

DESCRIPTION AND EVALUATION OF AN ENVIRONMENTAL EDUCATION
PROGRAM IN MADAGASCAR

by

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Abstract

The Duke Lemur Center (DLC) is a founding member of the Madagascar Fauna Group (MFG), a consortium of zoos and botanical gardens that promotes biodiversity conservation in Madagascar. The MFG's in-country programs include an environmental education component with a cascade training program that targets upper level regional staff (Chef ZAPs). This program trains the Chef ZAPs in the hopes that they will disseminate information on ecology and environmental issues to teachers and who in turn will pass the information on to their students. Although the program has been in place for more than 20 years, no formal description or evaluation had previously been undertaken. The DLC is in the process of implementing the MFG's model in a fledgling training program in another region of Madagascar. Our research seeks to provide recommendations to the DLC's new program by evaluating the MFG's existing environmental education platform.

A review of literature regarding accepted practices in environmental education and evaluation was compiled to inform the evaluation. Using a mixed-methods approach, interviews with key informants, participant surveys, and material culture were analyzed. Five interviews were conducted with MFG and DLC staff members. Surveys were designed to garner the opinion of Malagasy participants and were juxtaposed with the statements made by interviewees. Qualitative analyses of interviews and surveys were conducted using Nvivo 9 software, and additional quantitative analysis of Likert Scale responses was completed using Stata 12 statistical software.

This analysis informed the final recommendations made to our client, the Duke Lemur Center. Our recommendations range from small to large changes, and focus on shifts in organizational and programmatic structure that are important to consider for the expansion of the program within the SAVA region. The recommendations fall into two categories: administrative and field. These recommendations will allow the DLC to build upon the successes seen in the current Chef ZAP training program, such as the tremendous level of enthusiasm and positivity Chef ZAPs associate with the trainings. In this evaluation, we identify challenges which we found to pose a hindrance to the evolution and future success of the environmental education program; and we suggest recommendations to the DLC to address these challenges and ensure that the future environmental education programs in Madagascar can contribute to long-term social and environmental change.

I. Introduction

Promoting the conservation of Madagascar's ecological riches is a challenging undertaking in a country where 80% of the population depends on agriculture for its livelihood (CIA, 2011), and 68% lives below the standard set for the international poverty line (UNDP, 2011). Threats to biodiversity in Madagascar arise from the practice of slash and burn agriculture, known as tavy (Kremen, n.d.). Deforestation—in order to clear land for agriculture—has already reduced the natural forest cover to 10% of what it was, and it is estimated that 80-90% of Madagascar's land is subject to tavy every year (Kremen, n.d.). Biodiversity is lost due to habitat destruction, the consumption of bushmeat, and the subsequent extinction of species. Deforestation also generates a negative feedback loop, where deforestation leads to soil erosion, which then leads to decreased agricultural productivity—causing more deforestation and worsened ecological conditions for forest regeneration.

Because of the deeply ingrained cultural practice of tavy, population pressures, dependence on agriculture and high level of poverty, environmental education (EE) becomes a key component of conservation strategy in Madagascar. Use of EE in conservation strategies has greatly increased in the past two decades: the consideration of coupled human-natural systems thinking, and the inclusion of EE in international conservation work, has become widely accepted among the conservation community since the late 1990s (Fien, Scott, & Tilbury, 2002). Prior to this time, conservation organizations were more concerned with the science, and less with addressing issues arising from the human element of conservation. Since the shift in attitude in the conservation community, EE has occupied a role in conservation strategy based on the belief that EE has the potential to instill knowledge on, and values for, the preservation of biodiversity—and ultimately to change the behavior of the country's next generation of resource users.

The Madagascar Fauna Group (MFG) and the Duke Lemur Center (DLC) have recognized the instrumentality of EE in their conservation efforts. The MFG was formed in 1988 as a consortium to coordinate the conservation activities of zoos in Madagascar. Charles Welch and Andrea Katz from the DLC were the MFG's first program managers on the ground in Madagascar. Although initially only responsible for building the capacity of the zoo at Parc Ivoloina, Welch and Katz built on the traditional zoo educational activities and created an EE program for the wider community to participate in. This EE program was further expanded to

include special Saturday classes in primary schools in the villages near Parc Ivoloïna. Following the establishment of the Saturday School program, a teacher-training guide was developed to facilitate the training of primary school teachers in EE, and its incorporation into the national education curriculum. This step solidified EE's importance and prominence in the MFG's operational strategy. In 2004 Welch and Katz left Madagascar and returned to the DLC. Karen Freeman and Gareth Kett replaced them as the program managers, though Welch and Katz continued to collaborate with the MFG through the DLC (MFG, n.d.). Welch requested this evaluation of the MFG's teacher trainings in EE in Madagascar to inform the DLC's new EE programs in the Sambava region.

In order to conduct this evaluation, the authors posed three research questions: 1) How successful is the MFG's EE program?; 2) How can the MFG's EE program be improved?; and 3) How can these recommendations be used to increase the success of the new Sambava initiative? We used a conceptual framework for the evaluation of a teacher-training program. The conceptual framework included analysis of: 1) the enabling environment and local context; 2) the MFG's organizational structure and objectives; 3) the EE program objectives; 4) the EE curriculum; 5) partnerships; 6) the training of the trainers (or cascade) methodology; 7) capacity building; 8) monitoring and evaluation efforts; 9) internal evaluation reports; and 10) participant perceptions of effectiveness.

We will begin this report with a literature review on the evolution of EE pedagogy and programs, EE evaluation, and EE in developing countries. The next section discusses our methodology and the material culture that was used. We then present our results and findings in accordance with the themes outlined in our conceptual framework. Lastly, we present a summary of our findings and recommendations to the DLC.

II. Literature Review

To inform our assessments of the Duke Lemur Center's environmental education (EE), program, we needed to first examine the existing literature on all aspects of EE. We first explored defining documents and case studies about operating an EE program in a developing country. We also studied published methodologies and strategies for structuring EE, in addition to the concept of education for sustainable development. We looked into documented successes and challenges in order to frame our recommendations to the DLC. Finally, we examined

literature on the importance and process of conducting an evaluation for an EE program so that we might provide the DLC with an evaluation based on published and accepted methods.

Background: Definitions and Case Study

For both the literature review and our project as a whole, we found it necessary to establish some basic tenets of the field of environmental education. Although every author has their own interpretation of the commonly used terms, the basic tenets of environmental education theory are fairly widely accepted. We detail below two important works on environmental education theory and evolution.

Disinger's seminal paper on how to define environmental education, first published in 1983, sketches the fundamental debates over EE's purpose and meaning. Along with his 1997 epilogue, Disinger traces the evolution of the term and differentiates it from similar types of education, such as outdoor education and conservation education. The field of environmental education has had difficulties defining itself and setting goals since its inception in the 1960s. In the epilogue, Disinger concludes that EE's multidisciplinary nature causes a fundamental tension among practitioners; namely, that the practitioners tend to approach EE from their own field rather than take an interdisciplinary approach. Another tension in EE is between purely educational objectives versus behavior changing objectives. Although many definitions of environmental education exist, including an EPA definition, differing opinions about the purpose of EE persist (Disinger, 1997).

In *Environmental Education in the 21st Century*, Palmer gives an overview of the history and evolution of environmental education to date, and focuses on theory rather than practical implementation of EE. She briefly outlines "the global agenda," or the major issues impacting the environment, and advances environmental education as a crucial component of the efforts to move toward sustainable development. Palmer discusses the leading theoretical underpinnings of environmentalism (deep ecology, the Gaia hypothesis, ecocentrism and technocentrism). A number of fundamental tensions between education curricula and environmental education complicate implementation, namely between knowledge and action, individual discipline versus interdisciplinary, differing pedagogies, and the emphasis on science instead of a more "holistic" approach to EE. Palmer includes a number of case studies written by other authors on environmental education around the world; a number of these case studies focus on projects in

developing countries. The final section of the book discusses the future of environmental education and prospects for maximizing effectiveness (Palmer, 1998).

In addition to theory, case studies of environmental education in developing countries can shed some light on how basic themes of environmental education may translate well or diverge across country boundaries. One case study by Bernstein (1997) detailed a project in Mongolia that mirrored some aspects of the MFG's efforts at Ivoloina. The model is almost identical- both programs use a cascade strategy and include the development of a guidebook to help integrate environmental themes into the information currently included in the national curriculum.

This case study describes the Mongolia Biodiversity Project (MBP) in the immediate post-soviet era. The MBP was funded by the GEF through the UNDP, and was a long-term effort to protect biodiversity in Mongolia. As a developing country, the Mongolian government is short-resourced, particularly the environmental agency (MNE), and natural resources and wildlife face pressures from development. Education on biodiversity is part of a larger strategy to improve policy, information, and awareness of biodiversity, as well as to build the capacity of the MNE (Bernstein, 1997).

The MBP developed a guidebook, *Nature and Children*, which includes pedagogical strategies and information to help teachers develop a curriculum. To help teachers use the guidebook, the MBP organized teacher-training workshops; the MBP also uses the cascade strategy, training the trainers in the capital who then return to the countryside to train teachers (Bernstein, 1997).

Bernstein provides extensive lists of lessons learned through the MBP. She emphasizes the importance of conducting a needs assessment before beginning a project, the need to develop linkages between economic development and conservation, coordination among organizations involved in EE, and considering differing circumstances in the urban versus rural areas when developing curriculum materials (Bernstein, 1997).

“Conservation Education in Madagascar: Three Case Studies in the Biologically Diverse Island-Continent,” by Dolins et al. (2010) gives a good description of the contextual factors in Madagascar affecting conservation education, as well as presents three EE initiatives being implemented by non-governmental organizations (NGOs). Cases specific to Madagascar hold the additional benefit of exploring the enabling environment for supplementary education specific to our country of interest.

Dolins et al. (2010) first provide a summary of the recent political history in Madagascar, and issue that is critical to understanding the complexities of environmental education in the country. By the year 2000, Madagascar was the tenth poorest country in the world. And still by 2007, 85% of the population was living on less than \$2 per day. There was not much funding to support the education system, and conservation was not included in the national curriculum. However, there was some incorporation of the importance of soil and water into the science curriculum, although no connection between human actions and the quality of soil and water is explicitly laid out. The government budget for education was substantially lowered in the late 1980s, during the period of World Bank imposed structural adjustment, resulting in teachers' salaries being cut in half. The absenteeism rate hovers around 20%, and many teachers have taken second jobs to get by (Dolins et al. 2010).

The political and economic situation seemed to be improving in 2002, when President Ravalomanana was elected. Conservation was even built into the new Madagascar Action Plan. But the political crisis of 2009 threw the country into turmoil, and any progress that was made has been reversed (Dolins et al. 2010).

Despite the inhospitable enabling environment, NGOs are still attempting to run EE programs. This paper describes the efforts being made by three NGOs. The first is the International Research and Training Centre for the Valorization of Biodiversity (Centre ValBio). Centre ValBio focuses on villages just outside of Ranomafana National Park. It runs classes and demonstrations in schools, and has a training facility where it can host school groups on field trips. It gives tree-planting demonstrations, and teaches the children how to monitor tree growth. In addition, to reach youth who may not attend school, Centre ValBio runs a nine-month training program for youth to become leaders of conservation clubs. Much of Centre ValBio's training and education involves learning by doing, which builds ownership and connection to conservation (Dolins et al. 2010).

Madagascar Wildlife Conservation, a local NGO, created a comic book to educate children about endangered species and habitat preservation. An evaluation of the effect of the comic book on students' understanding of conservation issues showed that the comic book had a significant effect. Another NGO, called the Ako Project, has focused on bringing environmentally themed storybooks to children, which is an important endeavor given the dearth of books in rural Madagascar (Dolins et al. 2010).

In “Development of Environmental Education Programs for Protected Areas in Madagascar,” Ormsby evaluated EE activities in Masoala National Park, and then described key components for effective EE programs in Madagascar national parks. She found that typical EE programs already existing in areas surrounding the national park were: the distribution of newsletters, youth environment clubs, World Environment Day events, and radio programs. Radio programs are well known means of educating illiterate and isolated rural populations in developing countries (Ormsby, 2007).

Ormsby developed an EE training session for park rangers who expressed an interest in learning proper EE pedagogy. She designed a workshop with a variety of interactive activities, such as “role plays on environmental dilemmas, debate, collage, demonstrations, and hands-on activities,” (2007). Ormsby notes that participatory action and learning techniques have been successful teaching strategies in developing countries. Indeed, when surveyed, the park rangers said that they liked the interactive nature of the training session, as well as learning about EE techniques and biodiversity (Ormsby, 2007).

Ormsby also developed an EE curriculum guide. She designed the guide so that it would incorporate the interests of local stakeholders that she surveyed, but would still fit nicely into the national education curriculum. She included national curriculum goals, such as identification of taxonomic groups, knowledge of food chains and Madagascar’s geography, and identifying different weather patterns (Ormsby, 2007).

History and Guidelines

Since the 1970’s, international environmental education efforts have been governed under a varying set of guidelines. These fundamental assertions regarding EE set the basic operations of the DLC and the MFG in a larger context of historical EE programs. There have been a number of basic works that outline the accepted guidelines for conducting environmental education as agreed upon in international conventions and academia.

“The Roots of Environmental Education: How the Past Supports the Future” by McCrea traces the origins and evolution of environmental education in the United States from early thinkers in the 18th century to the modern era. Key events include the Belgrade Charter written by UNESCO in 1975 and the 1977 Tbilisi Declaration (McCrea, 2006).

The Tbilisi Declaration was the result of the 1977 Intergovernmental Conference on Environmental Education convened by the United Nations Education, Scientific, and Cultural Organization in cooperation with the United Nations Environment Programme. The declaration is one of the formative documents that established structure and principles for environmental education programs. The Declaration advocates an interdisciplinary approach that develops an environmental ethic (based on existing values) and a holistic understanding of environmental issues. In addition, EE programs should be both inclusive of surrounding communities and oriented toward problem solving. The Declaration also speaks to the training needs of “environmental specialists,” specifically that they should have the “necessary knowledge and skills to be given a full sense of their responsibilities” (UNESCO/UNEP, 1997).

A foundational paper by Hungerford et al. (2007) develops upon McCrea’s work and outlines four goals for curriculum development in environmental education just after the 1977 Tbilisi Declaration: 1) ecological foundation, 2) conceptual awareness, 3) investigation and evaluation, and 4) environmental action skills. Each goal has an associated set of skills and knowledge that students should be able to understand. The goals of environmental education according to the Tbilisi Declaration are to develop an awareness of environmental and its interconnected issues, provide the opportunities to gain the knowledge and skills to protect the environment, and to initiate behavioral change at all levels of society. Hungerford et al. define the superordinate goal as developing a knowledgeable and skilled citizenry who take action to balance quality of life with environmental issues. Environmental educators continue to use the pedagogical information presented in this paper to develop curricula (Hungerford et al., 1980).

The Intergovernmental Conference on Environmental Education also produced a set of guidelines to help governments and/or nongovernmental organizations develop environmental education programs. These guidelines stress that all facets of environmental education—social, cultural, economic, ethical and developmental concerns—should be considered when developing an environmental education program. Practical environmental issues should be a focus of environmental education, which should be linked with larger policy or regulatory efforts to institutionalize environmental protection. Environmental education should be a lifelong process. The five categories of environmental education objectives are awareness, knowledge, attitudes, skills, and participation; these objectives are echoed throughout environmental education (UNESCO/UNEP, 1997).

The North American Association for Environmental Education (NAAEE) has also developed a set of guidelines to improve non-formal environmental education programs. NAAEE recommends that program development start with a needs assessment, followed by an assessment of organizational capacity. Then program scope and structure should be defined, as well as how the program will be delivered, by whom, and with what materials. Finally, the program should be evaluated (NAAEE, 2004).

Best Practices

Many of the documents published regarding EE describe their own set of proclaimed best practices. Some of the recurrent elements are: community buy-in and support, engagement of stakeholders, and lastly some form of evaluation--all set in a strong ecological foundation. Completion of a preliminary literature review is encouraged by McKenzie-Mohr and Smith (1999), providing theoretical support for our efforts in this chapter of our description and evaluation of the DLC's environmental education program in Madagascar.

In "Exploring Principles of Good Practice: Learning from a Meta-Analysis of Case Studies on Education Within Conservation Across the WWF Network," Fien, Scott & Tilbury set out best practice principles for conservation education. The authors note over a decade ago that not much had been written (about the impacts of conservation education, or what good practice for conservation education is. WWF was the first international NGO to request an independent evaluation of its EE programs across its entire network. Many NGOs continue to operate programs with minimal, if any, evaluation. Without a culture of assessment, impacts and effects are difficult or impossible to determine (Fien, et al, 2002). We have seen this to be the case with the MFG. Although positive results from the Chef ZAP trainings are supposed, it has been nearly impossible to gather hard evidence to support the feeling that additional training provides some benefit.

The authors recommend twelve principles of good practice. The first is focus. Under this principle, the authors state that pedagogy should concentrate on building social and scientific capacity for conservation, growing popular support for conservation, and the measures that can improve people's quality of life, which would subsequently ease human pressures on the environment. Within the second principle, promotion of sustainable development, the authors identify the importance of active engagement in conservation work. The third principle,

integration indicates that conservation education programs should be one tool in a full toolbox, which includes capacity building, communication, advocacy, and environmental monitoring. Active participation was again stressed under the principle of pedagogy. Goals that pedagogies should strive to accomplish include the development of environmental knowledge and values, critical thinking and problem solving skills, and the ability to work cooperatively on conservation problems. Likewise, the importance of partnerships with local stakeholders and their involvement in the design and implementation processes were again identified as being critical for the institutionalization and sustainability of conservation education. Key decision makers are particularly necessary partners to have, as they have the power and influence to make the program sustainable. The seventh principle establishes, transforming systems, alludes to not simply changing people's behaviors and ways of doing things, but to empowering them to change the institutions and social constraints that are current barriers to conservation. Leadership and support entails local commitment, as well as good coordination between all stakeholders involved. Effective management, another principle, involves strategic planning, and consistent monitoring and evaluation that go beyond the summative to the formative and participatory. Lastly, participatory planning and research fully integrates all stakeholders into the project management cycle (Fien, et al, 2002).

What Works, edited by Martha Monroe, also seeks to identify best practices of environmental education and communication (EE&C) programs by drawing on case studies of programs from around the world. Monroe summarizes the key elements of successful projects, namely: community empowerment and involvement, interdisciplinary environmental education, stakeholder coalition-building, an institutionalized locally- and culturally-relevant environmental ethic, a gender component, flexibility, and meaningful evaluation and measurable objectives. Monroe also compiles recommendations for different types of EE&C projects. For those programs that seek to change school systems, Monroe recommends local relevance and appropriateness, identifying and involving key stakeholders, supporting institutionalization through local curriculum development, and build in review and evaluation to keep stakeholders engaged. Projects that are working to increase local capacity and professional development could provide funding for information dissemination, develop partnerships, and encourage networking and communication (Monroe, 1999). The programs run by the MFG and the DLC seem to fall into this category. In this context, it seems valuable for the MFG and DLC programs to maintain

a connection, allowing for networking and communication. In addition, the DLC should follow the MFG in continuing to pursue partnerships with other organizations operating in the area, like UNICEF.

McKenzie-Mohr and Smith put forth similar ideas to those expressed by Monroe. Social marketing and communication strategies are the key to raising awareness and eliciting behavioral changes. *Fostering Sustainable Behavior* is interesting because it focuses directly on those educators that find themselves becoming both environmental teachers *and* advocates.

McKenzie-Mohr and Smith suggest starting any endeavor by reviewing the literature and conducting research to obtain a picture of the current behaviors and motivations of the target audience. The authors present tools for the reader to conduct a social marketing campaign, with examples and case studies provided exclusively from environmental education efforts. The tools include: commitment, prompts, social norms, communication, incentives, and removing barriers. The concluding chapter provides information on how an evaluation can be incorporated and used to improve the success of a program. The tools and elements presented are well grounded in real-world examples (Monroe, 2001b).

Models and Strategies

In addition to multiple compilations of “best practice” guidelines and tools, the literature presents a vast array of organizational models and pedagogical strategies for promoting environmental education. Although the Duke Lemur Center is already establishing a cascade strategy model of information dissemination in the new location, we examined literature on a variety of strategies employed by environmental educators. These papers build upon the theories of best practices presented previously.

