Incorporating Community Education in the Strategy for Harpy Eagle Conservation in Panama

Marta Curti and Ursula Valdez

ABSTRACT: Many species of top predators are threatened, in large part, because of human destruction. Although conservation programs that include captive breeding, release, and research are vital, environmental education is just as important for the long-term survival of many wildlife species. In Panama, The Peregrine Fund developed an education program to support the restoration of threatened Harpy Eagle populations. The authors identified why people kill this species, and they created an education program to mitigate the annihilation of Harpy Eagles. Using teacher training workshops, mass media, and a unique scientific and cultural knowledge exchange, coupled with adaptive management evaluation methods, this program has been able to stem the tide of human destruction of this species in the Panama Canal Watershed area.

KEYWORDS: adaptive management, community-based education, evaluation, top predators

"The great aim of education is not knowledge, but action." —*Herbert Spencer*

As human populations expand, natural resources increase in demand, and boundaries between wildlife and human habitat continue to blur, conservationists have come to realize the importance of including environmental education (EE) in their management programs. However, because of limited time, personnel, and budgets, educational endeavors can seem daunting and may be overlooked or considered to be low priority. Although conservation actions not offering education may be sufficient in some instances, it is more likely that the preservation of many

Marta Curti is a biologist and educator for The Peregrine Fund in Boise, Idaho. Her main interest is further improving ways to successfully blend science-based programs with community education to strengthen conservation efforts, particularly of top predators. Ursula Valdez is a Peruvian biologist and doctoral candidate in the biology department at the University of Washington in Seattle. Her main interests are raptor ecology, tropical ecology, conservation biology, and teaching.

species, particularly of top predators, will be unsuccessful in the long run if a strong community education program is not implemented as a key part of any conservation plan.

Today, an increasing number of species, including the Harpy Eagle (*Harpia harpyja*), one of the most powerful raptors in the world, are negatively affected by human actions. Harpy Eagles live in the rainforest canopy and feed mainly on large arboreal mammals (Alvarez-Cordero, 1996). They may play a key role in maintaining the health of rainforest ecosystems because immeasurable cascade effects in the environment can result if top predators disappear (Robinson & Wilcove, 1989; Terborgh, 1990).

Historically, Harpy Eagles were distributed from southern Mexico to northern Argentina (Touchton, Hsu, & Palleroni, 2002). However, habitat loss and direct killing by humans have led to the widespread decline of this species. Currently, Panama is the last known country in Central America to still have a viable wild population of Harpy Eagles (Vargas-González et al., 2006).

In 1989, The Peregrine Fund (TPF), a nonprofit scientific organization dedicated to the protection of raptors worldwide, pioneered Harpy Eagle conservation with a captive breeding and release program. In 1998, TPF successfully released the first five captive-bred Harpy Eagles in Soberania National Park (see Figure 1). Shortly thereafter, two of these eagles were killed by hunters, and this tragic event led to the realization that captive breeding and release alone might not be enough to ensure the survival of this species. Thus, TPF put a temporary halt to the releases, and in 2002, they created the Neotropical Environmental Education Program (NEEP) to mitigate human-caused raptor mortality by promoting positive attitudes toward birds of prey and to ensure the permanence of raptor populations in areas also

