

SCHOOL REFORM AND RELATED SERVICE / RESEARCH PROJECTS IN GUATEMALA

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THE GUATEMALA LEARNING COMMUNITY

Jo Ann Burkhardt

The McMaster School service/research project in Guatemala involved a partnership with Colegio Shaddai, a school founded on evangelical Christian beliefs but teaching a primarily secular curriculum in the village of Chiquimulilla, Guatemala, a small town located near the El Salvador border and approximately ten miles from the Pacific coastal village of Las Lisa. The relationship between Colegio Shaddai and Defiance College was facilitated by Nancy Bontrager from Pettisville, Ohio (now a member of the McMaster School Advisory Board) who has an ongoing relationship with the Guatemalan school.

The Colegio Shaddai offers grades kindergarten through ten and supports itself mainly through small tuition payments from parents. Mandatory education through grade six is the law in Guatemala. Although students are required to attend school, very few children in the rural area of Guatemala attend school beyond the third grade.

The project involved the development of a model for teacher training to be used by the directors of the Colegio Shaddai. The training model was to be implemented by Anibal and Cledy Westendorf, the founders and

directors of the school. The work was carried out through two trips to Chiquimulilla during the 2003-04 academic year.

In the course of my research, I learned that most of the students in rural Guatemalan schools were taught by young men and women who had completed only two years of high school and one year of technical training in state-funded teacher training programs.

The model developed for the teacher training consisted of three key elements: articulating what was to be learned by the students; identifying how the teachers would facilitate this learning; and finally, deciding how the learning would be assessed. It became clear that in order to successfully implement the model, the learning goals needed to be based on the state curriculum. The local curriculum was a part of the Guatemalan National Educational Initiative. Determining how this learning would occur and deciding how the directors would know if the learning had occurred needed to be articulated.

In addition to the teacher-training model developed at the faculty level, five students applied and were accepted to be part of the project as McMaster Scholars. Three scholar projects related directly to the education program at Colegio Shaddai. Regina Keller, an Early Childhood Education major, had an interest and deep commitment to explore various ways instruction could be delivered to young children in order to meet individual learning needs and make instruction more effective. Camryn Lehrman, who was preparing to be a high school teacher, gathered qualitative data pertaining to the satisfaction levels of parents and teachers at the school. She compiled, analyzed, and summarized the data and then prepared a document to share her results with parents and teachers. Graphic Arts major Stefan Faerber applied his academic major to work being done to increase literacy rates and encourage reading within the Colegio Shaddai community. He created two books. The first book was created for early readers at the school, combining photographs of the Headmaster of Colegio Shaddai at various locations in the community with beginning level text in Spanish describing those locations. The second book is a book of pictures from Colegio Shaddai and the Chiquimulilla area to be sold in the United States to raise funds for Colegio Shaddai.

The other projects involved community development and promotion of the school. Joy Stoller focused her work on the agricultural needs of the community surrounding Colegio Shaddai. Joy found that there was a need on the part of local farmers to have their soil tested. She discovered that

this process, considered routine in the United States, was uncommon in Guatemala. Finally, Jeremy Ball, a Communications and Marketing major planned to create a marketing plan to be used by the directors of the Colegio Shaddai. He hoped that by implementing a marketing plan, the directors of the Colegio Shaddai could effectively convey to the community the vision of the school and continue to attract students.

The students and faculty involved in the Guatemalan project organized their work through a learning community, and in doing so created the model that now structures all McMaster School trips: intensive pre-trip study of culture and history; extensive preliminary work on the academic research projects; and post-trip follow up reflection and synthesis of results. In keeping with the McMaster School for Advancing Humanity goals, we identified and studied obstacles that historically had been considered root causes of human suffering within the rich Guatemalan culture such as lack of education, political instability, and inadequate health services.

The research was conducted through trips to Guatemala in February and May of 2004. The first trip involved extensive information gathering that then informed the second trip. During the spring semester between the trips, the teacher-training model was finalized and it was implemented during the May visit.