In “Strategies for the Training of Teachers in Environmental Education,” Wilke, Peyton & Hungerford present three training models: 1) superordinate training; 2) peer training; and 3) modular training. Under the superordinate training model, EE specialists train senior level administrators (superintendents) who then train the next level of administrators (principals), who subsequently train the teachers. In the peer-training model, EE specialists train a group of teachers in EE and training methods. This group of teachers then trains other teachers. Modular training involves developing a module based on a specific theme that teachers study individually. The downside to superordinate training programs is that they are time intensive and costly. It is

also suggested that peer training can be more effective in motivating teachers to provide EE if teachers are more likely to change their attitudes based on their peers' attitudes (Wilke, et al, 1987).

Some recommendations for designing a training program were to: 1) identify the needs of teachers and to include them in the planning process; 2) obtain support from all levels of the administration; 3) choose competent trainers; 4) ensure that there is enough time to complete the training; 5) ensure that there are enough materials and that they will be available; 6) coordinate between the different levels of stakeholders; and 7) evaluate the program. The authors suggest including parents, teachers, and community members, in the planning process. They stress the importance of discovering what local stakeholders believe their EE needs are, and integrating them into the design process to create a sense of local ownership. The same process is also vital for the teachers, who must feel like they are a part of the design process and can make a meaningful contribution to the planning and implementation of the EE program (Wilke, et al, 1987).

Gill (1997) discusses the importance of developing a program theory, or a "cause and effect description of the structure and operational characteristics of a program." The program theory helps to prepare a program to conduct a useful and effective evaluation by creating a model of how a program is supposed to work, resources required, staff, and intended outcomes. Gill discusses obstacles to the most effective program performance, particularly poorly defined objectives, insufficient resources and high staff turnover. However, Gill cites the positive outcomes of a case study at the Rookery Bay National Estuarine Research Reserve to support the benefits of a well-developed program theory. These benefits include revealing strengths and weaknesses of the program and determining overall effectiveness (Gill, 1997).

Hayes discusses the theoretical benefits of using the cascade strategy to train teachers, as the MFG and DLC are currently doing at the Chef ZAP level. The cascade strategy trains upper echelons of school administration, which then pass the training to teachers. The advantage of the strategy is that it is cost-effective; the disadvantage is that the training and information may be weakened if and when the teachers receive it. Hayes argues that "active participation at all levels" is critical to improve the effectiveness of the cascade strategy. In addition, Hayes identifies essential concepts that program managers should consider when conducting cascade trainings. These concepts include involvement of stakeholders in creating materials, flexibility

for trainers and teachers to develop new methods to implement the training, and structuring the training to be active and experiential rather than passive (Hayes, 2000).

Peace Corps Materials

There is considerable documentation of Peace Corps related environmental training materials. This is not particularly surprising; they are an organization that engages in supplemental education (environmental and otherwise) in developing countries all over the globe. Although these manuals are tailored to the needs and operations of the Peace Corps, they presented some relevant evidence of established practices and tools, especially for DLC's efforts in developing an initial program or a new location.

Teacher Training, A Reference Manual is a manual designed for Peace Corps volunteers who want to develop a teacher training program (not specific to environmental education). A teacher trainer needs to know the education system in the country in which he or she works, particularly the standard pedagogical approach so that he or she can replicate it and therefore make the information more accessible. Teacher trainers should also be familiar with adult education principles (andragogy); adults learn differently than children. Thus, the manual recommends different teaching techniques, namely relying more on experiential learning. Seven steps are recommended to develop a program: 1) needs assessment, 2) clear definition of goals and objectives, 3) choose subject areas, 4) plan activities, 5) be conscientious of flow and timing, 6) evaluate the program and 7) determine training limitations (Center for Education).

Environmental Education in Schools: creating a program that works!, by Braus and Wood, is manual designed specifically for Peace Corps volunteers with an intent to create environmental education programs. The manual identifies the five objectives of environmental education as: awareness, knowledge, attitudes, skills and participation. In addition, experiential education is identified as critical to students' understanding and retention (Braus and Wood, 1994).

Creating a locally appropriate program is crucial to effectiveness. The manual emphasizes, "assessing your community is the first step in developing an effective education program of any type—especially an environmental education program" (Braus and Wood, 1994). Five factors are identified as those needed to ensure a program will work: 1) buy in from the beginning, such as cultural appropriateness and local ownership; 2) materials, including

curriculum guides and reference materials; 3) teacher training, particularly involving the teachers in materials development, training teachers to be trainers, and evaluation; 4) funding; and 5) maintaining program support (Braus and Wood, 1994).

Additional materials produced by the Peace Corps are available to volunteers and cover topics from planning an EE program, to identifying stakeholders, choosing materials, and implementation. Perhaps the most useful topic considered is how to train educators to adapt materials, and even provides examples of adapting different kinds of materials. This may be a useful resource for the DLC to incorporate into its workshops to better facilitate the use of their own distributed materials (Peace Corps, 1999).

Education for Sustainable Development

In addition to numerous works on a variety of aspects regarding environmental education, there is an entire body of literature focused specifically on “education for sustainable development” (ESD). These types of programs often include additional elements of development and economic stability in the context of sustainable resource use. In some ways, these programs are more relevant to individuals living in developing countries, where the intersection between conservation and development is critical. There is some evidence of the success of these more targeted environmental education programs. Although an environmental education program by name, the DLC and the MFG employ some elements of education for sustainable development already. Agro-forestry programs and farmer trainings incorporate the teaching of better and more effective farming practices with better land management.

ESD can be summarized as “education *about/in/for* the environment,” (1995). As Tilbury puts it: “education about the environment is concerned with developing awareness, knowledge and understanding about human-environment interactions,” (1995) which has traditionally been in the realm of science and geography curricula. Education *in* the environment involves getting the students out into the field to experience nature, and to develop greater awareness and concern for the environment. Education *for* the environment strives to make environmental improvement the end goal by imbuing students with a sense of responsibility to take action to solve environmental problems (Tilbury, 1995).

In “Environmental Education for Sustainability: Defining the New Focus of Environmental Education in the 1990s,” Tilbury presents the evolution of ESD and what it has

meant for EE. It was not until the 1990s that EE programs began to include development education as well. The *World Conservation Strategy*, produced by WWF, IUCN, and UNEP in 1980, was the first report to turn ‘sustainable’ into a buzzword, and to highlight the poverty-development-environment nexus. The report was also the first to coin the term ‘education for sustainable development.’ It stated that education would be necessary to change attitudes and behavior. Agenda 21 and WWF iterated that EE cannot be considered as an independent subject, but rather a holistic approach should be taken, where EE is incorporated into all of the subjects in the curriculum. ESD also uses issue-based learning, action-oriented, and critical thinking approaches. Students are taught about specific environmental issues, and then are engaged through participatory learning approaches, which may be in class or in the field. Action-oriented learning seeks to challenge students to think critically about issues, and to give them the skills needed to solve problems. This is done through engagement with the real world, and participation in conservation projects. In class activities may include simulations, role-playing, games, or mixed media presentations and discussions (Tilbury, 1995).

Education for Sustainable Development (ESD) has been gaining popularity in recent years. To help organizations and communities incorporate principles from ESD into their education programs, McKeown (2002) has created the “ESD Toolkit”. The Toolkit provides background on the history and principles of sustainable development, what ESD is, challenges and barriers to implementing ESD, and a number of exercises to help with the implementation process (McKeown, 2002).

In “Teaching and Learning In, With, and For Community” (2010) Down provides a discussion on what ESD is and its importance, and specifically, how ESD can be incorporated into communities in the Caribbean. The idea behind ESD is that education “should lead to the creation of harmony and balance in our relationship with the environment as well as in our social and economic relationships,” (2010). The author then suggests that ESD pedagogy should be community centered, applied, practical, value driven, and future oriented. Down stresses service learning as being imperative for ESD. Service learning involves learning by doing and applying knowledge to attempts at solving complex real world problems. Service learning is thus a constructivist teaching methodology, which is focused on community service in order to meet the community’s needs. Once students become engaged in a community service project (such as tree planting or water conservation), they often develop a sense of belonging to the place, and this

encourages greater respect for the environment and the people who depend on it. This type of active engagement strives to help students see themselves as part of an interdependent whole (Down, 2010).

When pursuing education for sustainable development (ESD) Monroe stresses the importance of both “compelling adults to action and engaging citizens in problem solving.” There is a great deal of value in targeting adults when communicating information for change. It is important to find effective communication strategies to convey conservation research in a manner that incites rational adults to change their behavior. In addition, in order for these strategies to be effective, Monroe highlights the importance of public participation and collaborative decision-making. This includes frequent evaluation of results engaging learners in problem solving. There is a real need to be able to translate environmental research generated by experts in a manner that is intelligible and proactive (Monroe, 2007).

Efficacy and Measures of Success and Challenges

Operating an environmental education program in a foreign country presents numerous challenges, most of which the Duke Lemur Center has faced in one manner or another over the years that they have been involved in EE. In the context of providing guidelines and tools, Monroe and others have detailed some common challenges inherent in the successful operation of an EE program. Additional works within the scope of literature on environmental education focus more directly on specific challenges and opportunities for success within the field. Studies attempting to examine the behavior change as a result of conservation programs highlight the distinct challenge that the DLC (and almost all NGOs) faces- how can efficacy be measured in environmental education?

Hungerford and Volk (1997) discuss research findings that challenge an underlying assumption of the efficacy of environmental education: teaching and raising awareness about environmental issues do not necessarily lead to behavioral change. Synthesizing studies on environmental behavior, the authors suggest that three categories of variables contribute to behavior change: 1) entry-level variables, such as environmental sensitivity; 2) ownership variables, including in-depth knowledge and personal investment; and 3) empowerment variables, such as knowledge of environmental action strategies and intention to act. Hungerford and Volk discuss crucial elements of an EE curriculum to change behavior. Although the

techniques for education for a change in behavior are known, the challenge to implementation is that the teaching techniques are significantly different than those that are currently used (Hungerford and Volk, 1997).

Lemming et al. (1998) reviewed 34 papers that attempted to measure the effectiveness of environmental education. Most studies focused on improvements in knowledge and awareness, however the authors argue that research should concentrate on measuring behavior change (Leeming et al., 1998). How this is done consistently remains to be clearly specified in existing literature.

In “Successes and Challenges in East African Conservation Education,” Johnson-Pynn & Johnson explore the impacts of EE through service learning in East Africa. The authors first describe the service learning pedagogy, which was developed by John Dewey. Service learning requires that students interact with the real world, and think critically about problems and how to solve them. The authors argue that service learning foments positive environmental attitudes and values, and that these are prerequisites for solving environmental problems (Johnson-Pynn and Johnson, 2005). While this was relevant in the contextual information presented, the model used in this study is less applicable to the DLC’s program as it stands. It does provide support, however, for engaging the larger Duke community in the future Duke University hosts a wealth of potential student engagement and service learners should the DLC be interested in incorporating this idea into their teacher-training program.

Evaluation

Perhaps the most salient point of many of the articles examined in this review of the literature is the need for evaluation to illuminate successes and challenges. In many of the best practices and guidelines for EE, the importance of evaluation is stressed. In order to provide the best evaluation possible for the DLC, we specifically aimed to establish the guidelines for conducting an evaluation of an EE program. While measures of effectiveness and evaluations can vary greatly from program to program, looking to the experiences of other individuals and organizations has helped inform our own evaluation and subsequent recommendations.

“Evaluation is one of the most important activities environmental educators can engage in to justify programs to skeptics, thank funders for donations, and build support for continued operation.” IUCN’s *Evaluating Environmental Education*, by Stokking et al., (1999) is a detailed

manual that guides an organization in conducting a thorough evaluation of an EE program. It lays out 13 steps, including identifying the purposes and objectives of the evaluation, where the data will come from, methods of data collection, research instruments, and who will be included in the evaluation. It then goes through the data collection and analysis, interpretation of results, formulation of conclusions, and report creation steps (Stokking et al., 1999).

The above mentioned book by Stokking et al. focuses directly on an intended audience of environmental educators and program developers involved with voluntary programs where ultimate end users (students) that may not necessarily interact directly with program staff. This structure mirrors perfectly the cascade trainings used by the Duke Lemur Center, where program staff train higher level education officials who in turn present the information to students. The 13 steps are supposedly outlined for the purpose of conducting a practical and useful evaluation of an environmental education program. Although this book provides a comprehensive look at evaluations and detailed explanations, it did not present the information as a “how-to” guide. The basic guidelines are an important summary of the importance of evaluations for environmental education and steps for data collection, however these tools are not presented for program development (Monroe, 2001a). These guidelines provided a structural reference to our own evaluation of the MFG teacher-training program; however, due to the parameters of our study we did not attempt to follow this guide in all aspects of our evaluation process.

While the primary goal of Fleming and Easton’s paper: “Building environmental educators’ capacity through distance education” was the description of a specific training program to increase the capacity of those who perform evaluations of environmental education, their arguments for the importance of evaluation support our work with the Duke Lemur Center. They begin the article with the definition of evaluation as stated by the President of the American Evaluation Association: “the intentional work to continuously create and sustain overall organizational processes that make quality evaluation and its uses routine.” This is perhaps one of the most valuable tools that we can provide the Duke Lemur Center in the expansion of their environmental education program. Our evaluation, while perhaps precursory, provides a baseline evaluation with which to expand upon annually. While it is likely not plausible for the educators at the education sites to participate in the online course described by Fleming and Easton, the concept of both supplying evaluation and the tools for conducting evaluations, but the commitment to evaluation and demand for comprehensive information must be present within

the institution. Historically, as is apparent in our review of the literature, environmental education evaluations have been inadequately assessed on the merits of the evaluation, and merely serve as a defense of programs in order to maintain funding. Increasing the capacity of those involved in environmental education to conduct thorough and comprehensive evaluations is stated within the guidelines set by the North American Association of Environmental Education. Fleming and Easton acknowledge the difficulties associated with evaluation on environmental education, due in part to the attempt to measure long-term goals (i.e. conservation) over very short time periods. While it is nearly impossible to attribute long-term changes to short duration programs, in this respect the Duke Lemur Center is at an advantage. The program run by the MFG has been in place for many years and plans to continue to operation. Although an online course to teach evaluation for environmental trainers hired by the Duke Lemur Center may not be appropriate in the circumstances, it may be valuable to education trainers on evaluation methods and importance so that evaluations may be continued and improved over time (Fleming and Easton, 2010).

“Challenges for environmental education evaluation” addresses three thematic challenges for evaluation in an environmental education capacity, resulting in six final recommendations for improvement in the field. The first theme, capacity building, addresses the common challenges associated an educators ability to conduct an evaluation “Programs lack clear objectives, rely on limited research approaches, and do not articulate a program theory” (Monroe, 2010). An evaluation should focus on the impacts of the program on the audience and the environment. Monroe suggests that educators are better trained in program evaluation and professional development opportunities, or professional evaluations should be done to not only improve the program of concern, but the field as a whole. Few respectable evaluations have been published in peer-reviewed journals. There is a difficult balance between making evaluations able to be conducted by all, and making them too simplistic as to provide value. Evaluations should address not only whether a program is meeting its objectives, but also why it is successful. The recommendations regarding program theory suggest that more research should be made available through publications and practitioners to make findings more accessible to those in the field. Perhaps the two most relevant recommendations made by Monroe are those relating to the learning organization itself. The first being that evaluations should be used as an opportunity to make recommendations and suggestions for adaptive changes of the evaluations themselves in

addition to the organization, and second that these recommendations should aim to evaluate and improve the organization itself in addition to the program. “Evaluators can use the opportunity of any single environmental education evaluation to suggest ways in which the organization, not just the program, can be transformed to better meet their goals of cultivating society-ready citizens and solving difficult problems” (Monroe, 2010). An important issue addressed by this article is that: “An inherent belief that awareness and knowledge will lead to conservation behavior, even when the program does not teach about the behavior, pervades the environmental community” (Monroe, 2010). It is important to consider in any measurement of success what is realistic and attainable in terms of established outcomes.

In “Challenges and Opportunities for Evaluating Environmental Education Programs,” Carleton-Hug and Hug (2010) note that there is a “lack of a widespread culture of evaluation in environmental education,” despite its acknowledged importance by authors like Stokking and Monroe. The authors conducted a review of articles in scholarly journals with a focus on the evaluation of environmental education (EE) programs, to identify issues facing EE evaluators. Articles from the top three EE journals were selected if they contained the word “evaluation” in their title. These articles were then analyzed to determine how program evaluations are being conducted, what challenges exist in conducting evaluations of EE programs, and what the opportunities are for expanding evaluation efforts in the United States (Carleton-Hug and Hug, 2010).

In their analysis, the authors found that there is a lack of consensus and standardization around evaluation approaches. Many articles failed to describe the program objectives and delineate the evaluation design, or left out important sections like recommendations and impact. Specific challenges that were identified are: 1) the multidisciplinary nature of EE; 2) absence of clear program objectives; 3) a need for formative evaluation in addition to summative evaluation; 4) a need for more variation in evaluation approaches; 5) difficulty in conducting long-term evaluations; 6) institutional barriers to evaluation; and 7) difficulty in obtaining reliable data (Carleton-Hug and Hug, 2010).

Because EE is often incorporated into multiple subjects in the curriculum, it can be hard to evaluate the impact of EE. Additionally, many EE programs have discrepancies between their stated objectives and goals, and their actual activities. When evaluation is done, it is usually in a summative fashion, as this provides the measures of success that donors demand, and it is easier

to perform than formative evaluation. Due to administrative and budget constraints, evaluations are frequently only done in a very short timeframe. The downside to this approach is that the long-term impacts are never evaluated, so it is impossible to know if attitudes and behaviors are really being changed. Other institutional barriers include staff who do not see the value in evaluation, or do not have the skills to undertake an evaluation; a perception that negative results from an evaluation will harm the organization; and no existing incentives for conducting evaluations. Lastly, it is extremely difficult to measure the impact of EE programs when students obtain environmental information from multiple media sources, such as television and radio (Carleton-Hug and Hug, 2010).

Literature on a variety of aspects of environmental education has lent insight into our examination of the program run by the Duke Lemur Center and the Madagascar Fauna Group. We used the information published in peer-reviewed journals to inform the description and evaluation of the teacher-training program to follow. The literature review was a critical element in compiling our recommendations to the Duke Lemur Center. We have aimed to be as comprehensive as possible in our review of published materials on environmental education and we hope that this in itself will be a useful product for the DLC to move forward with the training program recently initiated in the SAVA region.

III. Materials and Methods

We conducted a mixed-methods evaluation of the Madagascar Fauna Group's (MFG) train-the-trainer program at Parc Ivoloina near Tamatave, Madagascar. Our focus was the Chef ZAP teacher training program. We gathered both qualitative and quantitative data using surveys, interviews, and analysis of pertinent material culture.

To date, the teacher training program had never been documented nor fully evaluated. The results of this evaluation will be used to inform a new project that our client, the Duke Lemur Center (DLC), is implementing in the SAVA region of Madagascar. The DLC's program is independent of the MFG's trainings but based upon the existing efforts of which the DLC was a founding force.

Positionality

Positionality is a term used in qualitative research that describes the perspectives from which the researcher(s) come to a research project. Factors that affect positionality may include personal background, ethnicity, and place of origin. The research team's relevant demographic, cultural, and biographical criteria are described below. These factors all influence the way that the research team has approached and been able to understand our research questions and MFG's environmental education program.

All of the research team have been raised in North America (United States and Canada) and are embedded in Western culture and ideals. Only one member of the research team has traveled to Madagascar in the past, meaning that three researchers had no firsthand knowledge of the country, culture, or people. However, three of the researchers have spent short periods of time in developing countries. Three of the four researchers were proficient in French, and none of the researchers have a working knowledge of the Malagasy language. All of the researchers are female and in their early to mid-20s. Three of the four are Caucasian, and one is of Indian descent but was raised in the United States.

The research team worked from North Carolina and is in the Masters of Environmental Management Program. As a result, the team was highly educated in environmental issues and conservation, and approach the subject from diverse backgrounds that include social and natural sciences. However, none of researchers were well-versed in the theory or practice of environmental education to teacher training programs.

Research Challenges

Our research design was constrained by lack of funds available for travel to Madagascar. As a result, we gathered most data remotely. This challenge significantly narrowed the pool of people associated with MFG and the teacher training program to whom we were able to speak.