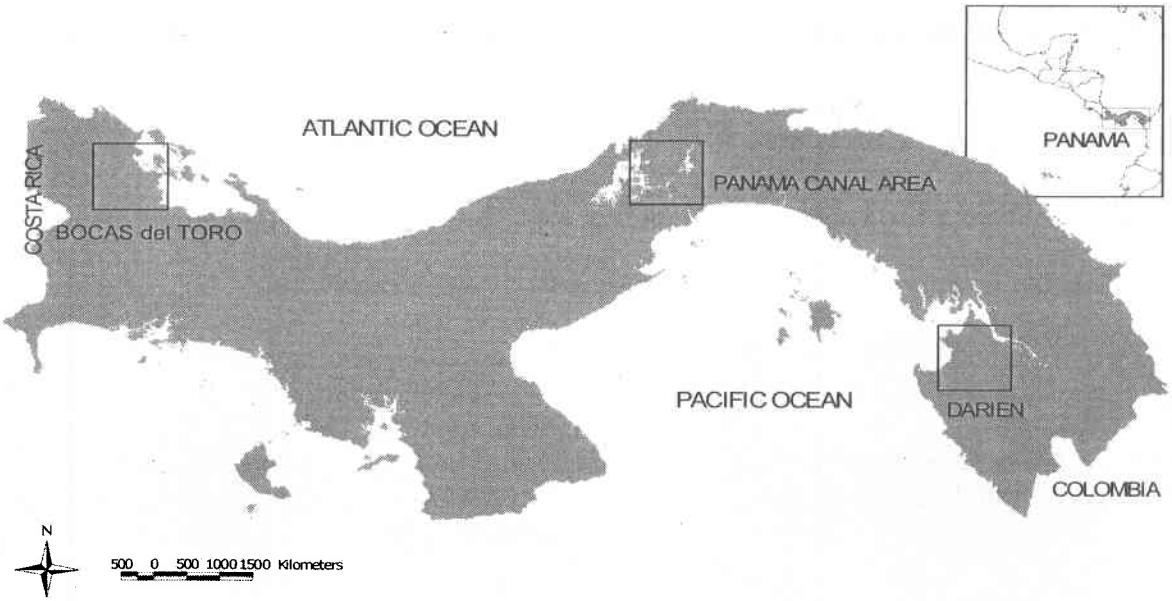


FIGURE 1. Map of the Neotropical Environmental Education Program's target communities in Panama: Bocas del Toro—where The Peregrine Fund has released some Harpy Eagles and where a small wild population remains; Panama Canal area—which encompasses the main release site of Soberania National Park; and Darien—home to the last known healthy population of Harpy Eagles in Central America.

occupied by humans (see Figure 2). To meet these primary goals, the following short-term goals were created on the basis of suggestions and information gathered in target communities:

- Use the Harpy Eagle as a flagship species to increase knowledge about conservation issues in rural, indigenous,[1] and nonindigenous settlements near Harpy Eagle release sites or where wild populations occur.
- Develop local capacity by training community members in raptor monitoring techniques.
- Create and distribute easy-to-use educational materials and teacher professional development workshops with Panama's Ministry of Education.
- Create a scientific and cultural knowledge exchange between biologists and members of indigenous communities.
- Develop age and culturally appropriate educational activities for children and adults.
- Use ongoing evaluations to measure the effectiveness of the program and make necessary modifications through adaptive management.

Although the program is still in its infancy, it has shown that when armed with a set of clearly defined goals, an identifiable target audience, and a wide variety of well-developed materials, an effective EE program does not need to be an overwhelming task and that much can be accomplished with limited resources and personnel.

