

RESEARCH ARTICLE

Are We Making the Grade? Practices and Reported Efficacy Measures of Primate Conservation Education Programs

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Conservation education is often employed alongside primate conservation efforts with the aim of changing knowledge, attitudes, and behaviors toward non-human primates. Recommended best-use practices include longevity, use of program incentives, collaboration among educators, and adaptive program assessment, among others. This study surveys primate conservation education programs (PCEPs) to assess the frequency of suggested best-use practices, and to investigate impacts on program efficacy. Online surveys were collected from PCEPs in 2013–2014 ($N = 43$). The majority of programs reported lengths of 5–10 years, with participant involvement ranging widely from a day to several years. Non-economic and economic incentives were distributed by approximately half of all programs, with programs that provided economic incentives reporting positive participant attitude changes more frequently than those that did not ($P = 0.03$). While $>70\%$ of PCEPs consulted with community leaders, local teachers, and research scientists, only 45.9% collaborated with other conservation educators and only 27% collaborated with cultural experts such as cultural anthropologists. Programs that collaborated with other conservation educators were more likely to report reductions in threats to primates, specifically to bushmeat hunting and capture of primates for the pet trade ($P = 0.07$). Formal program evaluations were employed by 72.1% of all programs, with the majority of programs using surveys to assess changes to participant attitudes and knowledge. Formal evaluations of participant behavior, community attitudes and behaviors, and threats to primate populations were less common. While results indicate that PCEPs follow many suggested best-use practices, program impacts may be enhanced by greater discussion of economic incentivization, increased collaboration between conservation educators, and improved commitment to adaptive evaluation of changes to behaviors in addition to attitudes and knowledge. *Am. J. Primatol.* 77:434–448, 2015. © 2014 Wiley Periodicals, Inc.

Key words: conservation education; survey; longevity; efficacy; collaboration; community involvement

INTRODUCTION

The challenges facing primate conservationists are daunting and wide in scope, given that the proximate and ultimate drivers of primate population declines are both global and local in nature [Geist & Lambin, 2002]. Threats to primate populations include tropical forest destruction, capture for the pet-trade, bushmeat hunting, pest control, injury due to infrastructure expansion, pollution, and disease [Caillaud et al., 2006; Golden, 2009; Nijman et al., 2011; Nunez-Iturri et al., 2008; Siex & Struhsaker, 1999; Wilkie et al., 2013] and are responsible for threatening 47% of all primates with extinction [IUCN, 2014]. Additional logistical challenges such as high poverty rates in target conservation areas, ever-dwindling funding sources, long-held negative cultural stereotypes, community resistance to outside influence, and high levels of political unrest and corruption further challenge

primate conservation programs [Fisher & Christopher, 2007; Johnson-Pynn & Johnson, 2005]. In the face of these many challenges, successful primate conservation requires a multi-faceted approach that draws upon principles and practitioners from the fields of biology, anthropology, psychology, economics, and education.

Primate conservation education, with its documented ability to change the knowledge, attitudes

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and behaviors of its participants, has become a tenet of many primate conservation programs and is encouraged by most granting agencies [Kollmuss & Agyeman, 2002; Kuhar et al., 2010; Leisher et al., 2012]. However, in practice, primate conservation education programs (PCEPs) are diverse, facing different challenges, targeting different audiences, running for different lengths of time, and employing different combinations of active and passive methods of learning that range from nature clubs to comic books to film [Breuer & Mavinga, 2010; Dolins et al., 2010; Wright, 2010]. Moreover, the conservation educator often operates in triage, self-teaching principles from diverse disciplines in hopes of acquiring the many skills necessary to implement successful community conservation programs on-site in primate habitats [Garber, 2010; Jacobson, 2010]. In light of this variation, increased attention over the past decade has been placed on identifying best-use practices for PCEPs, learning both from successful conservation education programs applied in the developed world and from case-studies of PCEPs in countries where primates are endemic [Bettinger et al., 2010; Dietz et al., 2010; Dolins et al., 2010; Wallis & Lonsdorf, 2010].

Several recent publications have identified specific factors that characterize impactful PCEPs in specific instances [Jacobson, 2010; Kuhar et al., 2010; Sherrow, 2010; Wallis & Lonsdorf, 2010]. For example, longevity, local involvement, collaboration, evaluation, use of effective communication tools, carefully considered program planning, and attachment of conservation education programs to existing conservation efforts have all yielded increased success in individual programs [Alexander, 2002; Breuer & Mavinga, 2010; Dietz et al., 2010; Dolins et al., 2010; Jacobson, 2010; Pusey et al., 2007; Savage et al., 2010; Wallis & Lonsdorf, 2010; Wright, 2010]. However, to date, no study has quantified the range and scope of PCEPs currently in practice, determining the extent to which primate conservation educators follow suggested best-use practices and quantifying where possible which applied practices have the greatest overall impacts on primate conservation as a whole. Remedying this deficiency is the goal of the present study, with particular attention paid to program longevity, local involvement, collaboration, and evaluation.

Longevity, or maintaining continuously operating programs, may be a valuable means of upholding knowledge, attitude and behavior changes of participants long term [Kuhar et al., 2010; Sherrow, 2010; Wallis & Lonsdorf, 2010]. A lasting presence additionally might enable programs to better establish themselves and build trust and support in their community [Espinosa & Jacobson, 2010]. An evaluative study of a PCEP in the Kalinzu Forest Reserve in Uganda, for example, found that both pre and post-program assessments of program

participants improved each year, indicating that in longer term programs, information can disseminate to community members even before they experience the education program themselves [Kuhar et al., 2010].