Furthermore, the language barrier and inconsistent internet access made it difficult for us to gain access to Malagasy staff who work at MFG. Although the research team has a working understanding of French, we did not feel comfortable enough with our language skills to conduct our interviews. As a result, we only conducted spoken interviews in English. We made multiple attempts to contact an English-speaking Malagasy staff member who conducts the trainings, but were unable to set up an interview.

Research Questions

Our initial research questions were as follows: Is the teacher training program successful? How could the program be improved? How could the program be evaluated? As our research progressed, we found that our original research questions were too broad and unanswerable given the limitations of the project and of the enabling environment in Madagascar. The MFG had not defined metrics for success for the teacher training program; the teacher training program's cascade structure and the constraints presented by conducting research at a great distance made conducting a full evaluation virtually impossible. Our final research questions evolved to become: how should success be defined? What factors are relevant to improve the program? How best to evaluate the program, given that we were only able to obtain participants' and staff's perceptions of the program?

Conceptual Framework

We developed a conceptual framework to identify major areas and themes on which our research focused (Appendix A). This framework, which is also our node structure in the qualitative analysis software NVivo, illustrates what we researched and gaps that our research attempted to fill.

Once we had gathered our data, the research team worked together to develop the conceptual framework, which we also used to code our data. The conceptual framework was also an iterative process and new nodes/themes were added to the framework as they emerged.

We identified six major themes and areas of focus: effectiveness, evaluation, curriculum content, enabling environment, the MFG, and the SAVA project. Each topic is color coded in the conceptual framework to help visually distinguish between subjects.

1. Effectiveness: This theme included successes, weaknesses/challenges, and suggestions for improvement of the MFG's environmental education programs. Successes of the program looked specifically at strengths of the program and spreading awareness.
2. Evaluation: This theme encompassed both internal evaluation that the MFG currently has in place, as well as information pertaining to our evaluation (external). We also identified data that could serve as possible recommendations, as well as mentions of quantitative data.

3. Curriculum content: We reviewed the MFG-provided curriculum, namely the *Guide Pratique du Maitre*, and highlighted discussions of other materials the MFG provides through their programs. We also looked at mentions of the national Malagasy education curriculum.
4. Enabling environment: The enabling environment is the context in which the MFG conducts their work, including the EE program. For our research, this theme focused on relevant information to the environmental education program. We identified other nongovernmental organizations that are doing environmental education work, the geographic area in which MFG works, and current environmental issues in Madagascar. We also looked at community support, which included demographics and local context, such as demand for education and training as well as on-the-ground relationships. The government sub-theme looked at relevant factors that impact the EE program, such as the ongoing political crisis, government regulation, and the structure of education in Madagascar. Of particular importance to our research was the state of education in the country, discussion of the Chef ZAPs, and MFG-government relations.
5. MFG: The organization and function of the Madagascar Fauna Group was a major area of focus in our research. We collected data on the overall objectives and mission of the MFG, how the organization is funded and associated costs, the DLC's role in the MFG, the MFG's capacity building work, external and on-the-ground partnerships, efforts to monitor the program, and possibilities for the future of the EE program. The structure of the MFG included research on upper levels of administration, which were individuals who are involved with the consortium through their individual zoos or botanical gardens. We also explored the functions of the field staff in Madagascar, such as the Program Manager role, and recurring challenges, namely staff turnover. We gathered information on all of the MFG's EE programs, but our main focus within our research were the Saturday School and the Chef ZAP training programs. The MFG's strategy and methodology for the EE programs were another important subject, and we looked specifically at the cascade strategy used in the Chef ZAP trainings, pedagogy, and the evolution of the program.

6. SAVA project: Finally, we collected data on the Duke Lemur Center's new location in Sambava, SAVA region. Because this project is so new, we primarily gathered basic descriptive data.

Surveys of Participating Trainees

We administered surveys to the participants of three Chef ZAP trainings at three locations in Madagascar. The purpose of the surveys was to determine perceived effectiveness of the trainings, the participants' motivations to attend, program objectives, suggestions for improvements, students' expected response to the material, usefulness of the materials, and perceived ease of implementation.

The surveys were developed in English and translated into French. Survey questions included scaled multiple choice questions and open-ended questions (Appendix B). Demographic and location data were also collected, and space was provided for additional comments. Surveys were not anonymous and many respondents provided names. These identifiers were not relevant to our research and thus were not included in the analysis. Names were removed as identifiers from electronic copies and maintained on the original hard-copies only; there is no way to correlate the names with survey responses directly. Gender and age information were relevant to our analysis and therefore were maintained in the database.

The DLC emailed surveys to training coordinators in Madagascar, who then printed and distributed them to participants at the MFG training in Tamatave, and to the new DLC locations, Andapa and Sambava. The trainings took place over the course of five days during August and September. We received 54 surveys organized by location; however, one packet contained no location information.

In addition, MFG administers post-training questionnaires in order to help the training staff tailor the trainings to participants' interests and suggestions. Five questionnaires MFG administers to trainings participants were sent to us when our surveys were returned. These data were analyzed separately from the surveys we distributed.

The open-ended questions in the survey were analyzed using NVivo. The scaled questions were quantified and analyzed using statistical software.

Interviews

Interviewees were chosen according to their role with the organization. We interviewed upper-level administrators, current and past program managers, and representatives of MFG member organizations. Interviewees were asked a similar set of questions but tailored based upon their role with the trainings or the MFG.

1) Interviews with Organization Staff

The purpose of the interviews with MFG's field staff was to determine perceptions of effectiveness, program assets and funding, the program's relationship with the community and community support, the MFG's relationship with the Malagasy government, and program goals, objectives, metrics, evaluation, and suggestions for improvement.

We interviewed the outgoing MFG program manager, An Bollen, and the preceding MFG program manager, Karen Freeman. These interviews were conducted using voice over IP software, recorded, and transcribed. We were unable to interview the education manager since the post was unfilled during the time we conducted our research.

As described in the challenges section, multiple attempts were made to speak with training staff, however we were unable to conduct a spoken interview with any Malagasy individuals who are associated with the Chef ZAP training program.

2) Interviews with MFG Administrators

The MFG is a consortium of zoos and botanical gardens who pay dues to support Madagascar in-country conservation projects. Interviews were conducted with representatives from MFG member organizations, namely Anne Yoder, Director of the Duke Lemur Center and Ingrid Porton, Assistant Director of the St. Louis Zoo. In addition, we spoke with our client, Charles Welch, Conservation Coordinator at the DLC. Mr. Welch also developed the training programs and the training manual, the *Guide Pratique du Maitre*, during the 1990s when he worked at Parc Ivoloïna. These interviews were conducted either over the phone or in-person, recorded, and transcribed. The purpose of these interviews was to gain an understanding of the upper-level administration of the MFG's environmental education program, program assets and funding, and program evolution.

3) Cultural Context Interview

We also spoke with Chris Golden, a researcher in natural resources and human health, who has spent a significant amount of time in Madagascar over the past decade. Chris's research takes him to Makira Protected Area in northeastern Madagascar, near the SAVA region where the Duke Lemur Center is establishing their new program. We conducted the interview with Chris to get an outside perspective of the culture and context in Madagascar, particularly the region where the DLC will be working. The information we learned from Chris will not be directly quoted in this paper; however, it was useful for gaining an outside perspective of education and cultural nuances in Madagascar.

Content Analysis of Program Materials and Records

Material culture reviewed included teaching manuals, annual reports, grant applications and other reporting materials. Since the data was gathered remotely, we relied on reports and applications the program managers could easily obtain. As a result, material culture is incomplete and inconsistent. Furthermore, many documents were in French, which made analysis difficult. The purpose of this data was to gain a comprehensive understanding of the structure and content of the training programs, internal metrics and evaluation, quantitative data, and program assets and funding.

We reviewed the following documents: MFG Annual Reports to Planet Foundation from 2008, 2009, and 2010; Ivoloina Environmental Education Center Annual Activity reports from 2004, 2005, 2007, 2009, and 2010; the Trapp Funding Report; and the 2005 Annual Report on Environmental Education Activities within MFG. We also reviewed the MFG website, as well as attended the 2011 MFG annual meeting in Durham, North Carolina and reviewed PowerPoint presentations given by An Bollen, Program Manager, at the meeting.

In addition to reporting materials, we also reviewed the MFG's primary tool for disseminating information on environmental education, the *Guide Pratique due Maitre*. The MFG developed the *Guide* to help teachers introduce and integrate environmental topics in the classroom. MFG's Chef ZAP and teacher trainings are intended to teach Chef ZAPs and teachers to the material in the *Guide* and how to use it. Although the content of the curriculum is not the primary focus of our evaluation, the *Guide Pratique du Maitre* was reviewed to gain familiarity with pedagogy and the subject-matter being taught.

Quantitative data on the Saturday Schools, considered the flagship of the MFG's environmental education program, was more plentiful than on the training program. The availability of this data was due in part to the fact that the nature of the program made progress more easily measured. These data, and data on the other MFG environmental education programs, were reviewed to learn about the effectiveness of the environmental education program as a whole. However, no new quantitative analysis was performed on these data.

Data Analysis Methodology

Interviews and survey data were imported into NVivo 9, a qualitative data analysis software, and coded according to themes. Data was also analyzed using text queries and word frequency queries. The research team utilized both enforced and inductive coding: nodes were established after gathering data and prior to coding, and new nodes were developed according to emerging themes and agreed upon by group members. The node structure also serves as our conceptual framework (Appendix A). Due to the constraints on our ability to collect data, the conceptual framework was iterative and evolved according to data that we gathered.

1) Coding Reliability

Before coding, group members jointly developed a memo that established coding methodological rules. All nodes included descriptions to help ensure coding reliability.

One interview was selected as a reliability check; this particular interview was chosen because all group members were present for the interview. Group members coded this interview according to the node structure then compared coding in NVivo 9. A subset of nodes were chosen to compare coding among group members. Coding was considered reliable if at least 3 of the 4 (75%) group members agreed on coding. This process was also used to refine the node structure, clarify purpose and uses of nodes, and ensure that the node structure was useful. All new nodes were reviewed and discussed by group members before adding to the conceptual framework.

After coding the reliability interview, each interview was coded by two group members then merged into a master file.

2) Quantitative Data Analysis

Survey data were also analyzed quantitatively using STATA statistical software. Likert Scale responses were encoded as numerical data. This data was categorized by region, gender, age, and years of teaching experience. The primary methods used were t-tests and descriptive statistics. Our results from the survey analysis are detailed below. Full log of STATA output is located in Appendices B-D.

IV. Results and Observation

Through the various interviews, surveys and material culture analyses, we uncovered major themes that assist in describing the MFG programs and shed light on the various strengths and weaknesses associated with the program. The full range of themes examined in our data analysis is structured in our conceptual framework, however the themes that were readily apparent in both interview responses and the survey data were: capacity building, spreading awareness, current levels of student education, and the challenges of the cascade strategy. Within these larger topic areas, similarities and differences arose in the surveys and interviews. Chef ZAPs and interviewees from the MFG and DLC had compatible ideas about the importance and need for capacity building. The Chef ZAPs demonstrated a strong demand for the training program, which holds capacity building of local educators as one of its primary tenants. Spreading awareness was a strong motivator for the Chef ZAPs who sought to increase their environmental knowledge, and the dissemination of knowledge is seen as a key indicator of success for program operations. Both interviewees and survey respondents stressed the importance of dedication and commitment of program participants in order to attain successful cascade strategy outcomes. The current political climate was an important factor in the lack of access and educational attainment for students according to interviewees; however, it was not a theme that was addressed by any survey respondents. Additional themes and nuances within these broad categories are detailed in the analysis of the survey and interview data.

Survey Analysis

The elements of survey responses cover a wide range of topics- from capacity building with educators in the area to global biodiversity conservation. Our survey instrument also included both open-ended and Likert scale response questions requiring the respondent to

evaluate an aspect of satisfaction with the program from 1-4. These responses provided material for both a qualitative and quantitative analysis of participant feedback. However, the results of our surveys must be considered carefully due to small sample sizes, limited variation, and possible cultural confounding factors. It is unlikely that participants felt completely comfortable rating the program very poorly if they felt grateful for the resources being provided by the MFG and DLC. Given these limitations, the quantitative survey results provide the most valuable feedback when interpreted in context with the written survey responses and the interview data.

Qualitative Survey Data

The 54 surveys we received from participants in the training programs in both regional locations have provided us with a valuable opportunity to examine the voice of the Malagasy Chef ZAP participants. We asked individuals what they believed the objective of the training program to be, why they choose to attend the workshop, and how they felt their students would react to the material. In addition, we asked respondents to indicate what they liked best and least about the training session, and what they would improve. On the whole, the survey data supported our perceptions of the training program presented by those MFG members that we spoke with, along the themes of capacity building, spreading awareness, and the challenges of educational attainment of students and the cascade strategy.

Reported Successes

The most prevalent elements in the surveys are arranged along a few distinct themes that support the MFG's stated goals for the program. When asked the objectives of the training program, survey responses fell into two broad categories: capacity building of educations, and spreading awareness (of environmental issues). These two themes were elements of our conceptual framework, and were areas that interviewed members of the MFG discussed frequently as desired outcomes. When asked why they attended the trainings, responses were significantly more varied, demonstrating different levels of commitment to environmentalism. The themes apparent in these responses follow much the same ideas of improving capabilities as an educator and spreading an awareness of the environmental issues that Madagascar faces to teachers, students, and the larger community.

Reported Challenges

When asked how they will use this information, most survey respondents expressed a desire to improve student outcomes. Interviewees from both the MFG and DLC also expressed this particularly salient challenge. The lack of consistent educational resources available to students in Madagascar has generated some question as to their ability to progress within the school system. Many respondents emphasized the desire to instill a level of commitment to the environment in their teachers and students, citing the challenges of the programs' cascade model. Dedicated individuals are needed not just at top level, but at every subsequent transition of knowledge to ensure that the information reaches students. The surveys suggest both high levels of optimism in addition to concerns that the model only works when it can inspire commitment from many individuals.

Through the surveys, it appears that the strengths of the MFG and DLC training programs, as expressed by the Chef ZAPs, are: increased awareness of environmental issues by students, teachers, and community members, and the increased capacity the training program fosters in local educators. Additionally, challenges within the program are clustered around the lack of fundamental access to education for students in Madagascar. Furthermore, the program has a strong need for many committed individuals in order for the cascade model to be successful. These themes are present in our conceptual framework and were highlighted by almost every interviewee and are contained in the proceeding analysis of interview results.

Additional Themes

Using Nvivo qualitative analysis software, we were able to search for key words and phrases that corresponded between our interviews and survey results. These word queries provided additional support for the themes that were suggested by our interview analyses and displayed gaps in our understanding of some key issues. Analysis of our interview data follows this section.

The most interesting word queries were those that elicited considerations that were not apparent in other aspects of our data analysis. One word query that was particularly interesting was "Respect." It was a concept that had not come up from our interviewees but was clearly an important aspect of environmental education to the Chefs ZAPs. Seven direct references were

made to teaching or learning a respect for the environment, most in response to why the individuals were attending the training, or how they intended to use the information.

Responsibility, protection, knowledge were also themes that became very apparent in the analysis of the open-ended survey responses. The motivations for attending the training, as well responses as what they hoped to get out of them were very much engrossed in these concepts. There appeared to be an innate sense of responsible to the environment and its protection by those who participated. We were surprised to see a connection made within the responses to national pride, civic duty, and environmental protection. Fifteen references were made to motivations for environmental action as a result of this theme. This area is something that could be explored by the Duke Lemur Center and the Madagascar Fauna Group in how they conduct the training sessions.

The importance of motivated and committed individuals for the cascade strategy to work was repeated by almost all interviewees. Unfortunately there is no clear, distinction in the survey findings between those Chefs ZAPs who are passionate about the trainings and environmental education, and those who were not. Looking at our results, it seems as though most participants had insightful and complete answers. At most, it seems 8 of the 54 individuals surveyed were lack-luster about filling out their surveys; however, this can not necessarily be attributed to their commitment to the trainings or lack thereof.

Missing from the surveys were any mentions of the current political crisis and its role on the environment and the state of education in Madagascar. Although this was something deemed to be at the root of many environmental ills currently threatening the biodiversity hotspot from the international perspective, the members of the education community surveyed did not bring it up in their responses. This omission may be for a variety of reasons. Perhaps it is, in fact, not seen as a huge concern to the education system or environment, or else the changing political environment is a factor that is out of the control of most Malagasy (and something they are relatively accustomed to), and so therefore not worth mentioning. Regardless, the political situation is not an aspect of environmental training that can be changed or improved the way that teaching methods can be targeted or adjusted. An important qualifier: -- we asked our interviewees about political concerns as these were brought up first and often by the interviewees. They mentioned current political affairs 50% of the time.

These inherent beliefs and moral codes may be a powerful call to action that the DLC can tap into. Exploring these ideas may enhance the DLC's efforts to inspire commitment in individual participants. The cascade strategy is hinged on key participants being committed and motivated to the cause. This was a theme that was echoed in almost every interview conducted. Without these individuals' commitment, the successes from a program styled in this way are likely very minimal.

These themes that arose from our open-ended survey responses provide statements from the participants to support much of what was said by MFG staff members. Confirming these ideas is crucial to lend credibility to statements made by those charged with running the program. In addition to confirming much of what we expected regarding the training programs, the surprising themes that rose out of the survey responses after Nvivo coding are perhaps the most useful going forward.

Quantitative Survey Data

In addition to open-ended response questions, basic demographic data for participants was collected including: age, gender, and number of years as an educational professional. The average age of respondents was just over 48 years old, and of the 54 Chefs Zaps surveyed, 11 were female and 43 were male. They had an average of 22 years teaching, with a range of 2 years to 38 years. The responses returned were distributed fairly evenly across study sites. There were 14 respondents from the Andapa region, 17 from the Sambava region, and 20 from Tamatave (3 respondents did not indicate a location). The demographics of participants were examined across regions, and we found that, in addition to a lack of female respondents among the Sambava region participants, we looked for additional discrepancies in this area. We found women to be over 4 years older on average, and have over 7 additional years of teaching experience compared to their male counterparts. These results are statistically significant at the 5% level of confidence in a one-sided t test (See Appendix C c. i). Participant demographics were fairly similar across all study sites. The Table 1 (following) outlines the summary statistics by region and aggregated.

Table 1: Summary Statistics by Region

	Variable	Mean	Std. Dev.	Min	Max	Obs.
Andapa	<i>Age</i>	48.36	7.64	33	58	14
	<i>Gender</i>	0.21	0.43	0	1	14
	<i>Years Teaching</i>	21.50	11.18	6	33	12
Sambava	<i>Age</i>	45.94	9.70	32	60	17
	<i>Gender</i>	0.00	0.00	0	0	17
	<i>Years Teaching</i>	18.63	11.77	2	38	16
Tamatave	<i>Age</i>	49.60	7.34	31	59	20
	<i>Gender</i>	0.30	0.47	0	1	20
	<i>Years Teaching</i>	24.16	11.31	6	38	19
Undesignated	<i>Age</i>	51.33	4.73	46	55	3
	<i>Gender</i>	0.67	0.58	0	1	3
	<i>Years Teaching</i>	27.33	6.81	22	35	3
Aggregate	<i>Age</i>	48.22	8.12	31	60	54
	<i>Gender</i>	0.20	0.05	0	1	54
	<i>Years Teaching</i>	21.94	11.26	2	38	50

Four Likert scale questions were integrated with the open-ended responses discussed above. These Likert scales were measured from 1-4 with 4 ranking the highest, and asked about how useful the trainings were, satisfaction with the trainings, whether the program met expectations, and how easy the information would be to implement. Using the results of these questions, we were able to analyze the rated success of the program as a whole and across regions. On average, the programs were rated very highly on all measures, with most respondents rating 3s and 4s across the board. Usefulness of the program was rated statistically higher than the other measures, while overall satisfaction was rated the lowest (See Table 2 for these findings and Appendix C for further analyses).