During our work at the Colegio Shaddai, it became apparent to us that there were virtually no books available to the students and teachers at the school. Diane Kaiser began the preliminary work for developing a library for the school in 2004 and used McMaster funds to purchase over 100 reading books in Spanish for the students. It was clear to us that in order for the students to want to learn to read, there must be something for them to read! In spring 2006, Diane Kaiser will lead a library-development McMaster School project to Chiquimulilla. Many American individuals and organizations have committed to helping provide books for a town or school library.

MATCHING CURRICULUM MATERIALS TO THE LEARNING STYLES OF THE CHILDREN OF COLEGIO SHADDAI

Regina Keller

BACKGROUND

The purpose of this project was to provide the school of Colegio Shaddai with resources needed for an awareness of diverse learning styles of children and to create ways for teachers and administrators to best adapt to different learning styles. This project involved academic research into the literature of learning styles as well as field research at Colegio Shaddai. The end product was a teacher training tool with materials, lessons, ideas, and information about how to detect learning styles and how to optimize student progress toward appropriate learning goals.

For the teachers at Colegio Shaddai, this project provided resources and knowledge that can be used in the classroom to make learning more attractive and efficient for students. It provided me with an incomparable international school experience with children, teachers, and administrators. The overall experience will help me greatly in my future teaching career not only in accommodating my students' learning styles but in responding to students from different cultural backgrounds.

RESEARCH QUESTIONS

The research questions I explored were: (a) What were the learning styles? (b) Why were they important to teaching and learning? (c) How were the learning styles assessed? (d) How was the information pertaining to learning styles and effective teaching presented to teachers and administrators at Colegio Shaddai? (e) How were teachers trained to



assess learning styles? (f) How were teachers trained to develop lessons, based on local curriculum, which would accommodate learning styles?

REVIEW OF LITERATURE

According to James Keefe, learning styles are the cognitive, affective and physiological factors that determine how one understands, responds to, and interact with a learning environment. (1988, 2) They exist in the neural design of the brain and personality of an individual, and from there they can be shaped by the learning experiences in school, home, and community (Keefe 1998, 2-3).

Lynne Sarasin defines learning styles as the preference or tendency of an individual to comprehend and process information in a certain way or combination of ways (1998, 3). Sarasin stresses that teachers need to be aware of the differences in learning style and respond with the appropriate methods, materials, and resources to fit their students' most productive modes (1998, 2). Teaching in terms of a child's specified learning style emphasizes the student's strengths, not his/her weaknesses.

Sarasin also feels that environment plays a key role. Stimuli and distractions in the surroundings where a child is attempting to learn can influence the child's preferred style causing him/her to adapt to a

different learning style than their naturally most productive one. While this is not unhealthy, a child generally learns more when his/her natural learning style is fostered (Sarasin 1998, 21-23).

Sarasin suggests that learning styles can be understood best by looking at three different ways of learning: through the senses including visual, auditory, and tactile/kinesthetic methods; through psychological aspects of perception; and through different intelligences, which link to Howard Gardner's theory of multiple intelligences (1998, 8). Gardner defines seven different intelligences that students may possess singly or in combination. They include logical/mathematical (ability to consider hypotheses and complete complex math operations); linguistic (uses language to express complicated meanings); musical (sensitivity to pitch, rhythm, and tone); spatial (understands how objects are related and fit together); kinesthetic (manipulates objects for hands-on experiences); interpersonal (effectively interacts with other people); and intrapersonal (directs life by planning according to self-perception) (Campbell, Campbell, and Dickinson 1996, xvi).

For school children, sensory learning styles are most prevalent. Therefore the focus for this project became the visual, auditory, and kinesthetic/tactile styles.

Marilee Sprenger suggests that for visual learners, learning becomes more concrete if they can just see what the material is (2003, 35). Carbo, Dunn and Dunn report that 40% of school-aged children recall best what they have learned visually (1986, 13). One can notice a visual learner by their consistent eye contact. Visual learners tend to be easily distracted by movement, and they may have a tendency to speak fast. They prefer handouts, overheads, and other multimedia displays. Commonly they may use phrases like, "I see what you mean," or "I get the picture" (Sprenger 2003, p.34).