Local involvement may also yield improved conservation impacts and can take the form of providing incentives for participation in the conservation education program and allowing participants to become involved in program operations and decisions. From creating job opportunities through ecotourism to introducing new cost-efficient and eco-friendly technologies to participants [Alexander 2002; Savage et al., 2010], conservation education programs that provide economic incentives may help bolster community support, encourage participation, and reduce some of the potential financial costs conservation can impose on local peoples [Durbin & Ralambo, 2009; Hackel, 1999]. Non-economic incentives, like the provision of health care supplies or additional educational instruction in non-conservation areas, can also serve to assist with participant quality of life [Savage et al., 2010]. For example, community conservation programs such as the Community Baboon Sanctuary in Belize [Alexander, 2002; Horwich & Lyons, 1998] and Proyecto Tití in Columbia [Savage et al., 2010] have reported impressive conservation successes, and both programs provide economic and non-economic incentives for program participation and to help support the community in which they are located. Involving participant and community members in the conservation process by holding open meetings that affect program operations and decisions is another important means of building community integration and support and/or providing valuable feedback that can aid in targeting the community's most pressing needs [Breuer & Mavinga, 2010; Padua, 2010].

Collaboration and consultation among primate conservation educators and those who work outside the field, such as local teachers or government officials, are also cited as important means of introducing new perspectives and skillsets to an education program [Garber et al., 2010; Jacobson, 2010; Sherrow, 2010; Wallis & Lonsdorf, 2010]. In particular, sharing materials (i.e., lessons plans, equipment) with other conservation education programs allows for increased dissemination of information and may even help to reduce program operating costs [Dietz et al., 2010; Wallis & Lonsdorf, 2010].

Last, without specific program targets and proper quantitative evaluation, it is impossible to determine whether any conservation education program has achieved its stated goal and yielded a conservation impact. Evaluation, both of a program's operations and of its participants, through means such as participant surveys, behavioral studies, or focus groups, has been shown to produce improvements in program management and in participant

knowledge, attitudes, and behaviors and, as a result, is a widely recommended practice [Carleton-Hug & Hug, 2010; Dietz et al., 2010; Espinosa & Jacobson, 2010; Keene & Blumstein, 2010; Norris & Jacobson, 1998]. Specifically, evaluation can positively redirect learning goals and methods, reinvigorate participant involvement by justifying program impact, and even lead to increased funding and participant volume [Engels & Jacobson, 2007; Flowers, 2010; Johnson-Pynn & Johnson, 2005]. A study of TACARE, a conservation and education program associated with the Jane Goodall Institute in Tanzania, for example, found that program evaluation helped to illustrate important gaps between program goals and accomplishments, precipitating a necessary change in management practices and communication [Pusey et al., 2007]. Evaluation, through its ability to more accurately articulate results, also helps to legitimize a program's performance to other researchers or educators as well as to potential donors [Norris & Jacobson, 1998].

Unfortunately, while evaluation is arguably a necessary component of any conservation education program, it is not universally utilized and confusion abounds both as to what evaluation actually entails [Bettinger et al., 2010; Espinosa & Jacobson, 2012; Kuhar et al., 2010] and to which evaluation methods (e.g., participant surveys, behavioral studies, focus groups) are most effective [Flowers, 2010]. Educational experts recommend adaptive evaluation that involves objective assessment of both participants and program management by the program themselves and by outside sources, which is then followed by program modification [Dolins et al., 2010; Engels & Jacobson, 2007; Kuhar et al., 2010; Powell et al., 2006; Zint et al., 2002]. However, adaptive management can be time-consuming and many conservation educators are tempted to rely on the assumption that any exposure to education is beneficial to participants and by extension local communities, even going so far as to forego evaluation and deem it unnecessary [Bettinger et al., 2010]. This general lack of commitment to evaluation and to what it includes leads to difficulties in carrying out assessments that can be compared across programs, thereby preventing the identification of the practices that yield the greatest impacts to primate conservation efforts in particular situations [Sherrow, 2010]. Such information is critical in order to better target limited funds for conservation efforts.

This study aims to serve as a general census of PCEPs, and where possible to evaluate conservation impacts of specific best-use educational practices. As challenges to PCEPs can differ between programs and from those facing conservation education programs in the developed world (which comprise the majority of subjects of conservation education studies), a comprehensive study of the practices employed by PCEPs and an evaluation of their efficacy could be

helpful to primate conservation education practitioners in ensuring that their programs yield maximum impacts. Results from our globally-dispersed survey noting the practices of individual PCEPs identify program strengths and weaknesses by: (i) assessing the scope of PCEPs; (ii) determining the form of and extent to which PCEPs apply suggested best-use practices; and (iii) noting correlations between reported measures of efficacy and those measures suggested to be most successful in the literature. Specifically, with respect to the latter goal, we hypothesize that longevity, community involvement, and collaboration will lead to positive changes to participant and community attitudes and behaviors and correlate to reductions to existing primate threats. This widespread evaluation is beneficial in both assessing the current global state of PCEPs and in identifying specific targets where PCEPs could improve.

METHODS

Survey Structure and Distribution

An online survey consisting of 30 questions was distributed to 147 PCEPs between March 2013 and January 2014. Survey distribution was completed in compliance with the University of Texas at Austin's Human Subjects Institutional Review Board, and this research adhered to the American Society of Primatologists principles for the ethical treatment of primates. Potential participants were identified by searching for the terms "education" and "conservation education" in the Primate Info Net directory (<http://pin.primate.wisc.edu/idp/>) and Primate Lit database (<http://primatelit.library.wisc.edu/>) and by reviewing both the American Society of Primatology Conservation Small Grant and the International Primatological Society's Conservation Grant recipients. Individuals or organizations who only provided professional or pre-professional education programs (e.g., field schools) or who only held programs in countries non-endemic to primates were not considered. Participants were e-mailed a link to the online survey with offline surveys available on request. All surveys were distributed in English.