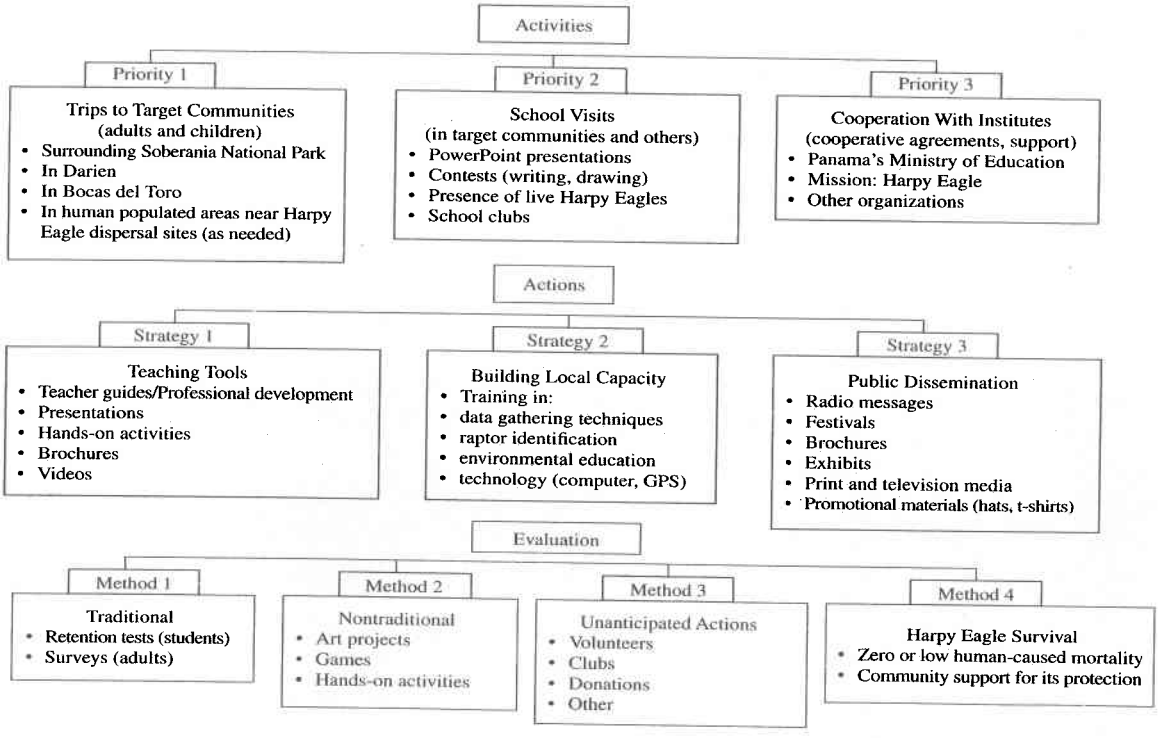


FIGURE 2. Matrix of the Neotropical Environmental Education Program activities, actions, and methods of evaluation, which were developed on the basis of results and findings in the pilot program.

Pilot Program

To test whether an EE program could have a measurably positive effect on Harpy Eagle conservation, TPF conducted a 6-month pilot program from October, 2001, to April, 2002, in two communities in the Panama Canal area (see Figure 1): Lagartera—where one of the released Harpy Eagles was shot—and Las Pavas—a community neighboring Largartera. At these sites, TPF held community meetings to gauge what was already known about the Harpy Eagle. It soon became evident that general knowledge of the species was very limited (U. Valdez, personal communication, December, 2001). TPF educators gave presentations introducing basic concepts about Harpy Eagle ecology, and they interviewed randomly chosen community members from both sites to measure the level of retention and understanding of the information provided. They also interviewed randomly selected individuals from two other communities in the Panama Canal area—Santa Clara and Nuevo Emperador—in which no previous educational activities on Harpy Eagles had been offered. To determine each person's level of knowledge about this topic, the educators assigned a percentage based on the correct answers given.

Results

A total of 344 adults in the four communities answered 11 questions about Harpy Eagles. Individuals who received information about the Harpy Eagle showed greater knowledge of the topic than did those who had not received previous information. For example, when asked to identify the main prey of Harpy Eagles (i.e., sloths), more than 70% of people living in the communities where TPF conducted its educational programs answered correctly, compared with only 41% answering correctly in the communities where TPF had not conducted any program.

Survey results also revealed pervasive misconceptions about Harpy Eagles, which led to a better understanding of why people kill these birds. When asked the question "Why do people shoot Harpy Eagles?" 21.2% of respondents said that people shoot Harpy Eagles because they do not know any better; 16.6% said that people shoot them out of fear; 11.3% said, "because they eat domestic animals,"[2] and 1.2% saw the animal as a direct competitor for the same food resources. Further interviews in these and other communities (beyond the scope of the pilot program), indicated that these people's perceptions about Harpy Eagles often originate from myths. Legends tell of Harpy Eagles so large they block out the sun, and of eagles carrying off entire houses filled with families, only to eventually consume everyone inside (a biologically impossible feat). In some communities, Harpy Eagles are the equivalent of the boogey man: "If you don't behave," some parents tell their children, "the Harpy Eagle is going to come take you away"[3] (M. Curti, personal observation, February, 2004).