Table 2: Summary of Likert Scale Responses

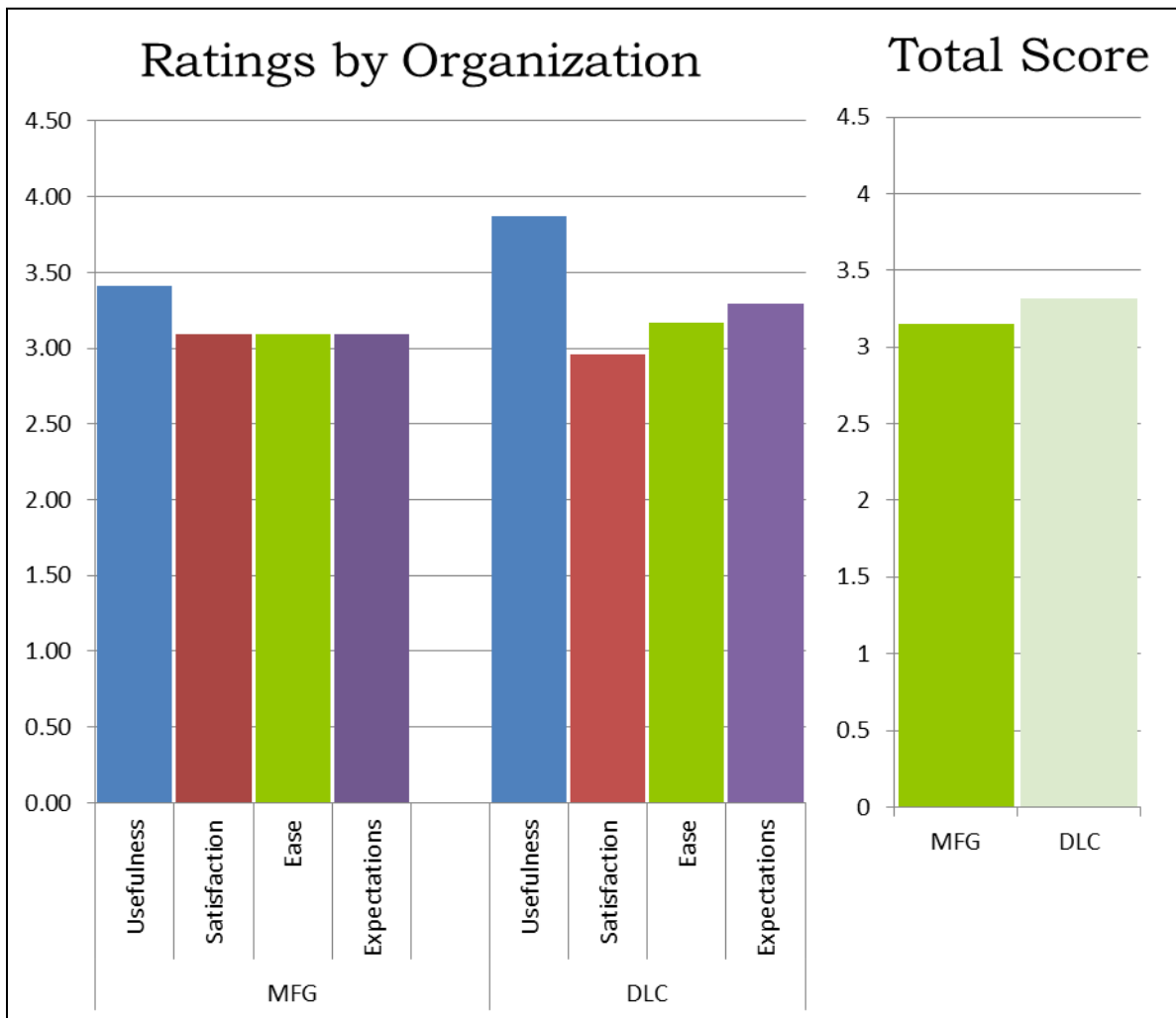
Variable	Mean	Std. Dev.	Min	Max	Obs.
<i>Usefulness</i>	3.679245	0.471233	3	4	53
<i>Satisfaction</i>	3.018519	0.23718	2	4	54
<i>Expectations</i>	3.207547	0.453978	2	4	53
<i>Ease</i>	3.137255	0.44809	2	4	51

For more meaningful analysis, the regions were separated into two categories. The older MFG run program in Tamatave was compared to the aggregated results of the fledgling Sambava and Andapa regions. There were no statistically significant differences in the ages or years of teaching experience in the respondents who attended both programs. However, it is interesting to note that there are statistically significant differences in the average Likert scale respondents across the two program categories. The Tamatave and Sambava Chefs ZAPs rated the usefulness of the trainings half of a point higher, however they appeared to be less satisfied with the program overall and felt less confident that the workshop met expectations. Due to the limited variation in the responses of individual questions, and to assess further the differences in responses to the two programs, a new variable (“total”) was aggregated to encompass a respondents total scoring of the program. This variable was then examined across gender and region.

Although there were no differences in responses between males and females, overall ranking was significantly higher in the collective new program (Sambava and Andapa) than by participants in Tamatave. This may be due in part to the differential history of the two programs. While the MFG run program is well established the community, the DLC initial workshops served the purpose of making new contacts and reaching out to new participants. Concern over the new program’s longevity may have led to a tendency for higher ratings in the new program. It is also important to consider who our survey respondents were. All the individuals in Sambava and Andapa were participating in the program for the first time, while Tamatave sees many Chef ZAPs repeat the training program. Usefulness in particular may have been rated higher because

the information was new, and therefore more “useful” to these participants than the information presented in Tamatave to those who have attended previously. Furthermore, the individuals that ran the trainings in the new locations are MFG employees. The DLC choose the best leaders from the environmental education program for this project, which may also have influenced the rankings.

Figure 1: Ratings and total average score aggregated by program organization.



Given the information regarding gender discrepancies illuminated by interviews with key informants, we tested for additional differences between men and women. The results of the Likert scale responses regarding the usefulness, applicability, and participant satisfaction do not show any statistically significant differences between men and women respondents.

The correlation between the variables was examined. Not surprisingly, age and years of teaching experience were highly correlated, and the correlation coefficient was statistically significant. There was a moderate statistically significant negative correlation between gender and program category. Rating of the usefulness of the material was moderately positively correlated with region, and of the Likert scale responses, ease of incorporating the material and acceptance of the material were most correlated. Neither years of teaching or gender appeared to be correlated with scaled responses (Correlation table can be found in Appendix C d).

Our quantitative analysis suggests that first and foremost an established connection with the local community will lend credibility to future evaluations. Overall, all educators who participate in the workshops find the environmental information very useful and continue to present a strong demand for the pedagogical tools provided. High evaluation scores should not always be accepted without further consideration for improvements; however, they are an indication of successful practices.

Interview Analysis

We conducted five interviews with key members of the Duke Lemur Center and the Madagascar Fauna Group. We spoke with An Bollen, the Program Manager of the MFG, Karen Freeman, Research Director of the MFG, Anne Yoder, Director of the Duke Lemur Center, Ingrid Porton, Vice Chair of the MFG and Assistant Director of the St. Louis Zoo, and Charlie Welch, Conservation Director of the Duke Lemur Center. Analyzing these interviews led to the surfacing of some key themes regarding the success and challenges of the teacher training programs at the MFG's Ivoloina facility, and how these may be applied to the current expansion of the program to the SAVA region.

Four Pillars

The MFG engages in a multi-dimensional approach when developing, planning and implementing their various programs by closely following their four strategic pillars: capacity building, scientific research, conservation action, and basic education. These pillars serve as a guideline to assist staff in determining which projects should maintain funding and which potential projects should become a priority. Our focus, the Chef ZAP (Teach the Teachers) program, falls under the environmental education pillar, but it is important to note that the 4

pillars are interconnected, and the all of the programs tie into the MFG mission and conservation goals.

1) Capacity Building

The overall goal of MFG's capacity building program is to build the institutional and human capacity required to manage sound environmental programs in the region. The MFG employs the use of adult education workshops conducted at the ICTC, such as the Chef ZAP trainings, to teach local government officials and community members' skills such as natural resource management, agro-forestry, reforestation, and veterinary medicine (Bollen 2009). Bollen also noted that the capacity building program aims to enhance local, on-the ground collaboration between partner non-governmental organizations, local stakeholders, MFG staff, and various partners through joint workshops.

2) Scientific Research

According to the MFG website, the organization conducts both biological and socio-economic research activities in Ivolina National Park (Ivolina Park) that result in direct conservation action by enhancing the understanding of Madagascar's complex ecological relationships. Major research undertakings include studying invasive species for invasive species control, species distribution and modeling in Ivoloina Park, and analyzing the effects of anthropogenic disturbances and climate change (Madagascar Fauna Group, n.d).

3) Conservation Action

The conservation action program allows MFG to utilize the results of the research conducted at Ivoloina Park to develop conservation strategies that address the current environmental issues in Madagascar (I. Porton, personal communication, November 18, 2011). Conservation action includes activities such as increased park patrolling to combat illegal logging activities, increased forest restoration projects, and conservation action plans for the zoo and botanical gardens at Ivoloina Park (Madagascar Fauna Group, n.d).

4) Education

The MFG's various basic education activities and programs aim to target a variety of audiences including primary-school children, university-level students, farmers, village heads, local decision-makers, mayors, and teachers in order to raise public awareness on the complex environmental situation in Madagascar (Bollen 2008; Madagascar Fauna Group, n.d.). Through programs and events such as the Saturday School, Teacher Trainings, Chef ZAP trainings, Farmer's training, Camp, Environmental Club, Bitsik'Ivoloina newsletter, and Mayor's training, the MFG attempts to transfer environmental knowledge, skills and values to the community in order to influence the community's impact on the environment (Bollen 2009).

Major Environmental Programs

As mentioned above, the major environmental education initiatives run by MFG include the Saturday School, Teacher Trainings, Chef ZAP trainings, Camp, Bitsik'Ivoloina newsletter, Farmer's training and Environment Club. Given that the Chef ZAP trainings are a component of the larger environmental education program, we feel that it is important to describe the goals and objectives of all the environmental education initiatives before providing a detailed analysis of the Chef ZAP trainings.

1) Camp

The Camp occurs during the holiday period and consists of environmental courses that last approximately 4 to 5 days (Randriambelona 2004). The main goal of the Camp is to educate secondary and university-level students in conservation, and topics covered in the sessions include, plant biology, bat conservation, soil erosion, plant identification, reforestation, composting, recycling, and alternative land uses ("Ivoloina CEE annual activity report," 2007).

2) Bitsik'Ivoloina newsletter

The Bitsik'Ivoloina is a newsletter that contains texts, poems, and games that have an environmental theme and outlines the environmental issues, how to community members can contribute, and the various programs the MFG has started (Randriambelona 2004; A. Bollen, personal communication, September 5, 2011). The newsletter is disseminated to farmers living alongside Ivoloina Park, villagers around Betampona Reserve, schools within the vicinity of

these protected areas, mass media in Tamatave, and authorities in Tamatave and around the protected areas (“Ivoloina CEE annual activity report,” 2007). The report also states that the goal of the newsletter is to reinforce the conservation activities of those who are trained by the MFG, as well as ensure that the general populous is aware of current MFG projects. The most recent edition of the newsletter was disseminated to nearly 3,000 community members, schools, youth groups, partners, alliances and libraries (A. Bollen, personal communication, September 5, 2011).

3) Environment Club

The Environment Club, ACE, is a non-political association that is open to anyone who has an interest in conversation and the environment (“Ivoloina CEE annual activity report,” 2007). The report continues by outlining that the members of ACE are given the responsibility of managing the association, planning the activities, and implementing the activities. Furthermore, it was outlined that the association assists in implementing any activities that relate to the environment, and focuses on implementing activities that are run by the MFG, such as field practices and awareness raising activities.

4) Farmers Training

The MFG targets farmers living alongside Ivoloina Park and in Tamatave in order to improve the traditional practices of farmers and promote more environmentally sustainable agricultural practices (“Ivoloina CEE annual activity report,” 2007). The report also states that theoretical and practical lessons include crop rotation, pesticide use, composting, mulching, and cassava. Recently, MFG introduced a new approach of selecting “model farmers” who are committed and motivated to adopting new methods of farming (Bollen 2011). Bollen added that this new approach also introduces a monthly follow-up to ensure that farmers are practicing the techniques outlined in the training sessions

5) Saturday School

The main objective of the Saturday School is to ensure that primary-school children from Tamatave (Area I and II), Sahambala, Ivoloina, and Ambodiriana pass the state Certificate of Primary Studies (CEPE) exam. All primary-level children must pass this exam in order to move

on to secondary-level studies. In addition to French and mathematics, students are taught basic environmental education through subjects such as elements of the ecosystem, deforestation, and consequences of negative environmental change (“Ivoloina CEE annual activity report,” 2007). Students are also given the opportunity to participate in practical, hands-on activities such as rice harvesting, composting, reforestation techniques, and native tree planting (Bollen 2010). The program also stated that the Saturday School sessions align with the academic school year, and serve as a supplement to the primary-level education each student receives.

6) Chef ZAP Trainings

The Chef ZAPs are the school district heads who are responsible under the ministry of national education and operate at the commune level (A. Bollen, personal communication, September 5, 2011). The Chef Zap trainings involve the training of local leaders in the necessary scientific and technical knowledge on environmental education so that they can act within their administration and create an environmental plan (Bollen, 2008). According to the Madagascar Fauna group funding reports, the objectives for the 2010 Chef ZAP trainings are to ensure that the Chef ZAPS are qualified to 1) understand the ecological elements and important processes in the environment, 2) blend environmental education into the current school curriculum using the *Teacher’s Guide to Environmental Education*, 3) produce comprehensive and supporting technical documents for use in teaching, 4) transfer the expertise acquired in the training session to their teachers (“cascade strategy”), 5) provide the follow-up of environmental education in their respective school zones, and 6) increasing capacity of Saturday School teachers to improve environmental lessons (Bollen,2010).

A component within the Chef ZAP trainings is the training of Saturday School teachers. The purpose of including these teachers is to ensure that the teachers responsible for running the Saturday Schools are well-versed in the entire Saturday School curriculum as well as any new pedagogic tools that may assist them in carrying out the lessons (Bollen, 2009). These teacher trainings are the most infrequent program run by the MFG, and usually take place every 3 to 4 years (I. Porton, personal communication, November 18, 2011).

The format of the trainings consists of 6 days of seminars, visual material (*Teacher’s Guide to Environmental Education*), brainstorming sessions, and visits to Parc Ivoloina to visit the Model Station of agro-forestry plots, Ivoloina Environmental Education Center, the zoo and

the botanical gardens (Bollen, 2010). The MFG created *Guide Pratique du Maitre* is a key pedagogical tool that is referenced throughout the trainings. This curriculum is used as a method of ensuring that Chef ZAPs integrate environmental education in the official curriculum (Bollen, 2011). The trainings begin with a visit to Ivoloina Park and continue with 4 days of courses on the types, causes, consequences and preventions of environmental problems in Madagascar, and concluded with discussion and debate on environmental protection and a final evaluation of the trainings by the participants (“Ivoloina CEE” 2007).

The Saturday School and the Chef ZAP trainings both have the common and ultimate goal of ensuring that primary-school children are provided with an adequate foundation in the environmental sciences in order to both improve their examination results and pass along environmental knowledge to their peers and community members (Bollen, 2008). Throughout Madagascar, the standard of education is low, and both the Saturday School and the CHEF ZAP programs aim to address the gap in education (K. Freeman, personal communication, October 31, 2011). Despite their similarities in outcome, both the Saturday School and Chef ZAP trainings employ different approaches for achieving improved test scores, with the Saturday School focusing on direct interaction with children and the Chef ZAP trainings focusing on the “cascade strategy.”

Strategies and Methodologies

As was identified in the interviews, two essential components of the EE program are capacity building and the cascade methodology. The EE program strives to build capacity in the local EE program manager, as well as the Chef ZAPs, through training, mentoring, and taking a participatory approach to EE planning and implementation (A. Bollen, personal communication, September 5, 2011). In this way, the Chef ZAPs develop ownership over the EE program, as they are involved in choosing which areas of EE their communities need the most, and then training others.

Capacity is further built through the cascade training method. Under this method, staff from the MFG’s EE program train the Chef ZAPs, who subsequently train the principals of schools in their district, and then the principals train the teachers in their school (A. Bollen, personal communication, September 5, 2011). This method was put into practice once MFG staff realized that training the teachers directly was ineffective due to high teacher turnover. Chef

ZAPs have a much lower turnover rate—they tend to stay in the same position until they retire—and this was the rationale behind the use of the cascade methodology (K. Freeman, personal communication, October, 31, 2011). The downside is that the EE program is dependent upon the competence and motivation of the Chef ZAPs and the school principals in training the teachers and fostering commitment and motivation in them for EE. As Bollen articulated, there are known issues with Chef ZAPs who do not fulfill the responsibilities of their job, nevermind following through with EE trainings.

Capacity building is highly dependent on the effectiveness of the cascade method. Though not perfect, the cascade method is the best option in this context. From the literature, it was found that the cascade method might also be known as the superordinate method. While engaging the Chef ZAPs in a participatory manner corresponds to recommendations made in the literature, other recommendations include also incorporating principals, teachers, and community members in the training program design. Such incorporation ensures that all of the stakeholders' needs are met and that the broader community has an opportunity to take ownership of the EE program (Wilke, Peyton, & Hungerford, 1987).

Curriculum Evaluation

The Guide *Pratique du Maitre* (the Teacher's Guide to Environmental Education in Madagascar) was evaluated to determine its usefulness as a material to help teachers both learn about the environment, and how to incorporate it into lessons. The Guide was written by two local Malagasies: the EE Manager for the MFG's programs in Madagascar and a Chef ZAP. An American Peace Corps volunteer, staff from the DLC, and other Malagasies also contributed to the creation of the Guide. The Guide begins with definitions and brief descriptions of key ecological concepts, then explains the overall objectives for use of the Guide, and competencies students should acquire for subjects in both ecology and environmental protection. There is then a short section discussing how EE should be integrated into the curriculum. It asserts that EE is not a specific discipline, and that it is meant to be mainstreamed into the overall curriculum. EE can be incorporated into existing subjects in the national curriculum, but the focus should be on how people affect the environment. Following this, lesson plans are provided for 12 themes in both French and Malagasy. The Guide was evaluated according to a framework made up of five main components: 1) conformity to objectives; 2) compliance with standards; 3) scope and

sequence; 4) appropriateness for learners; and 5) appeal. The results of the evaluation for each component will be described in more detail below.

1) Conformity to Objectives

This first step involved identifying the MFG's objectives for its environmental education (EE) programs. The objectives were explicitly stated in the MFG's annual reports to one of its principal funders—the Planet Foundation. From the 2008 annual report, the MFG states that its objective is to “give to the local leaders the necessary scientific and technical knowledge on EE so that they can act within their administration zone,” (Bollen, 2008). The 2009 report provides a similar objective: “[to] give to the local leaders the necessary tools on teaching EE so that they can improve teaching in their administration zone,” (Bollen, 2009). Lastly, the 2010 report adds another objective: “[to] increase the capacity of Saturday School teachers to improve [the] quality of their ‘environmental’ lessons,” (Bollen, 2010).

In addition to the MFG's EE program objectives, the Guide articulates objectives for its use and the intended impacts on the students. Paraphrasing from the English translation, the Guide states that its primary objectives are to make children aware of nature, the relationships of people to their environment, and the responsibility that people have for human actions that cause changes in the environment. In order to do this, the Guide aims to provide knowledge in two key areas: ecology and the environment. By ecology, it is meant that students will be taught ecosystem science, and how all organisms are interdependent, including humans. Environmental knowledge encompasses the effects of human actions, such as pollution and degradation of the environment. Students will be taught how to identify human-generated environmental degradation, ways to mitigate this degradation, and the value of environmental protection.

Upon examination of the individual lesson plans, it appears that they meet the above objectives. Each lesson plan states a general objective, as well as several specific objectives for the lesson. Many of them also include problem identification and solving components, participatory activities, and discussion of the role that humans play in causing environmental problems and the importance of environmental protection. The suggested activities and methods of evaluation seem to correspond to the lessons' objectives.

2) Compliance with Standards

The second step of ascertaining compliance was difficult to do given a lack of information on national standards. What was clear was that Malagasies with experience teaching the national curriculum created the Guide, and they explicitly stated that the Guide is meant as a tool to help teachers integrate EE into existing curriculum subjects, such as geography, science, history, and civic and moral education. The Guide provides the page numbers in the textbooks for each subject that are relevant for each lesson plan, and summarizes this information for each grade level and subject in a table at the beginning of the Guide. Such thorough integration of EE into the existing national curriculum is considered good practice in the EE literature (Ormsby, 2007), so it would appear that the Guide is in compliance with standard EE practice. Also of note, is that the Guide was approved by the Madagascar Ministry of Education, so it has legitimate authorization to be used (C. Welch, personal communication, November 11, 2011).