Survey questions were predominantly multiple choice with both single answer and multiple answer question types, following Salant & Dillman [1994]. Questions were organized into the categories of Scope, Fit, and Efficacy. Scope questions involved the general characteristics of each PCEP, such as program location, what participant groups are targeted, what threats are faced, and which educational tools are utilized. Fit questions gleaned information pertaining to program longevity, community involvement, collaboration, and use of evaluation. Efficacy questions assessed whether

TABLE I. Classification of Survey Respondents, Both by Individual Responding and by Program Type (N = 43)

Respondent classification	Percentage of respondents	Program classification	Percentage of programs
Research scientist	53.5%	Conservation agency or NGO	72.1%
Founder of an NGO or charitable organization	41.9%	Scientific researcher/research program	46.5%
Employee of an NGO or charitable organization	30.2%	Zoological institution	9.3%
Teacher	20.9%	Animal sanctuary	7%
Volunteer	7%	Rehabilitation site	4.7%
Government official or employee	2.3%		
Other	9.3%		

formal evaluations documented positive changes to participant attitudes and behaviors ('participant efficacy'), and whether educator observations and/or perceptions indicated subsequent changes to threats to primates ('threat efficacy') or community attitudes and behaviors ('community efficacy').

Survey Analysis

Survey responses were sorted to note whether respondents met standards pertaining to longevity, involvement, and collaboration, and if the program evaluated, whether they could document 'participant efficacy', 'community efficacy', or 'threat efficacy'. Relationships between standards and efficacy measures were tested with a Fisher's Exact test when sample sizes were large enough to allow for sufficient statistical power. Given small sample sizes and low potential power, a significant relationship was reported at $\alpha = 0.10$.

RESULTS

SCOPE: General Program Characterization

Fifty-eight programs responded to our survey, with 43 programs self-reporting as conservation education programs. Sample sizes per question

varied, depending upon how many conservation education programs responded to each question. When the total number of programs responding to the relevant question was less than 43, the number of programs responding to that question is identified with the notation N_r . Survey respondents most often classified themselves as either 'research scientists' or 'founders of an NGO or charitable organization' with nearly one third (31.8%) identifying as both (Table I). Only 20.9% identified themselves primarily as a 'teacher'. Respondents who marked "other" included a "trustee" and "communications manager." PCEPs belonging to zoological institutions, animal sanctuaries, and rehabilitation sites were not as well represented in surveys as those belonging to conservation agencies or scientific research programs (Table I). Following this trend, the most common conservation activities included were community outreach (81.4%), habitat conservation (69.8%), and scientific study of primate populations (65.1%), with only 25.6% engaged in a release or reintroduction program and 16.3% caring for captive primate populations. The largest percentage of programs were located in mainland Africa (46.5%), with Asia (32.6%), the Neotropics (27.9%), and Madagascar (16.3%) represented to a lesser extent. Efforts that included two or more of these geographic regions

TABLE II. Percentage of Programs Targeting Different Primate Taxonomic Groups, the Percentage of Total Primate Species and Subspecies Comprised by Each Taxonomic Group [IUCN, 2014], and the Percentage of Each Taxonomic Group That is Classified as 'Threatened With Extinction in Our Lifetime' by the International Union for the Conservation of Nature (2014)

Primate classification	Percentage of programs ($N_r = 41$)	Percentage of total primate taxonomic groups ($N = 638$)	Percentage classified as vulnerable, endangered or critically endangered
Lorisiformes	7.3%	8%	25.5%
Lemuriformes	14.6%	15%	41.7%
Tarsiformes	2.4%	1.7%	72.7%
Platyrrhini	26.8%	31.2%	39.7%
Cercopithecoidea	43.9%	38.1%	52.3%
Hylobatidae	9.8%	3.9%	96%
Pongidae	34.1%	2%	100%

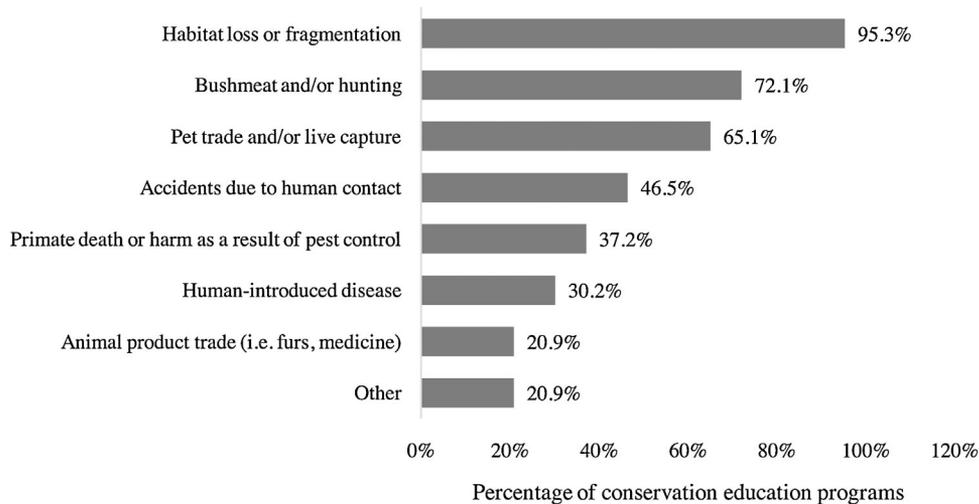


Fig. 1. Percentage of all primate conservation education programs ($N = 43$) reporting specific threats to target primate populations.

were reported by 18.6% of programs. The largest percentage of PCEPs targeted conservation of Cercopithecoidea, while Hominoidea were represented in $>1/3$ of all programs (Table II). Strepsirrhines were represented less than Haplorrhines, but in roughly equal proportion to their representation in primate taxonomy (i.e., % total primate species and subspecies; IUCN, 2014).