Next, there is the auditory learner. Carbo, Dunn and Dunn state that 20-30% percent of school-aged children are this type of learner (1986, 13). Sprenger says that the auditory preference includes "both hearing and speaking" (2003, 37). Since the auditory and speech areas of our brain are located near one another, these types of learners enjoy listening to others as well as listening to themselves talk. These individuals tend to have strong language skills, and they may have a wide-ranging vocabulary. Musical talent is not uncommon with these persons. They tend to check their spelling by sounding words out. They may "answer rhetorical

questions and say things such as 'sounds good to me,' or 'I hear what you're saying.'" (Sprengr 2003, 34)

The final and most common learning style among the school population is the kinesthetic style. The kinesthetic learner tends to excel most when he/she is totally engaged with the learning activity (Farwell, 2000). Sprenger shares three different types of kinesthetic learners. The hands-on learner usually enjoys "assembling, taking things apart, working with textured materials, and manipulating objects" (2003, 38). Secondly, the whole-body learners excel most when they actually turn into what they are learning. For example this may be role playing, exercising, constructing, giving demonstrations, and using whole body movements. The doodlers learn best by drawing, coloring, and of course doodling. They may say phrases such as, "I need a concrete example,' or 'That feels right'" (Sprengr 2003, 35).

What happens when teaching styles and student learning styles collide? Learning is compromised which is why knowing learning styles and adapting to them is so vital.

Not only is it beneficial for teachers/adults to know the learning styles of their students/children, but it is advantageous for children also. Having children take a learning style inventory that consists of different questions and/or observations can provide them, their parents, and their teachers with an inside look to how they prefer to learn.

RESEARCH METHODS

On the first trip to Guatemala, I interviewed the directors of the school to get a feel for the teachers' training/schooling, the structure of the school and curriculum, resources, and methods of discipline. I observed a wide range of classrooms, teachers, and students. I took extensive field notes about student learning, behaviors, and student resources. I interviewed multiple teachers on the issue of "differentiated learning styles." I consulted with the directors of the school about my findings and about what materials are available at the school and what materials I would need to supply them with using McMaster project funds.

After returning to Defiance I continued to engage in my own research. I discussed my findings and plans with Dr. Burkhardt. The next step was to create the final product.

DESCRIPTION OF FINAL PRODUCT

My final project is a teacher-training tool for the school designated for the teachers and administrators of the school. The final product was presented to the directors of the school during our second trip. Nancy Bontrager, who served as translator, worked with me to communicate my explanations and intentions to the directors of the school.

The final product is in the form of a three-ring binder with materials translated into Spanish. The first section is factual information about various learning styles. It tells about what the three styles are (tactile, auditory, and visual) and why it is important to know about them. In the last part of the first section I included learning style inventories for teachers to use to evaluate their students or to just use as a guide. The inventories are in simple and understandable terms and are credible ones. They are ones that have been researched and proven to be most effective. Along with the inventory are directions that explain how to administer the inventory.

The second section breaks down each learning style (auditory, visual, and kinesthetic) and lists appropriate traits, teaching strategies, and suggested teaching methods.

The third part of the binder consists of various lessons and thematic units for the teachers to use that capitalize on each learning style. For example, one unit used was on "farm animals," and the lesson plans include activity suggestions that benefit each type of learner. In this way, when the teachers teach content or a skill, they can have multiple ways of doing so. Also, when I was putting these lesson plans and units together, I took into consideration the material list that I had from the school. I focused on activities that could be best implemented with the resources they had. Each lesson plan included the materials needed, the time that it would take, the appropriate grade level, and the learning style it would capitalize on.

REFLECTION

As I look back at the McMaster School's goals, I believe that my project has tried to meet them. Going into a foreign land with this kind of project was a very intimidating thing; however, the support I received made it successful both academically and practically. It has been a blessing to be able to use my education and passion in this mutually beneficial way.