3) Scope and Sequence

In this step the scope and sequence of the EE topics presented in the Guide are evaluated.

The following table provides information on the specific topics covered in the Guide

Table 3: Summary of Curriculum Topics

Ecological Concepts	Environmental Protection Concepts	Lesson Plan Themes
<ul style="list-style-type: none"> • Diversity of places • Ecosystems • Habitat • Ecosystem ecology • Synecology • Autoecology • Autotrophes • Heterotrophes • The abiotic level (chemistry) • Producers • Primary, secondary, tertiary, and scavenger consumers • Decomposers • Populations • The relationship between/within species • Food chains and the transfer of energy • Photosynthesis • The water cycle • Environmental equilibrium and disequilibrium 	<ul style="list-style-type: none"> • Preservation of natural resources • Preservation of species diversity • Management plans for ecosystems • Adaptation of agro-pastoral activities to soil and water resources • Freshwater management • Environment and health: fighting against rapid development, mosquitos and parasites • Disposal of wastewater • Disposal and treatment of waste (in general and household) • Capture and purification of rain water 	<ul style="list-style-type: none"> • Usefulness of plants • Different parts of the plant and their functions, the role of leaves • The climate of Madagascar • Population and the environment • Forests of Madagascar • Degradation of the environment • Weather • Weather and seasons • One plant: the tree • Air • Water • Flow of water and the lakes of Madagascar

It was found that there is a clear sequence and progression from basic ecological concepts to more complex concepts. The scope covers everything from basic science, to human impacts on the environment, to environmental management. The lesson plans incorporate all of the concepts and become progressively more complicated and specific once the population, air, and

water themes are introduced. While the scope and sequence seems appropriate, it is unclear how the more complicated lessons can be adapted for younger learners, or if the complex lessons are meant for secondary school students only.

4) Appropriateness for Learners

All of the material in the Guide is appropriate for the Chef ZAPs and the teacher learners, but the more complex lessons may need to be simplified for the primary school students. An example of one of the materials in the Guide that is better suited to a secondary school student is the diagram depicting the greenhouse gas effect. Such a diagram would need to be simplified if taught to a primary school student.

There are also a number of activities and experiments outlined in the Guide. Some of these are appropriate for primary school students, while others are better for secondary school students. Examples of activities include constructing a water filter using different sediments, and tying a plastic bag over a plant to witness transpiration. Both of these activities are standard in North American primary school science curriculums.

It appears that the material and the lessons are appropriate for the learners, with the caveat that teachers adapt them for their class' skill level.

5) Appeal

Although many of the experiments and activities are standard practice in North American primary school science classes, much of the material has a local focus. This is particularly the case for the environmental protection concepts and lesson plan themes. Themes focus on plants and animals endemic to Madagascar, issues with development and deforestation, the negative impacts of overpopulation, and specific pollution and health problems arising from environmental degradation.

The experiments and activities themselves are interesting and help the children to learn by doing, which is another key tenet of EE good practice in the literature.

On the whole the Guide satisfies the evaluation framework's five main components. Primary concerns lie with the Guide's appropriateness for learners and appeal. Trainers must ensure that teachers have the ability to adapt the lesson plans to different grade levels, particularly the more complex lessons. In fact, concerns were raised by the Chef ZAPs who filled

out the MFG's Chef ZAP training survey (discussed in greater detail in the next section) that the teachers would not have the skills or motivation to incorporate the lesson plans into existing subjects. Additionally, the Chef ZAPs suggested that more materials and guidance could be provided to help them train the teachers.

More activities and field trips could also be included to encourage greater class participation and learning by doing. It is widely accepted best practice in the literature to encourage discussion, participation, critical thinking, and action-oriented learning (Tilbury, 1995). The tenets of education for sustainable development (ESD) could be better applied by the MFG, where ESD is "education *about/in/for* the environment," (Tilbury, 1995). The MFG already succeeds in providing education *about* the environment, and even attempts to provide education *for* the environment by introducing environmental management and responsibility to the students. But, in order to solidify students' feelings of connectedness to nature and a duty to protect the environment, education *in* the environment must be provided through field trips or service learning.

Monitoring and Evaluation

Evaluation is an integral step in the project management cycle; without evaluation it is impossible to know what impact programs are having on beneficiaries. Monitoring and evaluation (M&E) is used to monitor how activities are being implemented, and then evaluation is conducted to determine if there has been a change in behavior, understanding, awareness, skill level, or some other type of impact. Program evaluation may be defined as "the systematic collection of information about the activities, characteristics, and outcomes of programs to make judgments about the program, improve the program effectiveness and/or inform decisions about future programming," (Carleton-Hug & Hug, 2010). When applied to EE programs, utilization-focused program evaluation is more appropriate and is "done for and with specific intended primary users for specific, intended uses," (Carleton-Hug & Hug, 2010). This means that not only should the MFG ensure consistent M&E of its EE programs, but also that it should include Malagasies, such as Chef ZAPs and teachers, in the evaluation process.

M&E may also be conducted according to a summative or formative framework. Summative evaluations are the most common and are typically the type of evaluation favored by donors. Summative evaluations are similar to results based monitoring in that they provide

quantitative numbers on the outcome of the program. Such numbers may include test scores or pass rates. Formative evaluations are less common as they evaluate the effectiveness of the teaching itself. For this type of evaluation, more qualitative data and repeated evaluations are required (Carleton-Hug & Hug, 2010). The MFG performs some basic summative evaluations for the purposes of donor reports, but no formative evaluation methods are used (Bollen, 2011). Given that the MFG would like to know how effective its teacher-training program is, a formative evaluation would be more useful than a summative evaluation.

As the current situation stands, there is no formalized process for M&E. It is the program manager's responsibility to check in with the Saturday schools at least twice a year, and the Chef ZAPs report back to the program manager on how the cascade trainings were implemented. The program manager writes reports with basic indicators for the EE program three times per year. Indicators may include metrics on the number of Chef ZAPs and teachers who attended the trainings (A. Bollen, personal communication, September 5, 2011). Chef ZAPs will sometimes test or observe the teachers to evaluate how well they are teaching the material (C. Welch, personal communication, November 11, 2011), however the Chef ZAPs are very busy and it is hard for them to travel to all of the schools in their district to do this type of in person evaluation (K. Freeman, personal communication, October, 31, 2011). It is easier to evaluate the Saturday schools, as better information is kept on how many students are in the class and how many pass the EE exams (I. Porton, personal communication, November 18, 2011).

All of the interviewees lamented the absence of an integrated M&E process, capable of performing long-term evaluation studies. In order to change the status quo, a formalized M&E framework that includes locals in its development and implementation, and uses summative and formative techniques, needs to be created. Barriers must also be addressed, and include: a lack of value placed on evaluation; staff, time, and funding constraints; the organizational culture; transportation difficulties; and uncertainty around how to measure the impact of the cascade strategy and long-term behavior change in students.

Sample Responses from MFG Survey of Chef ZAP Trainings

One tool that is used consistently for evaluation is a post-training survey. The MFG distributes surveys at the end of training sessions to all of the participants. The survey is designed to evaluate the participants' overall satisfaction with the organization, implementation,

and content of the training sessions. The EE program manager then collects these surveys. Unfortunately, due to the high rate of turnover in EE program managers, these surveys become misplaced or neglected, and it is unclear how effectively they are used (K. Freeman, personal communication, October, 31, 2011).

Though we were unable to obtain a full set of completed surveys, a sample of five MFG surveys was mailed back to us along with the completed surveys that we had designed. The MFG survey begins with seven Likert scale questions and responses that may include bad, medium, good, and very good. The following table summarizes the responses.

Table 4: Summary of Likert Scale Survey Responses

General Organization	Relations Between Trainers and Participants	Methods Used for the Trainings	Materials Used During the Trainings	Participation of the Attendees	Relation of Training Content to Your Work	Logistics
Good	Very Good	Good	Good	Medium	Medium	Good
Medium	Very Good	Good	Good	Good	Very Good	Good
Bad	Very Good	Good	Very Good	Good	Very Good	Good
Very Good	Very Good	Very Good	Very Good	Good	Very Good	Good
Good	Very Good	Good	Medium	Good	Good	Medium

Scores were the lowest for the general organization of the trainings, and highest for the relations between the trainers and the participants. A question on the methods used in the trainings received all good or very good responses. The same went for materials used in the trainings, except for one participant who answered with medium. The participation of the attendees and logistics questions received scores of all good, except for one medium, and the final question on the relation of the training's content to the participant's work received scores of very good and good, except for one medium. From these results it appears that the organization of the training sessions, logistics, and class participation could be improved.

The second half of the survey is composed of six written response questions. The following table summarizes the responses translated from French to English.

Table 5: Summary of Survey Written Responses

What were your expectations at the beginning of the trainings?	Is it that this training met your expectations?	What are the different modules that you feel necessitate more depth?	When you return to work, what are you going to do to apply the training you received here?	In the future, what modules would you like to discuss to reinforce your environmental skills?	Give your suggestions for improving future training sessions.
To know the importance of the environment in daily life. To be capable of transmitting the knowledge acquired during the trainings to students.	Yes.	Environmental issues, environment and the curriculum.	First of all I will tell my family about all of the acquired knowledge.	Environmental problems.	Show films. Go on a field trip to a nature preserve.
To have a lot of knowledge on EE. To know how to effectively apply the acquired knowledge.	Yes.	Functioning of the ecosystem.	Train principals and teachers.	How to convince the teachers to follow the directions given by the trainers.	That the next training be located in a place where one practices environmental education.
To improve knowledge on ecology and environmental problems.	Yes.	Functioning of the ecosystem; the student and the environment.	I will tell anybody that has a need.	Environmental problems.	The environmental education training should be every year.
Learn environmental concepts. Environmental protection.	Yes.	Ecological factors. Educational projects.	Give information and environmental education.	Environmental problems.	Use of materials like an overhead projector, flip stand, or computer.
To be persuaded and capable of protecting the environment.	Yes.	Ecosystem. Animal kingdom.	(Could not understand response)	Animal kingdom. Make teaching materials.	Make teaching materials.

The common themes that emerge from these responses are a desire to: 1) learn more about the functioning of ecosystems and environmental problems; 2) be given more teaching materials and training on curriculum development; and 3) have trainings be conducted in the field. From some of the responses it seems that the Chef ZAPs may have difficulty creating teaching materials, developing lesson plans, and convincing the principals and teachers to teach EE. These are all crucial implementation issues, and should be highlighted in future training sessions. The participants also suggested that some of the trainings take place in a nature preserve and that other materials be used during the trainings. Given these recommendations, it is possible that the trainings could be improved through using different media, including more activities, encouraging greater participation, and having attendees learn by doing in the field.

When asked about the application of the trainings, all but one respondent expressed the intention of telling others. Notably, one respondent said they would tell their family. This shows that the trainings may have an impact beyond the passing of knowledge from the Chef ZAPs to the principals and teachers. If the Chef ZAPs tell their families what they have learned, they are helping to spread awareness about environmental problems in their greater community.

Overall satisfaction with the MFG led Chef ZAP trainings is quite high. However, as discussed, improvements could be made to the organization, implementation, and content of the trainings. Specifically, more materials and activities could be used to liven up the trainings, participation could be facilitated better, field trips could be included, and more emphasis should be placed on providing the Chef ZAPs with the necessary tools and skills to train the teachers.

Local Context

The Madagascar Fauna Group has aimed to be instrumental in the community in which they work by paying careful consideration to the needs and support of those who live in the surrounding areas. They have made a conscious effort to act upon the requests of parents and teachers, and in doing so generate local buy-in and support for their programs (I.Porton, personal communication, November 18, 2011). In turn, this effort has made their endeavors sustainable over the long run within the community. One of their biggest hopes was to build capacity among the teachers and Chefs ZAPs such that they, as foreigners, would no longer be needed to play an instrumental role in the teacher training programs.

Observed Need

The Madagascar Fauna group developed their environmental education program in response to the expressed need for improved access to education by parents in the region. Combined with the MFG's desire for improved conservation outcomes and environmental awareness among community members, the Saturday school program was born. It became the flagship of their education pillar. The MFG began the Saturday school component when parents in the community asked for education supplements. Students in the area were having a difficult time passing the CEPE exam (for admittance into secondary school) and needed more attention in basic curriculum (I. Porton, personal communication, November 18, 2011). The Saturday schools were born out of a genuine need that parents had expressed given the state of local access to education.

Buy-in and support

Teachers garner great respect in the rural communities in which they work, and as a whole the Malagasy people very much value education (C. Welch, personal communication, November 11, 2011). Knowing the importance of community buy-in for the success of their current and future programs, the MFG has worked hard to generate programs that they feel are not only necessary to further conservation in Madagascar, but are also requested by their local stakeholders. Although they cannot accommodate all the stated demand given staff and funding restrictions, it is clear that the MFG has aimed to include the community in the operations of their facility and the programs that they run at Ivoloina. Parents are active in their desire for their children to attend the Saturday School and other programs the MFG hosts. Community support for the MFG's programs has created a positive enabling local environment for the environmental education programs.

Capacity Building

Capacity building is one of the four pillars that structure the mission and goals of the MFG. The teacher training programs have been an effort to increase capacity within the community school system. The cascade strategy is a way for the MFG-hired trainers to teach upper level education administration, who then pass the knowledge along to their direct inferiors, who present the information to students. This system aims to increase the capacity of those at the

highest level of local education, so they can become better instructors. Although the Madagascar Fauna Group has worked hard in their efforts to increase capacity among the Chefs ZAPs and their staff, it seems as though they have not made as much progress as anticipated. When Charlie Welch and Andrea Katz, the founders of the teacher train program, returned to the United States they hoped that those remaining in the field at the MFG facility would be able to carry on the trainings. “When Andrea and Charlie left, and they’d done a lot of capacity building, but it was really shocking as to how much the staff still depended on the program manager” (I.Porton, personal communication, November 18, 2011). Capacity building, both internally and externally is one of the largest issues that the MFG is trying to tackle.

The MFG has worked to produce a holistic program that touches on all aspects of conservation. The four pillars of their mission, as discussed previously, guide this approach on the ground. By reaching out to educators, students, and researchers they hope to provide a facility that engages the community and instills passion in those they work with. Porton described the holistic program:

“We want to develop Ivoloina into the center for conservation information and education in Tamatave. So we offer now training, we have a training center. We have of course the agro-forestry research and demonstration center, and we are developing a plan for the rest of the station looking at restoration, reforestation, that will involve research and capacity building--with having students be part of the learning, research, and monitoring the results of different management plans. So it covers capacity building, education, research, and conservation action.” (I. Porton, personal communication, November 18, 2011)

Working along the four pillars they prioritize their projects and try to combine aspects of their work to best meet the needs and demands of the surrounding community. By sponsoring a Ph.D. student with his research at their facility, they have built capacity, and furthering their environmental research. The recommendations that come out of his project are hoped to become tools for conservation action in the future (I.Porton, personal communication, November 18, 2011). The most important aspect of the holistic program, and the four pillars, is that it is built on a foundation of community support.

The enabling environment is a key aspect of success to the big picture program objectives. Without local support and community buy-in, the MFG would never be able to generate the kind of capacity they hope to see in the Chef ZAPs they train. Their holistic approach to conservation engages much more than just educators; they involve students, parents, and members of government in their activities and programming. Without the trust and respect of the local population none of the MFG's stated goals would be achievable. Unfortunately, despite high local demand, the larger enabling environment for conservation and education has been downgraded due to the unstable political environment that has persisted in Madagascar since 2009.

Current State of Affairs

As mentioned previously, Madagascar experienced a military coup in 2009. With the transition in government, many government services and offices were no longer running. Many teachers were not consistently being paid, national parks were understaffed, and commitments to the environment were forgotten. Every individual we spoke with mentioned the challenges presented by the political situation in Madagascar. Unfortunately, we were only able to speak with the international component of the MFG's training program, and so cannot offer the perspective of the Malagasy on this area. Regardless, the unstable political climate has become a factor in many aspects of the MFG's work.

Madagascar is a biodiversity hotspot with over 88 percent of its flora and fauna endemic to the island (Conservation International, n.d.). As an island nation with such precious resources, its environmental plight is a worldwide concern. Massive deforestation as a result of slash-and-burn agriculture has given Madagascar the nickname "The bleeding island" as erosion tugs at the red soil. The island retains less than 1/5th of its original forest cover (Nesbit, 1991). With government regulations and enforcement at an extreme low, concern regarding environmental protection has increased. Illegal poaching of precious hardwoods increased dramatically in 2009, which resulted forest degradation of some of the most biologically important and pristine forests left in Madagascar (Madagascar Fauna Group, n.d.).

The MFG's role in the community where they work was founded out a demand for better basic education. High rates of failure and repetition of grades was common due to a lack of basic science and math skills. The recurrent themes that arose regarding the current state of education

in Madagascar were very much tied up in the role of the recent political turmoil. An Bollen mentioned that there has been concern over the current government's attempt to maintain or improve rates of student success have resulted in lowered standards allowing children to pass since 2009 (personal communication, September 5, 2012). This system is detrimental for those students who aim to take the exam to continue to secondary school but are ill prepared with the necessary skills.

Concern over Madagascar's environmental situation, particularly in light of their political troubles, was another theme that was widely apparent from our interviews. Heightened illegal logging in one of Madagascar's richest remaining forested areas was one factor in the decision for the DLC to expand to the specific location that they chose.

Partnerships & Monitoring

MFG's has two types of formal partners that assist with program support: external, administrative partners and on-the-ground partners. External and administrative partnerships involved out-of-country government agencies and many of the MFG's international consortium of zoos, botanical gardens and environmental institutions. These external agencies support MFG activities by providing the necessary funding and administrative decisions to implement the environmental activities. In addition to external partnerships, MFG holds relationships with local, on-the-ground collaborators that assist with the actual implementation and informal monitoring of the environmental programs.

Most recently, MFG has entered a partnership with The United Nations Children's Fund (UNICEF) in order to strengthen their environmental education efforts by addressing the lack of environmental education at the national level. UNICEF has begun to conduct workshops with government officials that highlight the absence of environmental education and has attempted to develop tools that assist in the integration of environmental education in the national curriculum (A. Bollen, personal communication, September 5, 2011). The inclusion of UNICEF will also play an important role in streamlining the various pedagogical tools and providing additional structure to the current programs (A. Bollen, personal communication, September 5, 2011). UNICEF has also expressed interest utilizing MFG's lessons learned to expand the Saturday School program throughout Madagascar (A. Bollen, personal communication, September 5, 2011).

It also became evident that a key component to maintaining the solid partnerships is the newsletter. The newsletter has served as invaluable tool for communicating the programmatic successes within the MFG and keeps partners aware of the progress of MFG activities. It also serves as an additional form of monitoring by allowing MFG to request information, such as updates, from program participants (A. Bollen, personal communication, September 5, 2011).

1) Partnership with Chef ZAPs

Our conversations with the MFG staff suggest that the most important partnerships for maintaining the success and longevity of the environmental education program are the on-the-ground partnership with the Chef ZAPs at the Circonscription Scolaire (CISCO) level. The Chef ZAPs serve as the voice between the schools and the MFG, and play an integral role by informing and mobilizing schools of upcoming activities and following up with schools (A. Bollen, personal communication, September 5, 2011). The Chef ZAP's role is also important because they are the only form of monitoring program success that currently exists. By acting as the intermediary between the MFG offices and the field team, Chef ZAPs can help ensure that schools are implementing environmental education techniques through school visits (A. Bollen, personal communication, September 5, 2011). The Chef ZAPs also report to the CISCO once and month, and this helps MFG in determining which schools should continue to be targeted for environmental education (A. Bollen, personal communication, September 5, 2011). Of particular importance is the partnership formed between the MFG and André, Gimode and Modeste (title and last name), who serve as strong and longstanding collaborators between the MFG and the school district. The trio acts as a secondary monitoring mechanism by checking up with schools, occasionally testing teachers, and coordinating many aspects of the trainings (A. Bollen, personal communication, September 5, 2011).