PCEPs addressed a wide variety of threats to primate populations, and faced numerous logistical challenges. Respondents labeled habitat loss or fragmentation as the most prevalent threat to primate populations, with animal product trade indicated as the least prevalent threat (Fig. 1). Responses labeled as “other threats” included factors such as “hunting for sport” and “inbreeding due to habitat isolation.” Nearly 83% of all respondents reported the presence of positive local attitudes toward primates while 78% also faced the challenge of negative local attitudes (Table III). Respondents who provided “other” attitudes noted

“many are not aware of the primates” and primates were “regional symbols of pride,” among other comments. The greatest internal logistical challenge to PCEPs was obtaining enough funding, and the most commonly cited secondary challenge was operating within existing bureaucracies (Table IV). Obtaining educational materials was a major challenge (ranked either second or third) for 37% of all programs. No programs listed gaining community support as their greatest challenge; in fact, this challenge did not apply to 21.1% of programs. Of possible funders, NGOs or charitable organizations were responsible for contributing to the majority of PCEPs, with government-operated scientific research foundations and for-profit businesses funding relatively few (Fig. 2). Self-conducted fundraising and donations from private individuals provided funding sources for over half of all programs. “Other” funding sources included “carbon investment funds” and “income from [their] volunteer program.”

TABLE III. Primate Conservation Education Programs That Reported Existing Positive or Negative Local Attitudes Toward Primates ($N_r = 41$)

Local attitude	Percentage of programs
Economically helpful (i.e., ecotourism revenue)	63.4%
Primates viewed as entertaining or beautiful	56.1%
Positive cultural precedent (i.e., folklore)	39%
Ecologically helpful (i.e., seed dispersers)	39%
Total percent of programs reporting positive attitudes	82.9%
Primates viewed as pests (agricultural or otherwise)	58.5%
Primates viewed as food	46.3%
Primates viewed as dangerous	34.1%
Negative cultural precedent	22%
Total percent of programs reporting negative attitudes	78%
None of these (neither positive nor negative)	2.4%
Other	19.5%

TABLE IV. Top Three Challenges Facing Primate Conservation Education Programs ($N_r = 38$)

Challenge	Greatest challenge	Second greatest challenge	Third greatest challenge	Challenge does not apply
Obtaining enough funding	65.8%	13.1%	7.9%	5.3%
Obtaining qualified personnel	18.4%	15.8%	21.1%	15.8%
Operating within existing bureaucracies	5.3%	26.3%	21.1%	7.9%
High staff turnover rates	2.6%	2.6%	7.9%	28.9%
Obtaining educational materials	–	18.4%	18.4%	7.9%
Gaining community support and/or trust	–	13.1%	15.8%	21.1%

Educational practices used by PCEPs took a variety of forms, with the majority of programs surveyed reaching over 1,000 individuals (Table V). The majority of responding programs targeted local children most intensely (94.6%, $N_r = 37$), but local adult programs were also common (70.3%). The largest portion of responding educators involved in PCEPs was comprised of paid local employees (34.2%, $N_r = 38$), followed by local teachers given project materials and/or training (26.3%) and researchers and their assistants (23.7%). Nearly half-utilized international volunteers (44.7%, $N_r = 38$), with slightly more programs using local volunteers (57.9%). Most programs used a mixture of passive and active educational methods, with passive educational methods used more commonly than active (Table VI). Pamphlets/posters were the most frequently used passive educational material, and participant workshops and art projects listed as the most frequently used active educational practice. Nature clubs, storytelling, and personal interactions with primates were listed as the least commonly employed active educational practices, all employed by less than 1/3 of all programs. Educational methods identified as “other” by respondents included “songs in the native language.”

FIT: Do PCEPs Follow Best-Use Practices?

Longevity

Half of responding programs run continuously throughout the year, with 25% labeled as ‘intermittent’ and 17.5% labeled as seasonal ($N_r = 40$). The most frequent program duration was between 5–10 years, with more programs reporting participant involvement for several years than several weeks, several months, or a single day (Table V). However, 27% of programs conduct multiple programs running for different lengths.

Community involvement

Seventy-one percent of responding PCEPs held planning or feedback meetings that were open to either community members or program participants ($N_r = 38$). Non-economic incentives were slightly more prevalent than economic incentives (61% of all programs vs. 51% of all programs; Table VII). The most common economic and non-economic incentives were both educational in nature—specifically exposure to more cost-efficient technologies or provision of educational materials related to non-conservation topics. Participant employment in ecotourism ventures or other entrepreneurial opportunities were each provided by 23% of PCEPs. Respondents who provided “other” incentives included “allowance for



Fig. 2. Funding sources obtained by primate conservation education programs. Both the greatest source of funding and all sources of funding were reported ($N_r = 40$ responding programs).

TABLE V. Cumulative Length, Individual Participant Involvement Length, and Cumulative Number of Participants Served by Primate Conservation Education Programs Across the Duration of the Entire Program

Program cumulative length	Percentage of programs ($N_r = 40$)	Participant involvement length	Percentage of programs ($N_r = 36$)	Total number of participants	Percentage of programs ($N_r = 37$)
A week to several weeks	12.5%	A day	22.2%	0–25 individuals	–
A month to several months	2.5%	Several days to a week	22.2%	25–50 individuals	2.8%
1–5 years	25%	Several weeks to a month	8.3%	50–100 individuals	8.3%
5–10 years	37.5%	A month to several months	13.9%	100–200 individuals	–
>10 years	25%	Several months to a year	13.9%	200–1,000 individuals	16.7%
		Several years	27.8%	Over 1,000 individuals	66.7%
		Varies	16.7%		

the teachers' salary," "soap and promot[ion] of proper sanitation," and "pedal-powered cinemas" among others.

Collaboration

Most collaboration occurred during program planning stages (Fig. 3). Local teachers or educators were collaborated with most frequently. Other practitioners of PCEPs were consulted in planning stages by 45.9% of programs — 27.1% less frequently than research scientists. Cultural experts such as cultural anthropologists were consulted by only

13.5% to 27% of all programs, depending on program stage. Consultation/collaboration with all categories declined as programs were implemented. For example, community leaders were consulted by 81.1% of all PCEPs during program planning, but by only 54% of all programs in progress.