PARENTAL INVOLVEMENT IN A GUATEMALAN SCHOOL

Camryn Lehrman

BACKGROUND

The purpose of this project was to develop methods, techniques, and strategies to involve the parents of students enrolled in the Colegio Shaddai in the new school curriculum. As an education major, I am aware of the influences and benefits of a family support system and how its presence or absence may either promote or hinder a child's academic success. In my own background I have experienced a parochial elementary school, home schooling, and a public high school. I have seen first hand a variety of degrees of parental involvement in the educational process. Therefore I was drawn to the idea of examining similar connections at the Colegio Shaddai in Guatemala. My goal through the McMaster program was to explore the interface between the parents/family and the school, Colegio Evangelico Shaddai, located in the rural setting of Chiquimullilla, Guatemala. I sought to examine family relationships and levels of involvement in their children's education and school.

As I understand it, the main goal of the McMaster School is to examine, in hopes of understanding, the root causes of human suffering in a more hands-on way than can be achieved within the four walls of a classroom. Deficiencies in opportunity cause human suffering insofar as they hinder individual potential for success and achievement. In any nation, children are the future. They hold in their small hands the key to whatever the future may bring. They deserve every opportunity possible to excel. A solid education is a valuable tool for the prevention of human suffering and for opening the door to options that may not have been available to the child's parents.

RESEARCH QUESTIONS

The questions that guided my research for this project include the following: What was the structure and history of education in Guatemala? What were important aspects of the culture in Guatemala that pertained to education? How were parents involved in their children's schools in Guatemala/Central America? What were strategies that could be used to involve parents in the school? How were schools structured in Guatemala? What was the relationship between parents and schools? And, how were families structured in Guatemala?



LITERATURE REVIEW

Gains in the fields of literacy and education were not significantly observed until Guatemala had obtained its independence from Spanish rule. The first campaign took place in 1875 as the government declared that all school-aged children were to receive a compulsory, free education. While these intentions were good, both the government and individual families lacked the funds to establish the necessary schools and follow through on such a mandate. Under the influence of then-leader Jose Arevalo, the government enacted a second plan to end illiteracy during the 1940s (Lerner Publications 1997, 45). Current educational goals include the elimination of culture- and gender-based discrimination from the curriculum, the teaching of values, the encouragement of a society of peace and national/cultural character, and the promotion of a moral, civic, and democratic education (Regional Programme; UN Economic and Social Council 2004).

Despite these and other measures, literacy rates remain around the 50-55% mark for the country as a whole. This rate is not uniform across Guatemala; urban regions have the most literate populations, with the rates range from 31.4 to 71.8% (Lerner Publications 1987, 45). Rural areas remain significantly behind their urban counterparts with an estimated

80% of rural indigenous populations incapable of even basic reading or writing skills. Such figures are reflective of higher school attendance in urban areas and the fact that many rural communities lack schools altogether. An additional hindrance is that many teachers do not speak the native languages of their pupils.

Compulsory education is required of children aged seven to 14 years (USC Center for Global Education 2003). A 1998 educational survey revealed that 42% of all Guatemalan young people completed sixth grade. For rural areas, the number was just under 34%, while urban areas did somewhat better at 54% (Chesterfield and Rubio 1998, 23).

The new face of education reflects the recent trend of 'Motivation and Multispeed Learning.' The Nueva Escuela Unitaria, or New Unitary School, founded in 1991, currently has 2,084 rural schools under its curricular jurisdiction. These institutions employ approximately 3,500 teachers and reach 113,000 children. A distinguishing feature of this system is that children work and learn at their own pace. This allows them to still work with their families during the harvest season.

GUATEMALAN CULTURE

Guatemala, a name derived from an Aztec word translated to mean 'land of the trees,' has an estimated population of nearly 12 million. Approximately 56% of these inhabitants are of Ladino ancestry. The remaining 44% are of indigenous heritage (ABC Clio 2003). Smaller populations of German, English, Chinese, and United States origin are documented as well. Of this population, an estimated 60% dwell in relatively remote, rural regions. Guatemala boasts an extremely young population with 43% of the census under the age of 15 (World Resources Institute 2002).