It became clear to TPF researchers that an education program was needed to achieve successful Harpy Eagle conservation. Because people were shooting these raptors out of ignorance, it seemed reasonable to believe that providing individuals with accurate information would help prevent further shootings in the future.

Program Description

The NEEP works in more than 60 communities throughout Panama and has a staff of no more than three full-time employees and one part-time assistant who also works on the Harpy Eagle Release project. With such a wide area to cover and so few personnel, the first challenge was to optimize the staff's ability to widely disseminate information. By forming partnerships with other nongovernment and government organizations, as well as local media, NEEP has been able to use radio and television broadcasts; festivals; magazine and newspaper articles; advertisements in local

phone books; brochures; and drawing, writing, and "name-a-captive-bred-Harpy-Eagle" contests to provide relevant information to target audiences and the general public in a dynamic manner.

However, because often the most effective means of disseminating information is through direct contact with the audience, TPF's greatest efforts focus on community visits with adults and children. In target communities, TPF educators present a different topic during each visit that builds upon information previously provided. Topics include Harpy Eagle biology, raptors as predators, food chains, and bird migration. These visits are advantageous because participants receive first-hand information, and, over time, they begin to feel comfortable asking questions and expressing concerns. Also, through direct and immediate feedback, it is possible to tailor future presentations to local interests and needs. Nonetheless, there are disadvantages associated with this method. When understaffed, it can be hard for educators to make regular visits and, consequently, more challenging to motivate community participation. Offering snacks, a free movie, or a raffle with small prizes can help encourage people to attend, but these extras can add up financially and may not always be feasible.

To compensate for these limitations, NEEP educators used two key approaches to maintain a constant presence in project areas. Though these approaches require a higher effort in the beginning, they should be self-sustaining in the long term, which is their greatest advantage.

Building Local Capacity

Through a scientific and traditional knowledge exchange program, TPF recruited seven field technicians from the Emberá-Wounaan communities to work on its Harpy Eagle Conservation Project in Darien, one of the main strongholds for the species in MesoAmerica (Vargas-González, Mosquera, & Vargas, unpublished data, 2008). TPF biologists trained the field technicians in raptor research and education techniques. In the field, they now locate raptor nests, monitor eagles through radio telemetry, and use GPS technology to better understand dispersal patterns. They also work closely within their own communities to teach local adults and children about raptors through games and presentations. The research and communication skills they have learned contribute to their long-term conservation education, as well as to that of the whole community, because field technicians and community members can learn to appreciate the intrinsic value of conservation and understand the practical value of having employment opportunities in their community.

To involve younger children, TPF hosted a traditional story-writing, raptor-themed contest. Forty-seven children from 19 communities participated. Ten winners were selected and their stories included in a trilingual (i.e., Spanish, Emberá, and Wounaan) children's book, which will be published and made available to some schools in Panama.

Teacher Professional Development

Interviews with teachers in target communities indicated that local educators did not have the knowledge, training, or materials to effectively teach EE in the classroom. As a whole, conservation topics were missing from the school curriculum. No information was available on basic raptor biology, and very little on the Harpy Eagle, despite the fact that it is Panama's national bird. To fill in this gap, the NEEP team, with the help of Panama's Ministry of Education, wrote an education guide on raptors, and they host 40-hr workshops to train teachers in its use. Participants receive professional credit recognized by the Ministry. Many past participants have already implemented activities from the guide in their classrooms, which indicates that the workshop had a positive impact on their desire and ability to teach their students about raptors. As a further incentive, NEEP staff members take a live Harpy Eagle (a captive-bred eagle trained as an education raptor) to those schools whose teachers demonstrate that they actively practice raptor education with their students. The presence of a live eagle in the schools can be inspiring and can be a great experience for both educators and students (U. Valdez, personal communication, August, 2002.)