Evaluation

Formal evaluation of either participant attitudes and behaviors or primate threat levels were conducted by 72.1% of all PCEPs. Formal evaluations most often targeted participant attitudes and

TABLE VI. Educational Materials and Strategies Utilized by Primate Conservation Education Programs. Responses Indicated Both Whether a Program Used a Particular Material/Strategy and Whether That Material/Strategy Was One of Their Top 3 Most Commonly Utilized Methods ($N_r = 38$)

Education material or strategy	Number of programs utilizing it	Programs utilizing it in the top three
PASSIVE		
Pamphlets, posters or other printed material	32	10
Video, audio or other multimedia presentations (slideshows, etc.)	29	11
Lectures to children	28	6
Educational materials (i.e., lesson plans)	28	9
Lectures to adults	27	6
Library of conservation and/or primate-related material	15	4
Comic and/or picture books	14	3
Television or radio programs	12	2
ACTIVE		
Workshops	28	7
Art projects	25	4
Guided habitat walks	27	4
Games	22	4
Ecological projects (i.e., replanting, gardening)	21	4
Participant involvement in research	16	3
Theater (i.e., skits)	13	1
Personal interactions with primates	12	1
Folktales and/or storytelling	12	1
Nature clubs	11	1
OTHER	3	2

TABLE VII. Types of Incentives Provided by Primate Conservation Education Programs

Incentive type	Number of programs providing incentive type
Economic incentives ($N_r = 35$)	
Introduction to more cost-efficient technologies or practices (i.e., fuel-efficient stoves)	13
Ecotourism which provides participant employment (i.e., tour guides or building ecotourism infrastructure)	8
Entrepreneurial opportunities	8
Other	7
No economic incentives provided	17
Non-economic incentives ($N_r = 36$)	
Educational materials/instruction (i.e., pertaining to non-conservation topics)	14
Technological equipment (i.e., computers, cell phones)	8
Services such as internet, recycling	7
Other physical objects (i.e., clothing, toiletries)	6
Infrastructure development (i.e., hospitals or schools)	6
Medical care and/or health information	5
Transportation services and/or road construction	1
Other	6
No non-economic incentives provided	14

knowledge, with just over half assessing whether participant behaviors changed (Table VIII). However, 25.8% of programs that formally evaluated also used formal evaluations to determine whether threat levels to primates changed across the duration of the program. The most common form of formal evaluation method used was participant surveys (87.1%, $N_r = 31$), with relatively few PCEPs using focus groups (32.3%), behavioral studies (22.6%), or other evaluation methods. "Other" evaluation methods (12.9% of responding studies, $N_r = 31$) included "consultation with authorities on rates of forest infraction" and internal evaluation based on an "annual work plan." In addition to formal evaluations, seventy-seven percent of all programs ($N_r = 43$)

also reported changes to community attitudes and/or behaviors and primate threat levels based on educator observations and/or perceptions.

REPORTED EFFICACY: How effective are PCEPs?

Positive changes to participant knowledge were reported most frequently in formal assessments, with changes to participant behaviors reported least frequently (Table VIII). All programs informally evaluating changes to community metrics reported either increased discussion among community members of conservation issues or increased participation in conservation by local officials (Table VIII).

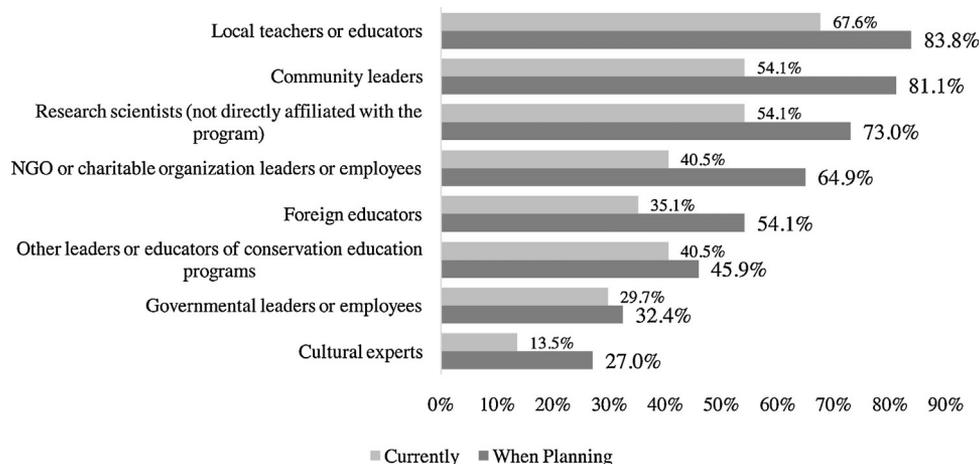


Fig. 3. Resources and collaborators consulted in planning and execution phases of primate conservation education programs ($N_r = 37$ responding programs).

TABLE VIII. Percentage of Responding Programs that Evaluated Participant and Community Efficacy Factors and the Percentage of Evaluating Programs that Reported a Positive Change to These Factors Across the Duration of the Educational Program

Attribute evaluated	Percentage of responding programs that evaluated	Percentage of those that evaluated which reported (+) change
Participant efficacy factor ($N_r = 30$ programs responding to question; evaluations limited to formal evaluations with surveys, focus groups, and/or behavioral studies)		
Participant attitudes	86.7%	84.6%
Participant knowledge	83.3%	92%
Participant behavior	53.3%	75%
Community efficacy factor ($N_r = 33$ programs responding to question; evaluations reported informal observation and/or perceptions of educators)		
Community discussion of conservation issues	72.7%	100.0%
Involvement of local officials in conservation	78.1%	96.0%
Community or household use of eco-friendly practices	62.1%	88.9%

Community use of ecofriendly practices was reported slightly less than the other community metrics. The most frequently reported decreases to primate threats across the duration of an educational program occurred to the animal product trade, bushmeat hunting, and the pet trade (Table IX). Decreases were reported for pest control and habitat loss least frequently. No program reported any change to human-introduced disease.