Relationships with local Chef ZAPs are frequently discussed in interviews and are critical to the success (perceived or otherwise) of the environmental education program. The Chef ZAPs are the point of most frequent contact between MFG and the local schools. Both the outgoing and previous MFG program managers discussed relationships with the Chef ZAPs in the context of how the environmental education program works. Some overlap among Chef ZAPs appears to be taking place: the same Chef ZAPs that are actively involved in starting up Saturday Schools in their districts also become more actively involved in trainings. Bollen discussed how the Chef

ZAPs nearest Ivoloina and Betampona are “continuous partners of MFG” (personal communication, September 5, 2011). Karen Freeman also stated that “we [the MFG] have a very good relationship with them [Chef ZAPs]” (K. Freeman, personal communication, October 31, 2011).

The commitment and motivation of Chef ZAPs also emerged as an essential theme. One interviewee described the Chef ZAP’s collective enthusiasm as a “fan club” (A. Bollen, personal communication, September 5, 2011). One year, when funding was short and MFG staff suggested that trainings be cancelled that year, the Chef ZAPs responded with “absolute uproar” (K. Freeman, personal communication, October 31, 2011). A “very strong interest” exists among most Chef ZAPs with whom the MFG is involved, and that these Chef ZAPs frequent the trainings (A. Bollen, personal communication, September 5, 2011).

Although Chef ZAPs are busy individuals and often overburdened with work to do--one particularly involved Chef ZAP is a mayor and a teacher as well!--few Chef ZAPs miss the trainings (K. Freeman, personal communication, October 31, 2011). In fact, they have requested up to 4 trainings per year (A. Bollen, personal communication, September 5, 2011). Survey results support the Chef ZAPs’ commitment: 23 of the 54 respondents (roughly 43%) mentioned continuing or increasing the frequency, duration or type of trainings as suggestions for improvement. Evidence clearly suggests that the trainings have cultivated a strong demand for training environmental education among the Chef ZAPs.

Worth noting is that Chef ZAPs are compensated with a per diem by MFG for their time at the trainings. The per diems are seen as a necessary expense to ensure that Chef ZAPs attend the trainings for the simple reason that if they are not paid, then teachers and Chef ZAPs would not attend (C. Welch, personal communication, November 11, 2011). In fact, the payment of per diems has been informally recommended as a way to compensate training attendees for their time.

The Chef ZAPs’ enthusiasm for the trainings was also identified as a potential factor for success. Implementing the cascade training depends on the interest in the community, but also the “motivation and dynamism of the Chef ZAPs trainer” who is carrying out the training at the school (A. Bollen, personal communication, September 5, 2011). Thus, the reach of the trainings depends upon the individual commitment of a given Chef ZAP. Fortunately, the mean satisfaction rate with the trainings was high (75%) according to surveys, and numerous anecdotes

from our interviewees indicate that many--if not most--Chef ZAPs are enthusiastic about the trainings.

The relationship with a reliable, motivated, and enthusiastic Chef ZAPs can serve as the linchpin for success. In addition to serving as the link between schools and the MFG, Chef ZAPs also serve as a critical link between MFG and the local community. More than one interviewee discussed the importance of having highly dedicated Chef ZAPs. The former program manager, Karen Freeman, described the impact of two such Chef Zaps on the MFG's environmental education program:

We're incredibly lucky that two Chef ZAPs... have been really fantastic and have made the education program work, and also really helped with our communication with other Chef ZAPs. You really need those key people to help bring it together. It's all about relationship-building. (personal communication, October 31, 2011)

Charlie Welch echoed the importance of deeply involved and dedicated Chef ZAPs to the training program, stating that the key was "a good, enthusiastic link [with the local school system], with somebody easy to work with and really cared" (personal communication, November 11, 2011).

2) Partnerships with Community

Most of the interviewees discussed the importance of relationships, and it featured particularly prominently when speaking with individuals who had spent a good deal of time working in Madagascar. More than just a good relationship with the Chef ZAPs, the MFG has sought to develop positive relations with the broader community through their environmental education program. These relationships are also seen as critical for the success and effectiveness of the environmental education program.

Building trust within the local community is identified as an important element to include in a new project, particularly in conservation activities (C. Welch, personal communication, November 11, 2011). Rather than telling the community what they cannot or should not do--which in Madagascar could be seen as insulting their ancestors and a cultural *faux pas*--MFG has

sought to make the local community an active stakeholder in the programs (K. Freeman, personal communication, October 31, 2011).

The MFG has used the whole of its environmental education program to build a good relationship with the community, and working with the teachers in particular is a strategic focus of efforts. Teachers and Chef ZAPs are trusted figures in Malagasy culture and are well-situated to disseminate information--should they choose to--both within schools and within the community (C. Welch, personal communication, November 11, 2011). Simply by being offered, the environmental education program as a whole, and the trainings in particular, help to build good will among the community. Very little training is available to teachers--or, indeed, most jobs (K. Freeman, personal communication, October 31, 2011). As a result, even if the cascade trainings do not have the intended effect, engaging local leaders is essential to MFG's public relations. The positive relationship with the community is both a strategic tool to build good will as well as supportive of MFG's overall conservation goals.

Part of MFG's success is attributed to the fact that they have been working at Parc Ivoloina for nearly 20 years; during that time, they have forged long-term relationships and focused on the areas and people they know well (K. Freeman, personal communication, October 31, 2011).

In one instance, a Saturday School program was moved from a village to a larger city where MFG would be able to reach more villagers and have more direct access to the mayor. Unfortunately, even though the logistical reasons for the move were sound, the program has struggled at the new location. Two reasons were identified: 1) the MFG was not as involved in the city where the Saturday School moved, and therefore had fewer relationships and less knowledge of local politics, and 2) no demand existed for the trainings among the teachers (K. Freeman, personal communication, October 31, 2011).

This anecdote illustrates that developing local, on-the-ground relationships and cultivating demand for programs goes hand in hand. MFG's strategy for generating this demand is to develop strong, long-term relationships with the locals and leaders; Karen Freeman succinctly summarizes: "the key is just to keep building on these local relationships" (K. Freeman, personal communication, October 31, 2011). As the DLC moves forward with its programs in the SAVA region, they should be aware of the importance of local relationships in enhancing the effectiveness of the program.

Perceptions of Effectiveness

The MFG hopes the good will they build with the community, and particularly with Chef ZAPs and teachers, will help the program become more effective. Ultimately, by instilling a value for conservation, the environmental education program seeks to change behaviors. Measuring the effectiveness of this strategy--or of any environmental education program--is very difficult. Given the time, distance, and language constraints on this project, information on *perceptions* of effectiveness was gleaned from our interviewees and material culture.

A debate exists among scholars of environmental education about whether the objective is to change behavior or merely inform and educate (Disinger, 1997). MFG's environmental education program is of the former school because they ultimately seek to change behaviors as a part of their broader conservation mission. However, creating and measuring behavior change from environmental education is difficult at best and the most effective method is also the subject of an ongoing debate.

Effectiveness is ultimately a measure of success. One of the research questions we sought to answer was how to define success for the MFG's environmental education program. For the purposes of this study, effectiveness is defined as the extent to which the program meets its stated goals or objectives (if they have been clearly delineated), but also if they have increased awareness of and enthusiasm about environmental issues. We will discuss the successes and challenges of each of these programs as measures of their effectiveness as well.

The discussion of effectiveness will be split into two parts: MFG's other environmental education programs and the Chef ZAP trainings. The efficacy of the Saturday Schools and MFG's other EE programs was not the primary focus of our evaluation. However, the Chef ZAP trainings are just one component of the environmental education, all of which contribute to the overall goal of biodiversity conservation. Since data for these programs were available and accessible, we feel this information provides a proxy for understanding the effectiveness of the environmental education program as a whole.

MFG sees their EE program as a "multilayered approach," working with primary schoolchildren in the Saturday Schools, secondary schoolchildren through CAMP, informal programs such as Bitsik and World Environment Day, and training farmers, mayors, teachers and Chef ZAPs (A. Bollen, personal communication, September 5, 2011). Bollen also touted MFG's multifaceted approach as "the recipe for success" (personal communication, September 5, 2011)

1) Spreading awareness

All of MFG's environmental education programs contribute to raising awareness about current environmental issues in Madagascar. Spreading awareness of environmental issues appears to be how many of the programs have been most effective. Many of the successes discussed during interviews were anecdotal. For example, one interviewee described "a gut feeling" that the programs are having the intended impact, and that he noticed that more people seemed to be more educated about environmental issues (C. Welch, personal communication, November 11, 2011). Another interviewee discussed the increase in illegal logging after the 2009 political crisis, and how the worst was expected at Betampona Reserve. Happily, however, the increase in the practice was not as widespread as expected or in other areas--a phenomenon that was attributed in part to the environmental education program and the long-term presence of the MFG (K. Freeman, personal communication, October 31, 2011).

2) Saturday School

A debate exists among MFG staff as to whether Saturday School should even be called "environmental education" or just education because conservation is not a focus of the Saturday Schools (A. Bollen, personal communication, September 5, 2011). This distinction has implications for efficacy of the program. Statistical and anecdotal evidence support the assertion that Saturday Schools are successful at increasing the level of education of students. However, whether the program instills an environmental ethic or changes behavior is less well supported.

The Saturday School program is clearly highly popular, which does not necessarily speak to its effectiveness. MFG get frequent requests to set up programs at additional locations of Saturday Schools and entrance into the schools has become competitive.

Although rates of admission to secondary school vary from location to location, but there is significant improvement across the board. At Ambodiriana, one of the locations around Betampona Reserve, passing grades doubled after the Saturday Schools began (MFG, 2005, p. 6). In 2009 and subsequent years, many test scores suffered due to the ongoing political crisis in Madagascar. The downward trend of the general level of education, primarily due to the lack of funding, has been a challenge since (A. Bollen, personal communication, September 5, 2011). However, in 2010-2011, the entire Saturday School class at Tamatave graduated and over 90% of the students passed at every Saturday School location (Bollen, 2011).

The Saturday School is reported to be stronger program than Malagasy schools, although this feat is “not a difficult task to accomplish” given the limited funding and training most Malagasy schools and teachers receive. The Saturday School program graduates a higher percentage than the school district with which the MFG works (I. Porton, personal communication, November 18, 2011). These statistics provide indisputable confirmation that the Saturday Schools are having a positive impact on general education levels in the areas in which the MFG works.

To what extent Saturday Schools instill a value for the natural world in its participants is unknown and a question of interest for the MFG. Some Saturday School children developed a relationship with MFG and return even after graduating to secondary school, either participating in camps or working with the MFG at the university level (A. Bollen, personal communication, September 5, 2011).

MFG has begun an effort to track down previous Saturday School participants, which is a difficult logistical task since the Malagasy government records are often unreliable. Thus far, the MFG has identified 60 previous participants in Saturday School and Camp that have gone on to university (A. Bollen, personal communication, September 5, 2011). Bollen highlighted one former participant, a 2000 graduate of the Saturday School program and a 2005-6 graduate of Camp, who is now a third year graduate student in natural resource management (Bollen, public presentation, July 26, 2011). This example indicates that MFG successfully and significantly impacted at least one former participant.

The argument is also made education in general contributes to conservation goals. Saturday Schools develop a more educated populous thereby increasing the chance that individuals will make good decisions--environmental or otherwise (I. Porton, personal communication, November 18, 2011). One interview put it plainly: “if we don’t have educated people, we’re nowhere in conservation” (I. Porton, personal communication, November 18, 2011). As described above, in the sense that it provides higher quality education, Saturday School program appears to be successful. At minimum, the MFG is contributing to a more educated populace who are more able to make informed decisions about environmental issues in Madagascar.

That the Saturday School model is being copied is another indicator of its success. Recently, MFG has begun with UNICEF primarily due to the widely regarded success of the

Saturday School program (C. Welch, personal communication, November 11, 2011). UNICEF intends to copy the Saturday School model and implement the program on a larger scale.

In summary, the Saturday Schools are highly effective at improving the general level of education among its participants. However, environmental education is not a central focus of the Saturday School. Although the MFG is in the process of tracking former participants, data are currently scarce that support the program's ability to change attitudes and behaviors through environmental education.

3) Camp

As previously described, the alumni of MFG's Camp program have formed environmental clubs: Association pour la Conservation de l'Environnement (ACE) and Association AGEJE. The fact that these organizations exist and are growing speaks to the fact that these programs have been effective increasing awareness and generating activity around biodiversity conservation.

4) Chef ZAP Training Program

Measuring the efficacy of the training programs is less precise. Because the metrics for success are less well-defined and also more difficult to measure, determining whether the training program is effective is a very different task. Furthermore, few quantitative data are available beyond attendance numbers on the Chef ZAP trainings. Even if we were able to travel to Madagascar to observe the trainings and meet Chef ZAPs, the cascade training structure makes following its implementation highly complex.

MFG does not have the resources to follow up and monitor the implementation of the training in every school or classroom. As a result, MFG must rely on reports back from Chef ZAPs as measures of the effectiveness on the training. The MFG hopes that Chef ZAPs will pass on the information and that enthusiastic teachers integrate the information into the curriculum (I. Porton, personal communication, November 18, 2011). Essentially, the entire program and its message depend on individual Chef ZAPs, which is why strong, positive relationships with the Chef ZAPs are indispensable; everything begins and ends with the Chef ZAPs.

At a minimum, the MFG is providing a service and access to previously unavailable information on ecology and environmental issues to the Chef ZAPs, mayors, and teachers. Even

if the training is not universally implemented, MFG sees a benefit in providing valuable information on environmental issues even only reaches a few teachers and students (I. Porton, personal communication, November 18, 2011).

Since the direct teacher trainings are so infrequent and we gathered little data on them, this section focuses on the strengths, successes, weaknesses, and challenges of the Chef ZAP trainings.

Chef ZAP Training: Successes and Strengths

That the trainings are in such high demand and the attendees are excited to attend are successes in and of themselves. The Chef ZAPs are clearly excited to be involved in the trainings, and this enthusiasm is reflected in the surveys. As mentioned previously, the Chef ZAPs rarely miss trainings even though they are busy individuals with a lot of responsibilities (K. Freeman, personal communication, October 31, 2011).

MFG has also been able to track the circulation of their pedagogical tools throughout school systems (A. Bollen, personal communication, September 5, 2011). That the tools have been made their way to all of the schools indicates that the Chef ZAPs have indeed been training teachers and other administrators.

The Chef ZAPs have also been creatively adapting the materials, which is another indication of success (A. Bollen, personal communication, September 5, 2011). Although no specific examples were provided, that the Chef ZAPs are interested and committed enough to work with environmental issues further an indication that the MFG has begun to instill a value for conservation. The survey data also supports the levels of commitment among Chef ZAPs.

As much as possible, MFG works to ensure that the subject matter of the training, and the trainings themselves, are responsive to the needs and interests of the Chef ZAPs (A. Bollen, personal communication, October 31, 2011). Efforts are also made to ensure the Chef ZAPs remain awake and engaged throughout the trainings, and that the trainings carried out in a way that keeps attendees interested (C. Welch, personal communication, November 11, 2011).

Another strength of the Chef ZAP trainings is MFG's longevity in the region. Strong relationships on the ground and dedicated Chef ZAPs, as discussed in a previous section, contribute to the ability of the Chef ZAP trainings to be successful. These long-term

relationships help MFG to recruit more Chef ZAPs, communicate with Chef ZAPs, and develop an enthusiastic base (K. Freeman, personal communication, October 31, 2011).

Finally, we saw some evidence that indicates the trainings have begun to create an environmental ethic among participants. One interviewee shared an anecdote about a mayor who felt that all fruit from trees MFG planted at a local school should be his (an example of the corruption common in Madagascar). However, after this mayor attended an MFG training, the mayor reversed his opinion and decided to give the fruit back to the school. The interviewee stated that this mayor's shift in opinion was as much due to the training's "power to get to people" as it was to peer pressure from other mayors who had also taken part in the trainings (K. Freeman, personal communication, October 31, 2011). This story testifies to the impact of the trainings and their ability to create a shared experience and subculture among former participants.

The Chef ZAP training program has done an excellent job of building relationships and cultivating demand for environmental education among participants, as well as excitement around the subject matter. The trainings are responsive to participants, which may contribute to the enduring levels of enthusiasm. The Chef ZAPs are invested enough to spend time modifying materials, and the majority of the participants are highly committed to the training programs' objectives. Over time, it appears as though the trainings have begun to instill culture of respect for the MFG's environmental education programs and potentially the environment itself.

Chef ZAP Training: Challenges

The MFG's EE program faces a number of challenges, which were identified by multiple interviewees. Many of these challenges are common to most nonprofits the world over—that is a lack of funds, time, and staff. Other challenges are more specific to the issues nonprofits face when working in difficult enabling environments in developing countries, such as inadequate capacity building and high staff turnover.

1) Inadequate funding, time, and staff

The Chef ZAP training program is expensive to run. This is due to the per diems that must be paid to the Chef ZAPs to enable them to attend the trainings. Many Chef ZAPs must travel long distances, sometimes 20 hours by a combination of walking and vehicular transport,

and then they must be housed and fed for a week. Because the trainings happen twice a year for one week at a time, Chef ZAPs must be compensated for their trip cost (includes travel cost and their opportunity cost of time), as well as room and board for the duration of the trainings. The Planet Foundation provides \$50,000 per year for the trainings, and this is enough to cover the two weeks of trainings (A. Bollen, personal communication, September 5, 2011). However, many of the Chef ZAPs who participated in the trainings and filled out our survey, expressed a desire for more trainings, or for the trainings to be longer than one week. Such demand among Chef ZAPs for more trainings was also iterated in interviews (K. Freeman, personal communication, October, 31, 2011). There would thus appear to be demand for more trainings, but not enough funding to meet this demand. However, time is also a factor—given that trainings must be conducted when school is not in session—and time spent at the trainings is time taken away from other Chef ZAPs responsibilities, such as report writing and checking up on schools in their CISCO (A. Bollen, personal communication, September 5, 2011).

Although it is reasonably easy to obtain funding for EE, it is hard to explain to funders why per diems are necessary (C. Welch, personal communication, November 11, 2011). Funders do not always understand why per diems need to be paid; they assume that Chef ZAPs would be willing to participate in free trainings and that no extra compensation is necessary. The reality is that Chef ZAPs cannot afford to attend unless they are paid per diems, and as a result, the trainings simply would not happen (C. Welch, personal communication, November 11, 2011). There seems to be a disconnect between donors' assumptions and the needs of the MFG's EE program, which provides a challenge in obtaining funding to expand the training program.

The printing of *Guide Pratique du Maitre* is also expensive. Over half of a recent grant from Sea World Busch Gardens for \$20,000 is needed to provide teaching manuals to more than 2000 teachers in two school districts (C. Welch, personal communication, November 11, 2011).

With regard to the Saturday schools, there is huge demand for the establishment of more schools and classes. Again, the lack of funding and staff prevents the MFG from being able to meet this demand (I. Porton, personal communication, November 18, 2011).

In terms of the EE program in general, one of the largest limiting factors is staff time. The staff is already overburdened with too many tasks, and it is hard to expand services to meet demand without corresponding increases in staff and funding. Inadequate funding is also preventing the MFG from being able to carry out a comprehensive evaluation of the

effectiveness and impacts of its EE program (K. Freeman, personal communication, October, 31, 2011).

2) Staff, Teacher and Administrator Turnover

The MFG has faced turnover issues in three areas: Chef ZAPs, Saturday School teachers, and EE program managers. Turnover in Chef ZAPs poses a challenge as significant time and money is spent training them and building relationships with them. Many Chef ZAPs are fifty years old or more, and so there has been a wave of retirements (A. Bollen, personal communication, September 5, 2011). Although there can be benefits to new, younger Chef ZAPs taking their places, these new Chef ZAPs still start from zero in terms of EE training and trust in the MFG. Despite there being turnover in Chef ZAPs, this turnover is predominantly due to retirement, and is substantially lower than turnover in teachers. The comparatively low turnover rate among Chef ZAPs is why the cascade method was chosen in the first place (K. Freeman, personal communication, October, 31, 2011).