Program Evaluation

To generate positive results, conservation educators should constantly evaluate their education actions (Jacobson & McDuff, 1997; Monroe, 2001; Zint, Kraemer, Northway, & Lim, 2002). NEEP uses a variety of evaluation methods to measure the program's impact. Short-term indicators include results from traditional and nontraditional evaluations. Traditional evaluations, such as surveys composed of open-ended questions, are designed to indicate participants' evolution in knowledge and attitude throughout the educational endeavor. NEEP uses retention tests, composed of true-or-false statements to measure the success of each individual presentation. TPF staff members conduct oral surveys with adults and use written retention tests with school-aged children. Nontraditional evaluations are interactive activities for varying ages and ability levels, and they allow for the documentation of changes in knowledge and attitude while providing participants with a more engaging activity than an interview or test.

Long-term indicators include (a) unanticipated actions—actions not solicited by TPF but that occur as a result of the program and may be undertaken, for example, by students, teachers, and businesses—and (b) Harpy Eagle survivorship. Long-term low or zero human-caused mortality will be the most significant measure of this program's success.[4]

Clearly, there are pros and cons to each evaluation method, such as respondents' potentially giving the answers they think a researcher wants to hear on a traditional survey, balanced with the ease of quantifying the data; difficulty in quantifying results of nontraditional methods, such as games, balanced with the notion that more reliable results often occur when participants are unaware that they are being evaluated; or determining whether an unanticipated action has really come about as a result of a specific program, while acknowledging when the project has affected positive change in unimagined ways. Therefore, to evaluate the program as accurately and as honestly as possible, NEEP combines all of these methods, thereby taking advantage of the benefits of each and mitigating some of the problems inherent in trying to measure changes in human attitudes and actions.

Through these evaluations, NEEP staff members are able to better identify the strengths or limitations of the program. When necessary, TPF modifies educational strategies (e.g., changing the type of information provided or the way in which it is presented) to improve their effectiveness in reaching program goals and to keep pace with changing social and cultural factors, pressures for natural resources use, and other external incentives that can influence changes in attitude.

Traditional Evaluations

NEEP conducted presurveys with local community members from five Naso communities before giving any presentations in those areas. After TPF employees completed three visits to the region to give three separate presentations on different topics, locals from four communities participated in a postsurvey. In all, 49 individuals completed the presurvey, and 34 participated in the postsurvey. Participants ranged in age from 15 to 84 years, and more than 50% had a sixth-grade education or lower. Surveys were conducted on a one-on-one basis: the NEEP educator and the interviewee (an individual who had arrived to listen to the presentation). The NEEP representative read each question aloud and recorded each participant's responses. Results indicated a 33% increase (from 12% to 44%; see Figure 3a) in people who were able to correctly identify a Harpy Eagle from photos after the presentation. There was an even greater increase in those who recognized the Harpy Eagle as Panama's national bird after the presentation. However, fewer people were able to explain correctly what a raptor or TPF is. (see Figure 3a). To measure changes in attitude (see Figure 3b), participants were asked to respond to such open-ended questions as "Do you fear Harpy Eagles?" or "What would you do if you saw a Harpy Eagle?" For the former question, the answers were divided into simple *yes* or *no* responses. For the latter question, NEEP staff categorized answers into *positive*

(reflecting interest, such as "I'd feel lucky to see such a large bird"), *neutral* (showing no interest or emotion at all), and *negative* (answers indicating that participants were still fearful of the species through such responses as "I would run away"). Although 65% of the participants expressed fear of the Harpy Eagle during the initial survey, only 37% were still fearful after the presentations (see Figure 3b). However, there was little change in how people might resolve perceived conflicts with wildlife. Both before and after the presentations, more than 70% of individuals said they would harm