Relationships Between Program Characteristics and Efficacy

Evaluations of relationships between program characteristics and reported efficacy of programs were limited by two factors: the small sample size of programs that actually formally self-evaluated ($N = 31$) and the fact that almost all programs self-reported improvements to some efficacy measures (i.e., 'community efficacy'), leaving little variation.

Thus, to eliminate Type I error stemming from a high number of tests with low sample sizes, we limited our investigation to one to three tests per program characteristic (longevity, community involvement/incentives, and collaboration) in which enough variation existed to look for trends. Of the characteristics tested, collaboration and economic incentives offered the clearest quantifiable link to success (Table X). Programs that ran for >5 years and included participants for > 1 week did not report positive success measures with greater frequency than those that ran for shorter periods of time. Programs that provided at least one economic incentive were more likely to report positive changes in participant attitudes ($P = 0.03$), but not to participant behavior or existing threats to primates. Those that provided economic incentives in the form of employment or entrepreneurial opportunities (1/4 of PCEPs) did not report greater efficacy than those that provided other forms of economic incentives (i.e.

TABLE IX. Number of Primate Conservation Education Programs That Reported Threats and Evaluated Each Threat Through Formal Evaluations and/or Educator Observations, Along With the Percentage of Evaluating Programs Noting an Increase or Decrease to the Evaluated Threat Across the Course of the Educational Program ($N = 43$)

Threat	Programs that reported threat	Programs that evaluated threat	Decrease	Increase	Neither
Habitat loss or fragmentation	41	18	33.3%	44.4%	22.2%
Bushmeat and/or hunting	31	12	58.3%	16.7%	25%
Pet trade and/or live capture	28	11	54.5%	9.1%	36.4%
Accidents due to human contact (i.e., power line electrocution, road accidents)	20	6	50%	50%	–
Primate death or harm as a result of pest control	16	7	57.1%	14.3%	28.6%
Human-introduced disease	13	3	–	–	100%
Animal product trade (i.e., furs, medicine)	9	4	75%	–	25%

TABLE X. Relationship Between Primate Conservation Education Program Efficacy (Positive Changes to Participant Attitudes, Positive Changes to Participant Behaviors, and Observed Decreases to Threats to Primates) and Characteristics Related to Program Longevity, Local Involvement, and Collaborative Activities

	Reported efficacy measure [<i>P</i> -value (Nr)]		
	Attitudes	Behaviors	Threats
Longevity			
Do programs that have been running for greater cumulative time (5+ years) report greater efficacy?	0.27 (26)	0.55 (16)	1 (21)
Do programs that involve participants for longer periods of time (>1 week) report greater efficacy?	0.26 (23)	0.52 (14)	0.6 (17)
Local involvement			
Do programs that provide at least one economic incentive report greater efficacy?	0.03 (25)	0.67 (21)	0.67 (21)
Do programs that provide at least one non-economic incentive report greater efficacy?	1 (24)	1 (15)	0.4 (21)
Do programs that provide employment through ecotourism or entrepreneurial opportunities report greater efficacy than those that provide other types of economic incentives?	0.63 (24)	1 (14)	1 (19)
Collaboration			
Do programs that report collaboration with other conservation education programs report greater efficacy?	0.15 (26)	0.59 (17)	0.07 (20)
Do programs that report collaboration with cultural experts report greater efficacy?	1 (25)	1 (16)	0.6 (19)

exposure to cost-efficient technologies). Providing a non-economic incentive did not increase the frequency with which any program efficacy measure was reported. Programs that collaborated with other conservation education programs reported decreases to primate threats more frequently than did programs that did not ($P=0.07$). Programs that collaborated with other educational programs also reported positive changes to participant attitudes more frequently than those that did not, though this relationship was not significant. PCEPs that collaborated with cultural experts (~1/4 of PCEPs) did not report greater efficacy measures than those that did not.

DISCUSSION

This study surveyed PCEPs to determine trends in PCEP demographics and to assess whether factors attributed to success—specifically longevity, community involvement, and collaboration—correlated with efficacy factors. Surveyed PCEPs included high involvement from the research community, overwhelmingly targeted children as participants, reached on average over 1,000 participants per program, and faced a varied range of threats to primate populations and program challenges. The majority of PCEPs already employ

many of the factors attributed to conservation success. However, survey results point to a number of areas in which PCEPs could improve both in scope and practice.

Scope of Primate Conservation Education Programs

While this study is ultimately subject to the sample of PCEP respondents, results suggest that PCEPs could benefit from greater scope—taxonomically and methodologically. While Cercopithecoidea were the most commonly represented group of primates, great apes were disproportionately represented when number of species per primate taxonomic group is considered. While great apes are charismatic species capable of inspiring great conservation interest and are all threatened with extinction [Zander et al., 2014], an appeal to the protection of primate diversity is worthwhile. In addition, while active learning methods (i.e. those that involve experiential learning), such as nature clubs and theater [Breuer & Mavinga, 2010; Dolins et al., 2010; Jacobson et al., 2007], have been shown to increase participant interest and aid in knowledge retention [Burt et al., 2012; Millenbah & Millspaugh, 2003; Ryan & Campa, 2000], surveyed PCEPs largely favored passive educational methods.