The high rate of turnover among teachers in Madagascar is a problem, which has partly been exacerbated by the recent political crisis in 2009. Some teachers are no longer being paid and absenteeism has risen sharply (I. Porton, personal communication, November 18, 2011). This creates challenges in the cascade model, where Chef ZAPs train the school principals, who then train the teachers. This means that training needs to be done on an ongoing basis. The repercussions of high teacher turnover are greater in the Saturday school program. Some of the Saturday schools have done well with maintaining the same teachers for long periods of time, while others have consistently had problems with turnover (A. Bollen, personal communication, September 5, 2011).

Many of the interviewees mentioned the abnormally high turnover rate in EE program managers as a challenge. An Bollen frames the issue well: “in the last four years I’ve had three different heads of environmental education centers, so the fact that there’s not been any continuity in terms of the managers for that center has made it more difficult to go in depth, because you need to keep training new managers to just get up to speed to the content of the program,” (personal communication, September 5, 2011). The problem seems to lie in a mismatch between the job description and the cultural reality. The job involves many tasks, and though it offers greater pay than a regular teaching job, it requires much more work and fewer

days off. Malagasy people do not seem to be as motivated by money as Americans; they would rather make less money and have more time off. Indeed, the MFG has had at least two people decide to become government teachers instead (A. Bollen, personal communication, September 5, 2011). It is also possible that a new mining operation in the area is inflating wages and diverting even more local people away from the position than normal (K. Freeman, personal communication, October, 31, 2011).

The high turnover rate in EE program managers has consequences for the MFG in terms of its evaluation capacity, and relationship building with the local people. The EE manager is responsible for administering and collecting surveys given to the Chef ZAPs upon completion of the trainings. These surveys are instrumental to evaluation of the EE program, but it is unclear where the surveys are or how they are being used. Additionally, it is imperative that trust is built between the EE manager and the local communities. For this to happen there must be continuity and the EE manager should be in place for a long period of time (K. Freeman, personal communication, October, 31, 2011).

3) Capacity Building

Capacity building is one of the MFG's pillars and all of the interviewees state its importance in one way or another. Regardless, there are still significant gaps in the MFG's capacity building program. As Ingrid Porton says, "I think the biggest thing is having more expertise and understanding of how to improve capacity building, (personal communication, November 18, 2011). She also notes how the local staff members were still extremely reliant on the program manager—even after all of the work that Charlie Welch and Andrea Katz of the DLC had done on capacity building. One of the most significant challenges to capacity building, aside from cultural misunderstanding, is the unfavorable enabling environment and weak education system in Madagascar (I. Porton, personal communication, November 18, 2011).

4) Other Weaknesses and Challenges

There are several other factors affecting the success of the MFG's EE programs that lie in the enabling environment. These factors include the commitment and motivation of the Chef ZAPs, the education level of the students, and difficulty in collecting any kind of quantitative data for program evaluation. The general consensus among interviewees is that there is great

demand from the Chef ZAPs for the trainings, and that Chef ZAPs lacking in commitment to the EE program are the minority (K. Freeman, personal communication, October, 31, 2011). As was previously discussed in the section on the current state of affairs, the education level of the students is quite low as a result of grade inflation, budgetary cuts to the education system, and unqualified teachers in the rural areas (A. Bollen, personal communication, September 5, 2011). When varying levels of student skill level are combined with obese class sizes and poor quality teachers, it is not easy to tailor the EE curriculum to the students' needs and abilities.

Lastly, because it is extremely difficult to track students or monitor the long-term impacts of EE classes, it is hard to come up with any measures of impact. Similarly, it is hard to measure the impact the trainings have on the Chef ZAPs quantitatively (A. Bollen, personal communication, September 5, 2011). It is easier to measure changes in attitude, but attempting to measure the actual effect is difficult (K. Freeman, personal communication, October, 31, 2011).

The weaknesses and challenges outlined above are not easy to overcome, but the MFG already has a strong foundation in place to address them. It has longstanding relationships with its donors and predominantly committed and motivated Chef ZAPs. Where improvements could be made are in the MFG's understanding of the local context. Differences in cultural values around the amount of work and compensation could be contributing to the high turnover rate for the EE program manager position, and the perpetual overburdening of local MFG field staff. It may be hard for the MFG to help donors understand the need for per diems and more funding for the EE program when the MFG itself does not have a complete grasp of the local context. The MFG's ability to build long-term local capacity seems to be elusive; if the MFG had a deeper and more nuanced understanding of the local culture it may discover why this is.

Thoughts about the Future and Possible Expansion

The main themes that arose from the question on vision for the future were expansion of the Saturday School program, increased relationship building, the need to obtain more funding and hire more staff, expansion into other parts of Madagascar, and partnering with UNICEF. The Saturday School program has been highly successful, and UNICEF is going to replicate the Saturday School program at other sites. Creating more partnerships will help the different NGOs operating EE programs in Madagascar to come up with common pedagogical tools and best practices. The MFG's involvement in these partnerships can benefit it through the participation

in a learning network, as well as helping it to formalize best practices (A. Bollen, personal communication, September 5, 2011).

The continuance of relationship building with the local people was also stressed as necessary for future sustainability, in addition to maintaining a secure source of funding, and increasing the supply of funding if possible (K. Freeman, personal communication, October, 31, 2011). Expansion into other parts of Madagascar, like the SAVA region, was also suggested (I. Porton, personal communication, November 18, 2011).

Essentially the MFG will continue to do what it is doing, though there is potential for expansion in the future. It will build off of its existing successful programs, like the Saturday School program, and participate in more partnerships and networks.

V. Recommendations and Discussion

Summary of Findings

Overall, negative opinions about MFG's environmental education program were rare. The program was well reviewed by both survey respondents and interviewees. Nearly 80 percent of Chef ZAPs surveyed responded that there was nothing they did not like about the trainings. Interviewees were all enthusiastic about the program, although some were significantly more well-informed than others. All responses to scaled questions were relatively high, and most open-ended responses were strongly positive as well. On average, usefulness of the material was rated highest, above expectations, ease of implementation, and satisfaction with the trainings. These findings must be interpreted in context, since the Chef ZAPs may have been unwilling to speak badly of the program during the training.

The MFG's environmental education program's objectives are unclear. In each of our interviews, we asked what goals and objectives the MFG had defined for the environmental education and none of them were able to point to a foundational document in which these were enumerated. In the past year, a new program manager has taken over An Bollen's post, and a strategic planning process is rumored to be underway (K. Freeman, personal communication, October 31, 2011).

Although overarching goals are undefined, an analysis of the *Guide* revealed that curriculum objectives are met. An analysis of the curriculum materials indicates that the

curriculum conforms well to objectives, complies with standards, is scoped and sequenced well, and has appeal. We found that parts of the curriculum may be too complex for younger learners, but that the *Guide* is an appropriate tool on which to train the Chef ZAPs.

As a result of poorly defined metrics and difficulty monitoring the program, measuring success is difficult. We chose to focus on effectiveness of the programs, particularly with regards to changing attitudes and behaviors, and identifying strengths and weaknesses of the Chef ZAP trainings. Overall, the quantifiable survey results indicate that the trainings have an 81.25% approval rating. Respect, responsibility, and national pride were among the chief reasons Chef ZAPs attended. On the whole, Chef ZAPS were highly motivated and enthusiastic, which is a major contributing factor to the effectiveness of the trainings. However, some differences in levels of commitment were observed, and a few attendees appeared to be uncommitted.

We found that on-the-ground partnerships, particularly with Chef ZAPs, were of paramount importance. Involving committed people long-term is the key to MFG's positive relationships with the Chef ZAPs and other members of this community. The MFG generates a great deal of good will through its environmental education program, particularly with the Saturday Schools and the Chef ZAP trainings. At a bare minimum, the environmental education program is valuable for contributing to good public relations with the local community.

Through their involvement with the community and longevity in the region, the MFG's has generated demand for their services--particularly the Saturday schools and the Chef ZAP trainings. Relationships and familiarity with an area help to cultivate demand, all of which are keys to making MFG's environmental education more effective.

MFG's EE program has perhaps been most successful at spreading awareness of environmental issues. Bitsik'Ivoloina, Camp, Saturday School, and the various trainings each contribute to permeating the information throughout the local community.

The Saturday School has been highly effective at its primary objective: increasing the percentage of students who pass the CEPE exam. Since the MFG is only just beginning to track down former students, which could provide some measure of success of Saturday School's environmental education component. At least one former Saturday School and Camp student has gone on to graduate school for natural resources management; although only a single case, this example illustrates the program has the capacity to impact environmental attitudes.

MFG's partnership with UNICEF opens up a variety of opportunities as the organization is now a member of a state-wide network. In addition, UNICEF's interest in replicating the Saturday School model is yet another indication of the program's success.

Both quantitative and qualitative data support that the Chef ZAP trainings' effectiveness in certain areas. That the busy Chef ZAPs look forward to and infrequently miss the trainings, creatively adapt the materials, and request additional trainings proves that the trainings are both popular and interesting for attendees. The success of the Chef ZAPs program depends on the Chef ZAPs themselves, and uncommitted or uninterested Chef ZAPs could prevent an entire commune from having access to the environmental education materials.

Although the MFG's program is successful on a number of fronts, certain factors inevitably cause it to be less successful than theoretically possible. The enabling environment, particularly after the 2009 coup, has presented a persistent challenge to the success of MFG's environmental education program. As previously described, the Malagasy education system suffers from a general lack of funding and training for teachers. Many teachers simply do not show up to work.

Although the general level and quality of education was low before the coup, the political instability resulted in even less funding for education. MFG saw the percentage of Saturday School students who passed the CEPE exam fall in the year immediately afterwards. When MFG saw a drop in attendance rates after the coup, they worked with parents to sign a contract to ensure that students would attend Saturday School regularly (A. Bollen, public presentation, July 26, 2011). As a result, attendance rate has recovered to previous levels.

The coup also erased all progress made toward nation-wide awareness of environmental issues, although these issues were never prominent in the national psyche (K. Freeman, personal communication, October 31, 2011). Illegal logging, especially of rosewood, also increased after the coup. However, *tavy* is a traditional practice that has been used for generations, and the high rates of poverty throughout the country mean that many families rely on subsistence agriculture to survive.

While the political instability certainly did not help poverty levels, Madagascar ranked among the poorest countries in the world before the coup. The devastating poverty around Parc Ivoloina and Betampona Reserve means that many children are pulled from school (and Saturday School) to work, often making gravel by hand (K. Freeman, personal communication, October

31, 2011). Teachers lacked access to information and resources before the coup, and education has never received sufficient funding. Although the 2009 coup certainly did not help, it arguably did not make the situation significantly worse.

Finally, the nature and structure of cascade trainings make them difficult to monitor and evaluate. The education system's weak institutional capacity means that the trainings depend on the commitment of individual Chef ZAPs, which is a significant weakness. However, the cascade strategy was chosen precisely due to the high turnover and general unreliability among teachers. The reliance on Chef ZAPs is a trade-off the MFG makes in order to ensure some continuity. Because the MFG is understaffed to begin with, it would be difficult to allocate staff time to follow up on the implementation of the training materials.

Recommendations

Our surveys, interviews, and analyses of material culture revealed successes and challenges with the MFG's environmental education program and the Chef ZAP trainings at both the administrative level and on-the-ground. We use our analysis of MFG's EE program to develop recommendations to the Duke Lemur Center (DLC) so they can apply the lessons learned as they expand their program within the SAVA region. Our recommendations range from small to large changes, and focus on shifts in organizational and programmatic structure that are important to consider when expanding the program within the SAVA region. These recommendations will allow the DLC to build upon the successes seen in the current Chef ZAP training program, such as the tremendous level of enthusiasm and positivity Chef ZAPs associate with the trainings. We feel these challenges may pose a hindrance to the evolution and future success of the environmental education program; however, we suggest the following recommendations to the DLC to address these challenges and ensure that the future environmental education programs in Madagascar can contribute to long-term social and environmental change.

Challenge 1: Disconnect between upper-level and field staff

We discovered that all the EE trainings and the majority of the EE programs are conducted in French, and many of the trainers and program implementers do not speak Malagasy. We recommend that, at the very least, the Program Manager for the new site be

trained in the Malagasy language. The Program Manager is an individual who will spend the majority of their time in Madagascar at the training site; therefore it is imperative to have the individual be proficient in Malagasy. Having a Program Manager that is trained in Malagasy will allow the DLC to build solid, local relationships and trust among community members, which will contribute to a strong Chef ZAP training program in the SAVA region.

Additionally, there seems to be a lack of knowledge about the EE program and, more specifically, the Chef ZAP trainings, among upper-level Duke Lemur Center and MFG staff. To prevent this gap in basic information for the new training programs, we recommend that all upper-level Duke Lemur Center Staff attend a workshop to learn the basics, successes and even challenges of their EE program. By increasing information sharing, the DLC can ensure that their staff is knowledgeable about the EE program, and this may assist in securing additional donors and funding, which is particularly important for the fledgling Sambava program.

Challenge 2: Issues with program content, logistics, and scope

As previously mentioned, the overall scope of the *Guide Pratique du Maitre* curriculum and the sequence of the topics seem appropriate; however, there are portions of the curriculum that may be too advanced for younger learners. More specifically, we recommend that the program trainers at Sambava ensure that the Chef ZAPs acquire the knowledge to train their teachers to rework the curriculum and accommodate the various learning levels of the target primary-level students. Furthermore, when reorganizing the curriculum, we recommend that the DLC involve the input of the local teachers in order to understand the students who will be receiving the curriculum and ensure that the documents they create are tailored to the most appropriate learning level.

Our examination of the material culture revealed that the MFG programs, such as the Saturday School, Mayor trainings, Farmer trainings, and Chef ZAP trainings, have single target audiences. While this is an effective way to ensure that Chef ZAPs are sharing information and gaining key material to teach their teachers and build community amongst themselves, it would be beneficial to have programs where the target audiences overlapped. We recommend that DLC create a holistic comprehensive program with multiple targets in order to strengthen community relationships, foster dialogue between community groups, and create a common vision among all those involved with the DLC.

Challenge 3: Poor networks and on-the-ground partnerships

The MFG has built strong relationships with Chef ZAPs, and this has contributed to the overall enormous success of the Chef ZAP training program. We recommend that DLC also forge a close relationship with the Chef ZAPs in the SAVA region in order to cultivate demand and enthusiasm in this region for the EE trainings. Furthermore, the MFG has built strong relationships with the academics conducting research at Parc Ivoloïna. Due to the length of their research projects, academics often spend an extended period of time in Madagascar and are able to build unique relationships with local communities. By reaching out to academics and involving them in the program cycle, the DLC can utilize this rich resource of local knowledge and increased capacity.

Challenge 4: Inability to retain staff and students

Our interviews revealed that the Education Manager position within the MFG has seen the highest staff turnover in recent years. We have deduced that the role and duties of this manager may be too broad, and the Education Manager is often overburdened with too many tasks. We recommend that the role of Education Manager be split into two jobs in order to lessen the workload and increase the chances that the individuals hired for the position stay committed. Additionally, it seems that the duties of the Program Manager may be too broad, and this manager is often forced to perform administrative and technical tasks which leaves less time for this manager to focus on a managerial role. We recommend that the DLC hire a Malagasy assistant who can serve as a liaison between the community and the Program Manager, and be responsible for on-the-ground administration. This assistant would help with program communication and day-to-day tasks, which would help alleviate burnout felt by Managers, and potentially address the issue of the high turnover among managerial staff. Hiring an assistant will allow the Program Manager to fully focus on their assigned duties instead of being distracted by tasks that are not directly related to their intended role.

We discovered that student retention is low in the Saturday School because children are often forced to leave during the middle of the program in order to assist their parents with additional income generation. If the DLC eventually hopes to implement a Saturday School in the SAVA area, to address the low retention rate, we suggest that the DLC consider formulating an income-substitution scheme that will allow students to stay in the program by compensating

families. For example, the DLC might build a garden or farm that is modeled after the successful MFG agroforestry teaching unit. This garden or farm could be used to provide food for students to take home to their family. In essence, the DLC would be compensating each family with food, and any income that is lost by keeping the student in the program is substituted with the harvest from the farm or garden. Additionally, the farm or garden can serve a secondary role as a teaching tool. It is important to note that the success of this scheme depends highly on the cultural acceptability of giving and receiving food. However, if the DLC builds strong community relationships with the families in the training area, these communities may be more likely to accept the compensation scheme.

Challenge 5: Lack of structured and consistent monitoring and evaluation system

We discovered that there is a lack of a structured monitoring and evaluation system, so we recommend that the DLC hire a trained evaluator to develop and perform this monitoring scheme. By implementing and continuing the monitoring and evaluation mechanisms, the DLC may increase their chances of securing donors, as many funding decisions are based on success measures and quantitative data. To supplement the monitoring and evaluation system, we recommend that the DLC create a strategic plan for the new trainings. This strategic plan can serve as a type of monitoring and evaluation mechanism by assisting the Program Manager, Education Manager, and field staff in visualizing how they would like the program at Sambava to evolve and the process they will use to reach their goals for this useful and important program initiative.

Overall, we felt that despite the challenges they face, both the MFG and the DLC have produced real value added to educational outcomes in Madagascar. There is a great deal of positive energy and enthusiasm surrounding the environmental education program and it is meeting a definite need in both locations. The MFG has many successes to show for its efforts over the last twenty years. As with any program or project, there are some challenges and room for improvements. Taking the time and effort to examine these issues is a measure of the commitment and dedication of the Duke Lemur Center towards helping Malagasy individuals protect their local environment. We hope that our work towards identifying suggestions and improvements will further the admirable work that the MFG and DLC are producing every day.