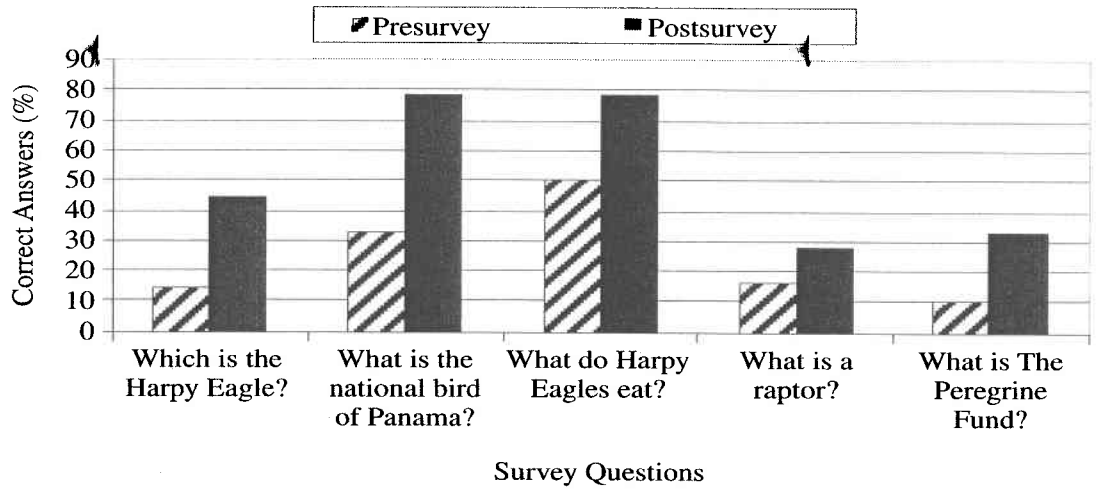


FIGURE 3a. Measuring changes in knowledge. Results of a pre- and postsurvey designed to indicate changes in participants' knowledge of Harpy Eagles and other raptors, before and after a series of informative presentations and activities.

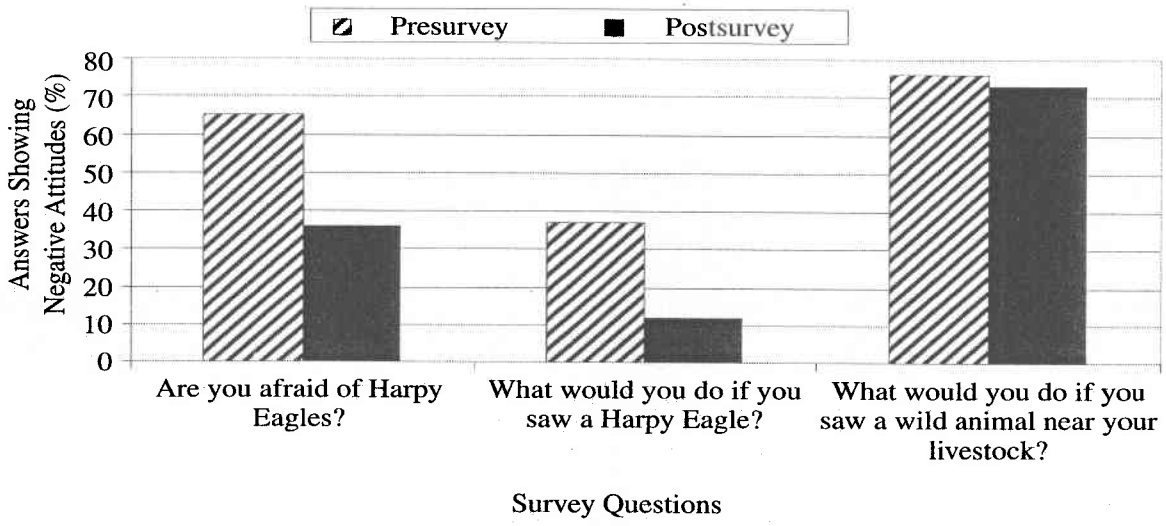


FIGURE 3b. Measuring changes in attitude. Results of a pre- and postsurvey designed to indicate changes in participants' attitudes toward Harpy Eagles and other wildlife, before and after a series of informative presentations and activities.

or kill animals if they considered them to be a potential threat to their livestock or livelihood (see Figure 3b). From these results, it was obvious that a higher emphasis needed to be placed on alternatives to shooting "problematic animals" that may unwittingly approach human areas.