Longevity and Length of Participant Involvement

Because the majority of surveyed programs have been established for a year or more and are continuously operating, it may be assumed that PCEPs aim to remain long-term provided they can maintain the necessary staff, stamina, and funding to run. This trend provides a culture of increasingly established programs and by extension lends a growing legitimacy to the field of primate conservation education itself. Nonetheless, the role of long-term participant involvement in these programs remains unclear and requires further evaluation. Program length and length of participant involvement were not associated with increased program efficacy in this study. Moreover, contradictory recommendations are present in the literature. While some primate education programs note that longer participant involvement correlates with greater knowledge gains [Breuer & Mavinga, 2010; Kuhar et al., 2010; Wright, 2010], a study of conservation projects in the UK found that length of participant involvement had no influence on knowledge retention, hypothesizing that the most significant learning took place during the early stages of participation [Evely et al., 2011]. If similar trends apply to PCEPs, the potential reach of utilizing short-term outreach efforts could be investigated as a means of stretching conservation dollars. Short-term education activities at 22 primate sanctuaries in Africa, for example, were able to reach out to over 429,000 people in one year [Ferrie et al., 2014]. Longer term conservation education may also be more efficiently and effectively achieved by integrating conservation education into local school systems [Dolins et al., 2010].

Local Involvement

While most conservation education programs do not qualify as Integrated Conservation and Development Programs (ICDPs) as defined by many aid agencies [Horwich & Lyons, 2007], PCEPs showed a commitment to integrating community development at a smaller bottom-up scale, frequently providing incentives for participation and including constituent feedback and support. In this study, economic incentivization, specifically, was related to an improvement in participant attitudes toward primates. Economic incentivization, however, is a complex and controversial practice. While providing economic incentives is a tactic commonly suggested by conservation education practitioners, implementation of economic incentives should be carefully and closely planned and monitored [Espinosa & Jacobson, 2012; Savage et al., 2010; Wallis & Lonsdorf, 2010]. Suggestions for implementing economic incentives, for example, include ensuring that incentivization is

scalable so that participants can continue to benefit as the program grows, providing direct monetary compensation for the costs conservation can impose on local livelihoods, and providing means for self-managed entrepreneurial opportunities (e.g. an artisan network for designing eco-friendly products) [Savage et al., 2010; Ferraro & Kiss, 2002; Peters, 1998]. Nonetheless, even if these guidelines are followed, community backlash can arise if economic incentives cease at the conclusion of a program, and an influx of funds into a community can introduce additional sources of societal conflict if distribution of funds is not managed appropriately [Horwich & Lyons, 1998]. Financial incentives (i.e., building for ecotourism infrastructure) may also do little to discourage harmful behaviors toward the environment, thus misallocating funds which could have been used for more direct conservation action [Ferraro & Kiss, 2002]. Indeed, in our study, while economic incentives could be associated with improvements in participant attitudes, the same could not be said for improvements to participant behavior nor to a reduction in threats to primates. On the other hand, community involvement in decision-making and planning remains an uncontested means of creating project support and strengthening participant motivation, precipitating knowledge and behavior changes [Dahl, 1997; Evely et al., 2011]. PCEPs surveyed here seemed to recognize this importance, with nearly 3/4 holding meetings open to community members or local participants and over 80% consulting with community leaders.

Collaboration

While programs reported high rates of collaboration with community leaders and research scientists, comparatively few conservation education practitioners collaborated with each other. This finding is especially surprising given that obtaining educational materials was one of the most commonly listed challenges to PCEPs and that collaboration among primate conservation educators was significantly related to improvements to participant attitudes. All primate conservation education practitioners could benefit from a reflexive look at their collaborative efforts in order to recognize any missed opportunities and to plan for future collaborations. Furthermore, as over half of all conservation education practitioners responding to our survey primarily labeled themselves as research scientists and not educators, increased collaboration may be particularly important for this segment of primate conservation education practitioners. Training in community conservation and participatory education is often absent from primatology graduate programs, placing these students at a disadvantage when they ultimately end up trying to conserve their research subjects. Fortunately, collaboration is an

intuitive and easily implementable practice, and may be one of the identified deficiencies in this study that is most easily remedied.

A focus on increasing collaboration among primate conservation educators is already apparent. Primate conservation education is increasingly being featured in the literature and at conference symposia so that successes, problems, and suggestions may be aired. Online efforts to help encourage collaboration and sharing among primate conservation practitioners have also increased. The Primate Education Network (PEN) (<http://www.primateeducationnetwork.org/>), for example, now offers a service that includes downloadable program materials and a directory of members interested in or involved with PCEPs. Many individual educational programs additionally have an online presence, with social media spreading ideas and connecting educators and interested supporters. As mass media was found to be the most popular source of information for a conservation education program on tamarins in Brazil [Engels & Jacobson, 2007], the potential power the internet holds for influencing the public and connecting educators is clear. Social media can also help provide a venue for crowdsourcing fundraising efforts, given that in our study obtaining funding was listed as the greatest challenge for the majority of PCEPs and over half of programs engaged in self-conducted fundraising outside of the institutionalized granting process.

Evaluation

While approximately 70% of all PCEPs surveyed used some form of self-evaluation, evaluation targets and methods varied greatly. Most formal assessments targeted by PCEPs assessed changes to participant characteristics—specifically knowledge and attitudes. Only half of those programs that completed formal assessments investigated whether participant behavior changed. This distinction is particularly important, given that while conservation education programs often report an increase in knowledge about primate species or conservation issues following program involvement [Engels & Jacobson, 2007; Kuhar et al., 2011], behavior changes do not always follow from conservation education programs [Kuhar et al., 2010]. An evaluation of a conservation education project in the Chesapeake Bay, for example, found that their teacher training programs significantly increased teachers' intentions to take environmentally responsible action, but that many students in the programs subsequently taught by these teachers did not experience the same increase [Zint et al., 2002]. This discrepancy led study authors to conclude that the curriculum provided by the program needed to be more effectively

communicated to and by teachers to produce the desired effect of increasing environmentally responsible behavior among youth [Zint et al., 2002].

