Environmental Education and the Black Lion Tamarin, *Leontopithecus chrysopygus*

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Introduction

People are unaware of the importance of natural areas because they are so rarely used for education purposes. This is especially true for Brazil, while significant exceptions can be found in the education projects designed for the conservation of lion tamarins, *Leontopithecus* (*v.* Dietz et al. 1994). The first, set up on behalf of the golden lion tamarin, *L.rosalia*, began in the early 1980's (Dietz and Nagagata, 1986; Kleiman *et al.*, 1986; Deitz *et al.*, 1994), and opened up a whole new conservation scenario, providing the basis on which subsequent programs were established for the golden-headed lion tamarin, *L.chrysomelas*, in Bahia (Alves, 1991; Nagagata, 1994) and the black lion tamarin, *L.chrysopygus*, in São Paulo (Jacobsen and Padua, 1992, in press a and b; Padua, 1991, 1994, in press a, b; Padua *et al.*, 1990; Padua and Jacobsen, 1993). These programs, although varying in their context, are in general designed to involve local communities in the conservation process and disseminate scientific findings in a simple and direct language so that the information can be understood by all. As the lion tamarins are charismatic, beautiful, and highly threatened, they have been highly effective in attracting attention and stimulating pride in the communities within their geographic ranges, and as such enhancing the protection of the forests they live in (Padua *et al.*, 1990; Dietz *et al.*, 1994). In addition, some of these education projects have applied research methods important for improving the strategies employed, in assessing their overall effectiveness, and in pinpointing those which have been effective and those which have not, so that other educators and education programs can benefit.

The environmental education program for the conservation of the black lion tamarin began in 1988/89, and was centered on the Morro do Diabo State Park, which harbors the most significant surviving population of the species. The Park is administered by the São Paulo State Forestry Institute (IF). Education initiatives have likewise been carried out in other sites where *L.chrysopygus* is found. In June 1992, a course for teachers was held at the Caetetus Ecological Station (also of the São Paulo Forestry Institute). It served as a starting point for a continuous school program maintained by the Station's new administration. Another program centered on the Fazenda Rio Claro of the Duartex Co., where *L.chrysopygus* was recently discovered (Valladares-Padua *et al.*, 1994). Activities with local students included a study of the extent to which information was passed on to their parents (Padua *et al.*, in press). The results of this study were adapted and translated into Portuguese for the journal *Educador Ambiental* (Padua *et al.*, 1994).

The education program for the black lion tamarin has been carried out according to specific methodologies, the most thorough of which was that centered on the Morro do Diabo State Park, and which I will summarize here. It was continuously and systematically evaluated following the PPP model (Planning/Process/Product), designed by Jacobsen (1991), and adopted by Padua and Jacobsen (1993) and Padua (in press a). This model helps ensure effectiveness in each step of the program, from conception to completion, through the planning stage, implementation (process) and the evaluation of the results (product).

Planning Stage

The needs, goals, objectives, target public, constraints, and available resources are defined during the planning stage. A preliminary survey conducted among the local population showed that people had very little environmental knowledge. Although they showed great interest, the majority knew little about the local flora and fauna. The need to instil a broader knowledge and understanding was evident.

The goals and objectives of the program were also defined based on information gathered through preliminary surveys. Since the Park is the largest surviving remnant of the Atlantic forest in the west of the state of São Paulo, and threatened as such, the main goal was the preservation of the integrity of the Park itself. The objective, therefore, was to foster among local people an appreciation of the Park and its rich wildlife.

A specially designed school program introduced students to the Park and furnished means for them to increase their knowledge of ecological concepts, and stimulate positive attitudes towards nature. Strategies that would impact the value and increase the knowledge of individuals were systematically applied during all stages of the program: research has shown the importance of these aspects to increase awareness and change people's behavior (Swan, 1974; Iozzi, 1989; Hungerford and Volk, 1990; Stapp, 1974). Although the environmental education program was targeted mainly at local students, many activities were specially designed for a broader public.

The involvement of the communities surrounding the Morro do Diabo State Park was of great importance due to the increasing rate of destruction of the natural environments of the region. Students alone may not have the chance to halt this destructive process since little may be left for them to fight for when they eventually become the decision-makers. For this reason, the environmental education program sponsored several out-reach activities targeting the entire community, from local authorities to businessmen and laborers.

The planning stage also included seeking institutional support and participation, crucial for the program's implementation. The Park's employees were encouraged to collaborate, and as a consequence nature trails were set up and educational activities in the Park were carried out with little extra expense. Although the São Paulo Forestry Institute was very supportive of the program, and provided help in a number of ways, additional sponsorship was obtained from several institutions concerned about the conservation of the Park (see 'Acknowledgements'). This was most important in giving the program an impetus and pace that enabled the full realization of its objectives and goals.