In the community of Nuevo Emperador in the Panama Canal area, 56 students participated in a pre- and postretention test (see Table 1) designed to measure the effectiveness of a presentation on Harpy Eagles. Before the presentation, students completed a pretest that comprised 10 statements, which were projected onto a large screen and read aloud by NEEP staff members. On an answer sheet, students circled their answer choice of *yes*, *no*, or *I don't know*, indicating whether they agreed or disagreed with each statement. After the presentation, NEEP staff members gave the same test (i.e., posttest) to the students. NEEP staff members then compared the answers to see (a) what students already knew prior to the presentation, (b) what new knowledge they had obtained, and (c) what concepts they were still struggling with so that these sections could be improved for future presentations. As seen in Table 1, all of the students gave the desired response (i.e., *yes*) to Statement 10: "We should protect the Harpy Eagle," during the pre- and posttests. For Statement 4, "Harpy Eagles eat sloths and monkeys," only 33 responded correctly (i.e., *yes*) on the pretest, compared with all but 1 who answered correctly on the posttest. However, for Statement 7, "You are afraid of the Harpy Eagle, "only a little more than half gave the desired response (i.e., *no*) during the pretest, and 10 answered *I don't know*. The posttest indicated that 18 students were still fearful of the Harpy Eagle after the presentation, and that 1 student who previously answered *I don't know* now expressed fear. Clearly, changes in the presentation needed to be made, including reemphasizing that this species is not dangerous to people. Overall, there was a great increase in the total number of correct answers given from 433 (78%) on the pretest to 530 (95%) on the posttest.

Nontraditional Evaluations

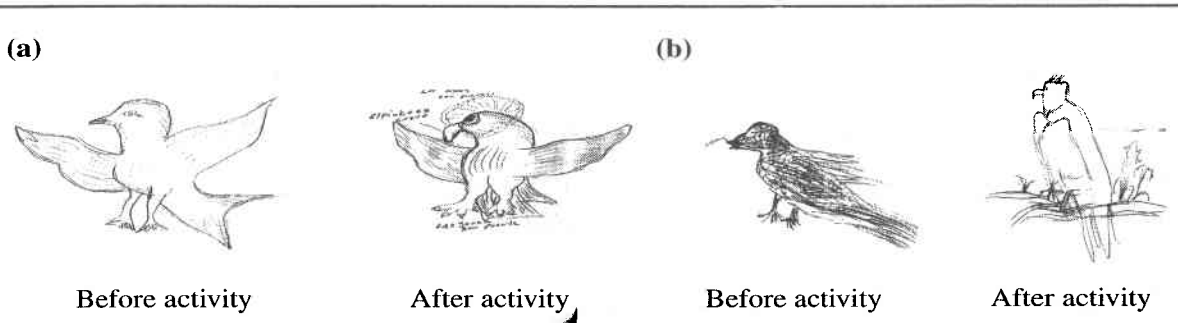
In one nontraditional evaluation, a total of 49 participants were asked to draw a raptor (preevaluation). Participants then watched a slide presentation and participated in a dynamic activity illustrating the main characteristics of raptors. Afterward, the same individuals made another drawing of a raptor (postevaluation). Preevaluations (see Figure 4a pre, 4b pre) indicated that all participants knew that raptors are birds, whereas the majority (34 participants) knew little else about their defining characteristics. Postevaluations (see Figure 4a post, 4b post) indicated a definite increase in the recognition of raptor characteristics, which include a curved beak, sharp talons, and keen eyesight. Twenty-nine people (more than 50%) showed either an improvement in their ability to identify at least one key raptor characteristic or they had accurately drawn a raptor in both the pre- and postactivity. Also, 5 participants did not correctly complete the activity, and 15 showed no improvement in their illustrations.

In another evaluation, NEEP modified bingo game cards so that instead of a number or letter combination, the squares were filled with illustrations or words related to topics covered in the presentations. In small groups, community members listened to questions read aloud by an NEEP educator, and then they placed a stone over the square with the correct answer. When a group got "bingo," their answers were examined to determine how well they understood the concepts. This method of evaluation is more difficult to quantify, but it gives educators a good sense of the participants' general comprehension. It works particularly well in communities in which members are shy and reluctant to participate, and it is a very nonthreatening, fun activity for most.