Changes to existing threats to primates and to community attitudes and behaviors were rarely monitored formally by PCEPs. Many programs relied on informal observations by practitioners to monitor these characteristics. Yet, even allowing for this qualitative evaluation, the two most common threats facing targeted primate populations—deforestation and bushmeat hunting—were only evaluated by roughly 40% of programs facing those threats, leaving the bulk of programs without baseline metrics with which to identify trends and adjust programs appropriately. Evaluations of changes to community metrics could also benefit from increased systemic evaluation. In fact, it is unclear whether systemic formal evaluation would have yielded the same result as that from practitioner perceptions (i.e., 100% of PCEPs reported a positive change to community attitudes and/or behaviors). Systemic studies assessing which specific aspects or segments of communities benefit most from the dissemination of information provided by PCEPs would be of particular value.

Comparatively low rates of monitoring community behaviors and threats to primates may follow directly from trends in the type of evaluation employed by most PCEPs. Participant surveys were by far the most common assessment method employed, with less than a third of programs relying on non-survey methods such as behavioral studies or focus groups. While surveys may be efficient ways to monitor changes to participant attitudes and knowledge, changes to community conservation practices and threats to primates are invariably more complicated to assess and require more financial and logistical investment. Community behavior and threats to primates involve multiple stakeholders with whom the conservation educator may have no involvement; and it is impossible to definitively state whether changes to community behaviors or primate threat levels are the direct result of educational programs. Nevertheless, correlatory patterns can be useful both in identifying which types of educational programs may be most appropriately applied to which threats and in justifying need for support to funding agencies.

Regardless of target, the most effective forms of evaluation must move beyond a pre- and post-program survey assessment (i.e., 'summative' evaluation) of participants to a multi-step process that includes assessments that take place across the course of the program (i.e., 'formative' evaluations), evaluating program management and practices in addition to participant involvement. Formative evaluation can help to highlight the problems and successes of particular program methods and has been significantly linked to program success

[Norris & Jacobson, 1998]. In particular, emphasizing program objectives in early stage evaluations serves to lend focus to the evaluative process and helps ensure project goals are met [Flowers, 2010; Zorrilla-Pujana & Rossi, 2014]. Unfortunately, in a survey on the evaluation practices of conservation education programs in general, 90% of programs were found to use summative rather than formative evaluation [Carleton-Hug & Hug, 2010]. As many evaluators are unsure how to conduct non-summative evaluations [Carleton-Hug & Hug, 2010], further training in evaluation measures such as Jacobson's [1991] Planning-Process-Product model of evaluation which utilizes program evaluation from beginning stages to program results would be beneficial. A successful evaluation system implemented for a conservation education program in the Smokey Mountains, USA, for example, included program observation, a goal-setting workshop, stakeholder interviews, pilot testing and surveys among other methods [Powell et al., 2006].

Efficacy

PCEPs self-reported to be highly efficacious. Nearly all programs that formally evaluated reported an improvement to participant knowledge and attitudes. However, it should be noted that these metrics may be the most easily manipulated, especially given that local populations already possessed positive attitudes towards primates in 82% of all programs. Participant and community behaviors may be less easily molded, though PCEPs still reported extremely high rates of improvements to these factors as well. Impacts of PCEPs on actual threat reduction to primates are less clear. Primate education targeted to local populations may yield knowledge or cultural changes that ultimately trickle up to a broader audience, impacting factors such as global consumption patterns or institutional policy. However, these changes are difficult to measure, and results from this study and others suggest that PCEPs may have the most immediately measurable impacts when targeted to primate populations facing threats that are locally driven or result from direct primate-human interactions. For example, deforestation was cited as a major threat to over 95% of PCEPs surveyed, but most studies reported increases to this threat across the program duration. In contrast, threats related to direct primate-human interactions (e.g., bushmeat hunting and pet trade) had the highest levels of reported threat reduction. The mechanism for this threat reduction can be found in PCEP case studies such as that of Engels & Jacobson, [2007]; in which over 90% of participants in an educational program focused on golden lion tamarins reported that they would not disturb a wild monkey if encountered following program involvement. Given these trends, further comparative study by primatologists

investigating which educational practices yield the greatest impacts on which threats is needed in order for educational practitioners to target their efforts most appropriately.

Study Limitations

The limitations of this study stress the need for further evaluation of PCEPs and for increased detailed collaboration between primate conservation education practitioners. In asking participants to take the survey themselves, this study only analyzes self-assessments of PCEPs, yielding subjective results. Results were further limited by a sampling method which was only able to find programs with an online presence and which had an English speaking practitioner. As many primate range countries speak a language other than English and primate habitats are often in remote areas where reliably accessing the internet is difficult, this study may be missing the valuable input of these programs. Furthermore, while every attempt was made to reach out to all primate education programs, sample sizes were low and varied by question. While we suspect that it might have been tempting for some respondents to skip questions to which they could not report following best-use practices, we can neither know nor assume this. Nevertheless, these challenges are inherent in all survey distribution studies and sample sizes are consistent with other recent studies assessing global best-use practices of primate conservationists such as primate rehabilitation [Guy et al., 2014]. Furthermore, even with small sample sizes and the challenges inherent in the survey approach, this study can identify noteworthy trends and identify areas requiring further attention by PCEPs.

Suggestions for Future Development

Primate conservation educators face daunting challenges and have the capacity to make real and lasting conservation impacts on the ground in primate habitats. They already employ a great many of the best-use practices suggested by the broader educational community. Nevertheless, this study suggests that further improvements can be made by focusing on a number of primary targets: (i) an expansion in scope to include more attention on specific taxonomic groups (e.g., tarsiidae, hylobatidae), and more diverse educational methods (e.g., active methods such as nature clubs); (ii) greater investigation of relative impacts of short vs. long-term programs, in order to assess whether funds could be better used targeting a larger number of participants for shorter periods of time; (iii) careful attention and greater dissemination of information on best-use practices for economic incentives, given links between these types of incentives and program success; (iv) an emphasis on collaboration,

particularly among other primate conservation educators, to include sharing of educational materials and training of graduate primatology students in community conservation and participatory education; and (v) increased commitment to continuous evaluation and adaptive management, both across and within individual PCEPs.

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