Process Stage

The program's content, its implementation strategies, and the evaluation procedures were defined in the Planning Stage. The content of the black lion tamarin environmental education program was selected based on the information gathered in the planning stage and on the scientific findings of a long-term study of the species (Valladares-Padua, 1993; Valladares-Padua *et al.*, 1994). Program strategies were designed accordingly and included the elaboration of educational materials for local teachers who lacked information on the Park, its natural resources, and history. Visitors watched a slide presentation before their visit to the Park. Three nature trails were set up for students, each focusing on a different aspect of the Park. A Visitor's Center included an area for exhibits and one where objects could be handled during activities which were specially designed to stimulate curiosity and learning. There students play games and have contact with live animals. As snakes were especially feared in the region, three were kept and presented to students to turn their feelings of fear into admiration. Class contests were sometimes held, and after the visits the students received hand-outs with information and games.

All activities were designed to encourage appreciation of the black lion tamarin and the Park. Each activity was pilot-tested and constantly evaluated using straightforward questions as advocated by Nowak (1984). This process evaluation furnished helpful information for the improvement of the program during its

implementation. Among the many community-oriented activities were art exhibits, art or sports competitions and workshops. The local radio station played an important role in broadcasting special activities and supplying information on the environmental education program in general.

Two Park employees and some local high school students were trained as nature guides. They helped design the program by contributing with new ideas and activities. These were pilot-tested and, depending on the results, adopted by all as an educational strategy. As most of the program's participants were members of the local community, they were important in helping to solve specific implementation problems, and facilitated the local community's acceptance of the program as a whole.

Product Stage

The Product Stage assessed whether the goals and objectives were being achieved, as well as the direct and indirect effects of the program. A formal evaluation procedure helped assess its effectiveness, and the results were used to improve, change or abandon the various strategies. Results based on systematic data collection were also used to obtain institutional and funding support.

The black lion tamarin environmental education program was able to count on considerable public interest, acceptance, and participation. By the end of the first year, 6,000 students had visited the Park, and the average annual visitation in the following three years was 8,000. A systematic evaluation with 144 students assigned to experimental and control groups were tested on three occasions: a *pre-test*, prior to exposure to the program; a *post-test*, immediately after visiting the Park; and a *retention test*, one month later. The tests were written questionnaires which measured the student's knowledge and attitude. Statistical analyses showed that there were significant differences between the experimental and control groups ($F=98.29$, $p \leq 0.05$) indicating the program's effectiveness (Padua, 1994, in press b).

Other indicators of the program's success were: the increase of families visiting the Park during weekends; university students spending weekends at the Park's lodging house; local teachers requesting environmental education courses; and the nature guide's increasing interest to improve their performance. Several events demonstrated people's interest in the Park's conservation. Some were related to festivities, such as floats for the town's anniversary celebration, end-of-year parties of the Rotary and Lion's Club and other public initiatives. However, the most important indications of community involvement referred to the protection of the Park itself. After a radio interview in which the education staff explained the threats to the Park and its wildlife resulting from the relocation of the garbage dump of the nearby town of Teodoro Sampaio, people wrote and telephoned to the Town Mayor requesting an immediate solution. The garbage was removed in less than a week. The community also voluntarily helped the Park employees to extinguish a forest fire. Fires had occurred in previous years, but the community's collaboration was unprecedented. A third instance of community willingness to participate in nature conservation occurred outside the Park. A nearby farm was being illegally logged, and through public pressure this was stopped and the farmer was fined.

In order to improve the socioeconomic conditions of the poorer sections of the communities, local businessmen formed a group with the purpose of establishing development plans which gave priority to problems of pollution, as well as using local underprivileged and unskilled labor: concerns which would have been lacking in solutions imported from the outside. Finally, the community became active in demanding the continuity of the program itself. Letters were sent to the Park's administration in São Paulo and to the Town Mayor requesting a local director to guarantee the continuity of the education program during a temporary hiatus in the program's activities.

Conclusions

The environmental education program for the lion tamarins, together with other conservation measures should serve as examples of integrated and effective efforts towards species and habitat protection. Through public programs of this sort, people increase their knowledge concerning local environmental problems and shift their values and attitudes to an extent that encourages them to act. Giving power to local communities in terms of their understanding of environmental problems can greatly contribute to the conservation of natural areas. In Brazil, this is especially important due to the richness of its natural environments and the lack of resources to protect them. The lion tamarin example should be shared and disseminated so that other species and ecosystems can benefit from the lessons learned.

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