Some simple nontraditional evaluations include (a) passing out photos of plants and animals and asking participants to find others in the group with whom their pictures form a complete food chain and (b) passing out pictures of raptors and nonraptors to each participant and then asking them to correctly place each photo in a box labeled either *raptors* or *other birds*. Both of these activities take less than 10 min and provide the evaluators with immediate feedback as to how well a particular topic has been understood.

TABLE 1. Pre- and Postretention Test on Harpy Eagle Natural History Conducted With 56 Students in the Nuevo Emperador Community in October 2006

Statement (correct answer)	Pretest answers			Posttest answers		
	Yes	No	Don't know	Yes	No	Don't know
The Harpy Eagle is Panama's national bird. (yes)	54	0	2	55	0	1
The following photo is of a Harpy Eagle. (no)	5	46	5	0	56	0
Harpy Eagles are found in Panama. (yes)	50	0	6	55	0	1
Harpy Eagles eat sloths and monkeys. (yes)	33	10	13	55	1	0
One of the greatest threats to the Harpy Eagle is deforestation. (yes)	48	0	7	56	0	0
Harpy Eagles live in tropical forests of Central and South America. (yes)	17	1	38	52	0	4
You are afraid of the Harpy Eagle. (no)	17	29	10	18	36	0
Harpy Eagles live in deserts. (no)	2	47	7	0	53	3
Harpy Eagles build their nests in low trees. (no)	1	53	2	0	56	0
We should protect the Harpy Eagle. (yes)	56	0	0	56	0	0
Totals	433	36	90	53	19	9
Percentages	78	6	16	95	3	2



FIGURES 4a and 4b. For this nontraditional evaluation, participants drew their depiction of a raptor before (pre) and after (post) an informative presentation. Postdrawings indicate an improvement in participants' ability to correctly depict key raptor characteristics, including a curved beak, sharp talons, and keen eyesight. Illustrations 4a (pre and post) were made by one individual, and illustrations 4b (pre and post) were made by another individual.

Unanticipated Actions

One of the most satisfying examples of an unanticipated action occurred in 2004 when students from a private school, Colegio Brader, located in Panama City paid a visit to TPF's Neotropical Raptor Center to see the education eagle. Inspired and guided by their teacher, and also by their close-up encounter with a live Harpy Eagle, 60 of these students created a club called *Mission: Harpy Eagle*. Members of this club now teach public school students about the importance of the Harpy Eagle by using originally designed presentations, videos, displays, puzzles, and games. They have collaborated with NEEP on school visits and festivals, and their work is highlighted during the teacher professional development workshops as an example of what other educators can do to promote conservation. This project is mutually beneficial for everyone involved. These upper class children get a chance to visit rural areas and see another facet of life in their country, while children from less privileged areas interact with others their own age who are already motivated to make a positive difference.

Harpy Eagle Survival

The most important success indicator is the long-term survival of the Harpy Eagle near human-inhabited areas. From the start of NEEP to the present, over 40 eagles have been released and at least 6 have dispersed to forest edges near human settlements. However, only one human-caused eagle mortality has been confirmed in areas where TPF has conducted long-term education in Panama. In most other instances, individuals have expressed excitement at seeing a Harpy Eagle and a desire to protect it.

In the Panama Canal target community of Aguas Claras, a young eagle appeared in the forest bordering the town. When TPF staff arrived, all the school children were outside, some dancing happily below the perched bird. Word spread fast, and most of the community turned out to get a glimpse of the eagle.

TPF has received phone calls from at least four other target communities in the Panama Canal area alerting staff when an eagle has been seen. In these communities, few homes have telephones, so phone calls were made either from cell phones or pay phones. Individuals took it upon themselves to make and pay for the call. This shows (a) an overall awareness of the project (knowing whom to contact); (b) an interest in protecting the birds; and (c) a desire to be directly involved, even in a small way, in this conservation effort.