VI. Acknowledgements

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VIII. Appendices

A) Conceptual Framework

Quantitative Analysis:

B) Variable Descriptions

- a. Definitions
- b. Key of Categorical Variables

C) Raw STATA output

- a. Summary Statistics
- b. Summary Statistics by Region
- c. T-Test Comparisons:
 - i. Gender
 - ii. Program Location
 - iii. Aggregate Ranking Measure
- d. Correlation Matrix

D) Complete Do-File

Survey Instruments:

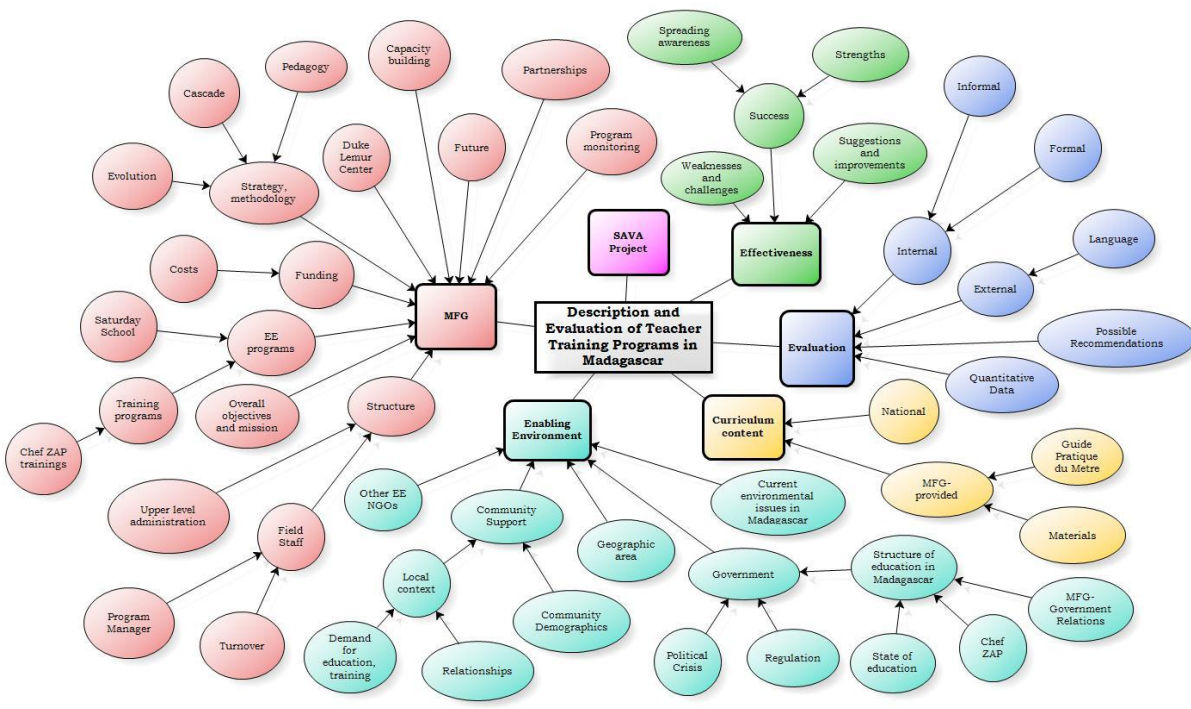
E) Participant Consent Form (French)

F) Survey Instructions (French)

G) Survey (French)

H) Survey (English)

Appendix A – Conceptual Framework of Data



Appendix B-D: Quantitative Analysis

B) Variable Descriptions

a. Definitions:

1. **Age**- age of survey respondent
2. **Gen**- gender of respondent (0 = male, 1= female)
3. **YearsTeaching**- number of years of education experience of respondent
4. **Accord2**- Scaled response (1-4) “Was the training session successful in reaching [its objective]?”
5. **Utile2**- Scaled response (1-4) “How useful was the information you learned?”
6. **Satis2**- Scaled response (1-4) “Did the training session meet expectations?”
7. **Facile2**- Scaled response (1-4) “How do you think your students will receive this new material?”

b. Key of Categorical Variables:

accord2:

- 2 en désaccord
- 3 d'accord
- 4 totalement d'accord

satis2:

- 2 mal satisfait
- 3 bien satisfait
- 4 dépassé

utile2:

- 3 utile
- 4 très utile

facile2:

- 2 peu possible
- 3 avec soutien
- 4 facilement

gen:

- 0 homme
- 1 femme

Region1:

- 1 Andapa
- 2 Sambava
- 3 Tamatave

regionNEW:

- 0 Tamatave
- 1 Andapa
- 1 Sambava

C) Raw STATA Output

a. Summary Statistics

```
. sum Age gen YearsTeaching accord2 utile2 satis2 facile2
```

Variable	Obs	Mean	Std. Dev.	Min	Max
Age	54	48.22222	8.116293	31	60
gen	54	.2037037	.406533	0	1
YearsTeach~g	50	21.94	11.25658	2	38
accord2	53	3.207547	.4539777	2	4
utile2	53	3.679245	.4712334	3	4
satis2	54	3.018519	.23718	2	4
facile2	51	3.137255	.4480896	2	4

b. Summary Statistics By Region

```
. by Region1, sort : summarize Age YearsTeaching gen facile2 utile2 satis2
```

```
-> Region1 = Andapa
```

Variable	Obs	Mean	Std. Dev.	Min	Max
Age	14	48.35714	7.642061	33	58
YearsTeach~g	12	21.5	11.18034	6	33
gen	14	.2142857	.4258153	0	1
facile2	13	3.384615	.5063697	3	4
utile2	14	3.857143	.3631365	3	4
satis2	14	3	0	3	3
accord2	14	3.428571	.5135526	3	4

```
-> Region1 = Sambava
```

Variable	Obs	Mean	Std. Dev.	Min	Max
Age	17	45.94118	9.704835	32	60
YearsTeach~g	16	18.625	11.77497	2	38
gen	17	0	0	0	0
facile2	16	3	.5163978	2	4
utile2	17	3.882353	.3321056	3	4
satis2	17	2.941176	.2425356	2	3
accord2	17	3.176471	.5285941	2	4

```
-> Region1 = Tamatave
```

Variable	Obs	Mean	Std. Dev.	Min	Max
Age	20	49.6	7.344171	31	59
YearsTeach~g	19	24.15789	11.31009	6	38
gen	20	.3	.4701623	0	1
facile2	20	3.1	.3077935	3	4
utile2	19	3.315789	.4775669	3	4
satis2	20	3.05	.2236068	3	4
accord2	20	3.05	.2236068	3	4

```
-> Region1 = .
```

Variable	Obs	Mean	Std. Dev.	Min	Max
Age	3	51.33333	4.725816	46	55
YearsTeach~g	3	27.33333	6.806859	22	35
gen	3	.6666667	.5773503	0	1
facile2	2	3	0	3	3
utile2	3	4	0	4	4
satis2	3	3.333333	.5773503	3	4
accord2	2	3.5	.7071068	3	4

c. *T-Test Comparisons*
i. Gender

. ttest Age, by(gen) unequal

Two-sample t test with unequal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	43	47.34884	1.292231	8.473723	44.74101	49.95666
1	11	51.63636	1.691007	5.608435	47.86857	55.40416
combined	54	48.22222	1.104488	8.116293	46.0069	50.43754
diff		-4.287526	2.12823		-8.687951	.1128981

diff = mean(0) - mean(1) t = -2.0146
Ho: diff = 0 Satterthwaite's degrees of freedom = 23.2054

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0278 Pr(|T| > |t|) = 0.0557 Pr(T > t) = 0.9722

. ttest YearsTeaching, by (gen) unequal

Two-sample t test with unequal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	40	20.425	1.77731	11.24069	16.83005	24.01995
1	10	28	3.022141	9.556847	21.16344	34.83656
combined	50	21.94	1.591921	11.25658	18.74092	25.13908
diff		-7.575	3.506018		-15.01261	-.1373946

diff = mean(0) - mean(1) t = -2.1606
Ho: diff = 0 Satterthwaite's degrees of freedom = 15.8641

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0232 Pr(|T| > |t|) = 0.0464 Pr(T > t) = 0.9768

. ttest satis2, by (gen) unequal

Two-sample t test with unequal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	43	3	.0332779	.2182179	2.932842	3.067158
1	11	3.090909	.0909091	.3015113	2.888351	3.293467
combined	54	3.018519	.0322761	.23718	2.953781	3.083256
diff		-.0909091	.0968085		-.3003757	.1185575

diff = mean(0) - mean(1) t = -0.9391
Ho: diff = 0 Satterthwaite's degrees of freedom = 12.8048

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.1825 Pr(|T| > |t|) = 0.3651 Pr(T > t) = 0.8175

```
. ttest accord2, by (gen) unequal
```

```
Two-sample t test with unequal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	42	3.190476	.0701591	.4546827	3.048787	3.332165
1	11	3.272727	.1408358	.4670994	2.958926	3.586529
combined	53	3.207547	.0623586	.4539777	3.082415	3.332679
diff		-.0822511	.1573436		-.4169588	.2524566

```
diff = mean(0) - mean(1) t = -0.5227
Ho: diff = 0 Satterthwaite's degrees of freedom = 15.3486
```

```
Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.3043 Pr(|T| > |t|) = 0.6086 Pr(T > t) = 0.6957
```

```
. ttest facile2, by (gen) unequal
```

```
Two-sample t test with unequal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	41	3.097561	.0681182	.4361696	2.959889	3.235233
1	10	3.3	.1527525	.4830459	2.95445	3.64555
combined	51	3.137255	.0627451	.4480896	3.011228	3.263282
diff		-.202439	.1672526		-.5642788	.1594007

```
diff = mean(0) - mean(1) t = -1.2104
Ho: diff = 0 Satterthwaite's degrees of freedom = 12.8213
```

```
Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.1240 Pr(|T| > |t|) = 0.2480 Pr(T > t) = 0.8760
```

```
. ttest utile2, by (gen) unequal
```

```
Two-sample t test with unequal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	42	3.666667	.073621	.4771187	3.517986	3.815347
1	11	3.727273	.1408358	.4670994	3.413471	4.041074
combined	53	3.679245	.0647289	.4712334	3.549357	3.809133
diff		-.0606061	.1589175		-.3976303	.2764182

```
diff = mean(0) - mean(1) t = -0.3814
Ho: diff = 0 Satterthwaite's degrees of freedom = 15.922
```

```
Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.3540 Pr(|T| > |t|) = 0.7080 Pr(T > t) = 0.6460
```



```
.
. ttest satis2, by (regionNew) unequal
```

Two-sample t test with unequal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	23	3.086957	.0600739	.2881041	2.962371	3.211542
1	31	2.967742	.0322581	.1796053	2.901862	3.033622
combined	54	3.018519	.0322761	.23718	2.953781	3.083256
diff		.1192146	.0681869		-.0192959	.2577251

```
diff = mean(0) - mean(1)                                t = 1.7484
Ho: diff = 0                                           Satterthwaite's degrees of freedom = 34.4176
```

```
Ha: diff < 0                Ha: diff != 0                Ha: diff > 0
Pr(T < t) = 0.9553          Pr(|T| > |t|) = 0.0893          Pr(T > t) = 0.0447
```

```
.
. ttest accord2, by (regionNew) unequal
```

Two-sample t test with unequal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	22	3.090909	.0627332	.2942449	2.960448	3.22137
1	31	3.290323	.0949652	.5287437	3.096378	3.484267
combined	53	3.207547	.0623586	.4539777	3.082415	3.332679
diff		-.1994135	.1138149		-.4281738	.0293468

```
diff = mean(0) - mean(1)                                t = -1.7521
Ho: diff = 0                                           Satterthwaite's degrees of freedom = 48.6586
```

```
Ha: diff < 0                Ha: diff != 0                Ha: diff > 0
Pr(T < t) = 0.0430          Pr(|T| > |t|) = 0.0861          Pr(T > t) = 0.9570
```

iii. Aggregate Ranking Measure

. ttest total, by (gen) unequal

Two-sample t test with unequal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	39	12.92308	.1814048	1.132873	12.55584	13.29031
1	10	13.3	.3666667	1.159502	12.47054	14.12946
combined	49	13	.1623593	1.136515	12.67355	13.32645
diff		-.3769231	.409087		-1.255827	.5019807

diff = mean(0) - mean(1) t = -0.9214
 Ho: diff = 0 Satterthwaite's degrees of freedom = 13.7499

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
 Pr(T < t) = 0.1864 Pr(|T| > |t|) = 0.3727 Pr(T > t) = 0.8136

.

. ttest total, by (regionNew) unequal

Two-sample t test with unequal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	20	12.6	.210263	.9403247	12.15991	13.04009
1	29	13.27586	.2213736	1.192133	12.8224	13.72933
combined	49	13	.1623593	1.136515	12.67355	13.32645
diff		-.6758621	.3053143		-1.290405	-.0613187

diff = mean(0) - mean(1) t = -2.2137
 Ho: diff = 0 Satterthwaite's degrees of freedom = 46.0623

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
 Pr(T < t) = 0.0159 Pr(|T| > |t|) = 0.0318 Pr(T > t) = 0.9841

d. Pairwise Correlations of Variables:

```
. pwcorr Age YearsTeaching gen regionNew facile2 utile2 satis2 accord2, sig
```

	Age	YearsT~g	gen	region~w	facile2	utile2	satis2
Age	1.0000						
YearsTeach~g	0.8903 0.0000	1.0000					
gen	0.2148 0.1189	0.2719 0.0561	1.0000				
regionNew	-0.1718 0.2141	-0.2109 0.1416	-0.3082 0.0234	1.0000			
facile2	0.1261 0.3780	0.2158 0.1451	0.1812 0.2033	0.0910 0.5255	1.0000		
utile2	0.0756 0.5907	0.0487 0.7398	0.0527 0.7081	0.4876 0.0002	0.3188 0.0241	1.0000	
satis2	0.1350 0.3303	0.2063 0.1506	0.1558 0.2605	-0.2509 0.0673	0.1577 0.2690	0.2251 0.1051	1.0000
accord2	0.0391 0.7808	0.0538 0.7137	0.0742 0.5976	0.2185 0.1160	0.4889 0.0003	0.3254 0.0186	0.1402 0.3167

D) Complete Do-File

```

1  cd "H:\MP"
2  log using "H:\MP\survey data.log", replace
3  import excel "Copy of Survey Data.xlsx", sheet("Surveys") firstrow
4  encode Gender, generate(Gender1)
5  encode CITY, generate(Region1)
6  label list Region1
7  gen regionTam = 0
8  gen regionSam = 0
9  gen regionAnd = 0
10 replace regionTam = 1 if Region1 == 3
11 replace regionSam = 1 if Region1 == 2
12 replace regionAnd = 1 if Region1 == 1
13 generate gen = 0
14 replace gen = 0 if Gender1 == 2 | Gender1 == 3
15 replace gen = 1 if Gender1 == 1
16 label define gen 0 "homme" 1 "femme"
17 drop Gender1
18 encode facile, generate (facile1)
19 encode utile, generate (utile1)
20 encode Satisfaction, generate (satis1)
21 encode accord, generate (accord1)
22 label list facile1
23 recode facile1 (4 = 2) (2 = 3) (1 3 = 4) (missing = .), generate (facile2)
24 label values facile2
25 label define facile2 4 "facilement" 3 "avec soutien" 2 "peu possible"
26 drop facile1
27 label list utile1
28 recode utile1 (1 3 4 = 4) (2 5 = 3) (missing = .), generate (utile2)
29 label values utile2
30 label define utile2 4 "très utile" 3 "utile"
31 drop utile1
32 label list satis1
33 recode satis1 (3 = 4) (1 2 =3)(4 = 2) (missing = .), generate (satis2)
34 label values satis2
35 label define satis2 4 "dépassé" 3 "bien satisfait" 2 "mal satisfait"

```

```
36 drop satis1
37 label list accord1
38 recode accord1 (4 = 4) (1 2 = 3) (3 = 2) (missing = .), generate (accord2)
39 label define accord2 4 "totalement d'accord" 3 "d'accord" 2 "en désaccord"
40 drop accord1
41 label drop Gender1 accord1 utile1 facile1 satis1
42 label dir
43 label list
44 sum Age gen YearsTeaching accord2 utile2 satis2 facile2
45 by Region1, sort : summarize total
46 ttest Age, by(gen) unequal
47 ttest YearsTeaching, by (gen) unequal
48 ttest satis2, by (gen) unequal
49 ttest utile2, by (gen) unequal
50 ttest accord2, by (gen) unequal
51 ttest facile2, by (gen) unequal
52 by Region1, sort : summarize Age YearsTeaching gen facile2 utile2 satis2
   accord2
53 gen regionNew = 0
54 replace regionNew = 1 if regionSam==1 | regionAnd ==1
55 ttest Age, by(regionNew) unequal
56 ttest YearsTeaching, by (regionNew) unequal
57 ttest gen, by (regionNew) unequal
58 ttest facile2, by (regionNew) unequal
59 ttest utile2, by (regionNew) unequal
60 ttest satis2, by (regionNew) unequal
61 ttest accord2, by (regionNew) unequal
62 pwcorr Age YearsTeaching gen regionNew facile2 utile2 satis2 accord2, sig
63 gen total = 0
64 replace total = facile2+ utile2+ satis2+ accord2
65 ttest total, by (gen) unequal
66 ttest total, by (regionNew) unequal
```

Appendix E—Survey Consent Form (French)

Dans le cadre de la réalisation d'une étude de recherche qui a pour but d'explorer la mise en place d'un programme de formation professionnelle pour devenir enseignants spécialisés dans le domaine de l'environnement en Tamatave, Madagascar. Vous avez participé au programme d'éducation environnementale conduit par le 'Madagascar Fauna Group,' c'est pourquoi on vous sollicite pour répondre à cette étude. Veuillez lire attentivement ce formulaire et nous adresser vos éventuels questions.

Le but de cette étude est d'obtenir une description approfondie du programme de formation d'enseignants mis en place au Parque Ivoloïna, en Tamatave Madagascar, afin de développer une liste de recommandations pour des programmes similaires à Sambava, Madagascar.

Si vous décidez de faire partie de cette étude, vous recevrez un questionnaire dans lequel il vous sera demandé de faire part de votre expérience en tant qu'enseignant de l'environnement au sein du programme. **Le questionnaire prend approximativement 15 minutes à compléter.**

Votre participation est entièrement volontaire et aucune question n'engage une réponse obligatoire de votre part.

Vous pouvez vous désinscrire à tout moment au cours de l'étude. Néanmoins, toutes données renseignées seront prises en compte par l'étude. Ce questionnaire est anonyme et aucune donnée personnelle ne sera enregistrée et publiées/visibles.

Vos réponses seront utilisées dans le cadre de la consolidation d'un document de recherche qui sera mis à la disposition de l'Université de Duke ainsi que le public.

Si vous avez des questions concernant cette étude, veuillez contacter Gina Angiolillo à gina.angiolillo@duke.edu, ou Noelle Wyman noelle.wyman@duke.edu, ou adressez votre demande à un membre de MFG.

Une copie d'un questionnaire que vous avez rempli vous sera transmise.

Si vous choisissez de participer à cette étude, veuillez le spécifier ci-dessous.

Votre Signature _____ Date _____

Votre Nom (en lettres moulées) _____

Nom imprimé de la personne d'obtenir le consentement _____

Date _____

Appendix F—Survey Instructions (French)

Manakory Tompko!

Merci en avance pour prendre le temps de faire notre enquête! Nous sommes très heureux d'entendre vos pensées et vos opinions au sujet des formations pour que nous pouvions aider les participants futurs. Vos réactions minutieuses et honnêtes sont fortement appréciées. S'il vous plait, répondez aux questions de votre mieux, en encerclant le mot qui mieux décrit votre expérience avec les formations. Il n'y a pas des réponses faut ou correct, mais juste vos opinions.

Exemple:

A) Mon fruit favori est :

La banane L'ananas la goyave la papaye

B) Est-ce que vous êtes humain? (OUI) (NON)

Vous pouvez ignorer une question si vous voulez, mais avec les réponses complètes, nous pouvons mieux voir si c'est possible d'améliorer le programme pour l'avenir. Vos réactions sont très utiles.

S'il vous plaît, lire la forme de consentement au dessous à propos d'anonymat de vos réponses. Vos réponses aux questions suivantes seront complètement anonymes. Nous n'avons pas besoin de votre nom. Signer sur le revers de cette page seulement si vous consentez à compléter l'enquête. Une copie supplémentaire de cette forme sera fournie si vous voulez le prendre un exemplaire avec vous.

Merci de nous aider avec notre projet. Nous espérons qu'après l'enquête est terminer, nous pouvons présenter des petite suggestions d'amélioration pour un projet de formation qui est déjà très efficace!

Misaotra betsaka!



Gina, Noelle, Sanjot, et Niki

Appendix G—Survey Instrument (French)

Si vous avez besoin d'espace supplémentaire, n'hésitez pas d'écrire sur le cote envers de la feuille.

1) À votre avis, quel était l'objectif de la formation ?

2) Est-ce que la formation c'atteint l'objectif ? [*cercle votre opinion*]

Totalement d'accord D'accord En désaccord Totalement en désaccord

3) Mon attente pour les formations est... [*cercle votre opinion*]

Dépassé Bien satisfait Mal satisfait Déçus

4) Vous avez participer dans ces formations pourquoi?

5) Quelle partie de la formation avez-vous aimez le plus ?

6) Quelle partie de la formation avez-vous aimez le moins?

7) Comment pensez-vous d'améliorer la formation ?

8) L'information utiles que vous avez appris c'étais? [*cercle votre opinion*]

Très utile Utile Peu utile Pas utile

9) Est-ce qu'il sera possible d'utiliser cette information dans votre école ? [*cercle votre opinion*]

Facilement Avec soutien Peu possible Difficile

10) Comment est ce que vous allez utiliser cette information dans votre école ?

11) Apres vous, quelle seront les réactions de vos élèves en recevront ces informations nouvelle ?

Information personnel (optionnel)

Sexe: H F Age: _____

Depuis combien de temps travaillez-vous dans la profession d'éducation: _____

Responsabilité principale: _____

Avez-vous déjà participé dans les formations du MFG? Oui Non Nombre: _____ Des

Observations supplémentaires:

Appendix H—Survey Instrument (English)

1) In your opinion what was the purpose of the training?

a. Was the training session successful in reaching this goal?

Strongly Agree Agree Disagree Strongly Disagree

b. Did the training session...

Exceed Expectations Meet Expectations Fall Short of Expectations Disappoint

2) Why did you come to the training session? (this year?)

3) What was your favorite part of the trainings?

4) What would you change about the trainings?

5) How useful was the information you learned?

Very Useful Somewhat Useful Not Useful I did not learn anything new

6) Will you be able to incorporate this information into your teaching: Yes No

a. If so, how do you think your students will receive this new material?

Positively interested receptive ambivalent

7) Have you been to the trainings before? Yes No

a. If so, for how many years? _____ years

b. Would you come again next year? Yes No

Additional Optional Information:

How long have you worked in education? _____ years Age: _____

Who do you primarily instruct?

Other trainers teachers primary school students secondary school students

Primary Subject taught (if applicable)? _____ Gender: M F

How many students do you work have in your classroom? _____ students.