-fox? Yes No

13. If you have where did you see it? (you may circle more than one)
At the zoo; in a film; TV; in a book; school talk; in its own environment; other
14. What did you think about the flying-fox?
At the zoo.... In the film....
On the T.V.... In the book....
At the school talk... In its own environment....
15. How do you think you would feel if you had the opportunity to get close to either a microbat or flying-fox?
16. Please write a story or a poem or draw a picture about a microbat or a flying-fox in the space below.

APPENDIX I

Quiz 2 Questions

1. Where do bats live?
2. Can you describe what a flying-fox looks like?
3. Can you describe what a microbat looks like?
4. What do microbats eat?
5. What do flying-foxes eat?
6. Why are microbats important?
7. Why are flying-foxes important?
8. Have you seen a flying-fox? Yes No
9. If you have where did you see it? (you may circle more than one)
At the zoo; in a film; T.V.; in a book; school talk; in its own environment; other
10. What did you think about the flying-fox?
At the zoo...
In the film...
On the T.V....
In a book....
At the school talk...
In its own environment....
11. Have you seen a microbat? Yes No
12. If you have where did you see it? (you may circle more than one)
At the zoo; in a film; T.V.; in a book; school talk; in its own environment; other
13. What did you think about the microbat?
At the zoo....
In the film....
On the T.V....
In the book....
At the school talk....
In its own environment....
14. Describe how you felt when you got close to a live flying-fox
15. What was the most important thing you remembered from the bat talk?
16. What did you enjoy most of all from the presentation?
17. Please write a story or a poem or draw a picture about the day the flying-foxes visited your classroom.

QUESTIONS & ANSWERS

PEGGY EBY: We have time for one question please.

MS EVANS: Without wishing to denigrate the educational side of things, I'm wondering if you have considered that there is probably some much more complex psychology going on. There is going to be a difference, on one hand, between the attitude of those people who have struggled with the land - saw the environment in those early years as something that they had to fight to survive - and on the other hand those people who are urban dwellers and whose source of food is the supermarket and who do not really have a close relationship or competitive relationship with nature. So I would suggest there are probably some fairly fundamental changes in attitude going on there as well.

DENISE FORD: I pointed out that this paper looked at changing attitudes in Sydney. I then focused on the way people's attitudes have changed and in the past 20 years by looking at the impact that education can have on those attitudes.

KATHY DAVIS (Newcastle University): I've just been to two prolonged visits to Melbourne and, without a doubt, talking to the average person in Fern Gully compared to the people in Sydney, education is what it is all about. In both cases you've got urban people that are visiting the same sort of areas, the botanic gardens. They do not have any education down there. They have no idea - very, very different - and it's the education that is the whole thing.

PEGGY EBY: Okay, thank you.