Guatemala is a land with a rich linguistic background. Spanish is the dominant language, spoken by some 60% of the Guatemalan population (ABC Clio 2003). Twenty-one Mayan dialects have also been documented. These strains have continued for over 20 centuries. Native dialects include Quiche, Cakchiquel, and Kekchi (ABC Clio 2003). An estimated 12% of the populace lives in absolute poverty. In addition, only 11% of homes have potable water and only 22% have electricity (Lerner Publications 1987, 39).

Recent surveys have set out to explore the relationship between Guatemala's traditional Mayan culture and its education system. The strong influence of Mayan culture has always been evident. However, its

integration within the education system has only recently been closely scrutinized. It is only natural that this strong cultural identity would continue to influence the upbringing and teaching of Guatemalan youth (Heckt 1999, 321).

METHODOLOGY AND PROCEDURES

In order to learn to gauge the level of and feelings towards parental involvement at Colegio Shaddai, as well as to form a connection with the people, my colleagues and I felt that interviews would be the best course of action to pursue. To collect a variety of views and ideas, plans were made to include interviews with the administrators and teachers of Colegio Shaddai, as well as a number of parents, on our first trip to Guatemala.

Getting my thoughts about what I wished to learn from these interviews down on paper, I created a list of potential questions to be asked. This list was modified slightly to suit the perspectives and experiences of each group of people: the administrators, the teachers, and the parents of Colegio Shaddai. The following excerpts detail the questions that guided my interviews:

Questions for Administrators and Teachers

1. What are your feelings about parents being involved in the schools?
2. Are you accepting/encouraging of parental involvement within your school?
3. Are parents involved in your school?
4. If yes, how are parents involved in your school?
5. What do you see as current barriers to parental involvement?
6. What measures or services does the school take to involve the parents?
7. Do you wish that there were more parent involvement?
8. How important do you believe parental involvement in a child's education is for student success?
9. Do you take measures to inform the student body's parents of school events, changes, etc?
10. Does the school offer parent/teacher conferences or other forums to inform parents?
11. Do you make yourself available for conferences with parents?
12. Do you have anything else to add on the topic of parental involvement?

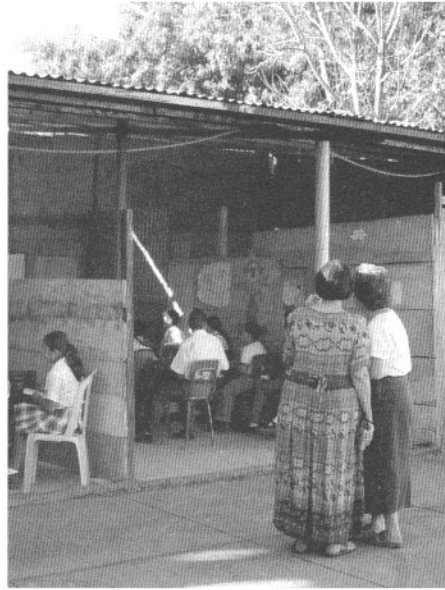
Questions for Parents

1. How do you feel about parents being involved in the schools and their children's education?
2. Are you involved in your child(ren)'s school?
3. If yes, how so and how often?
4. Do you wish you were more involved in your child(ren)'s education and school?
5. What services does the school offer to keep parents involved and informed?
6. Do you personally take advantage of any of these services?
7. Do you wish there were more ways to be involved?
8. Do you or have you ever discussed your child(ren)'s education and progress with their teacher or a school administrator?
9. Do you have anything else to add on the topic of parental involvement?

Once I had created a template of interview questions, I solicited the aid of Nancy Bontrager. Through the help of Mrs. Bontrager, I succeeded in collecting the data and personal perspectives through a series of interviews with Colegio Shaddai's administrators, teachers, and parents. Over the course of our first trip, I was fortunate enough to get thirteen interviews, three with administrations, three with teachers, and seven with parents. The following represents a summary of the notes taken during these interviews:

There were several themes that emerged from interviews with administrators that suggested there were challenges in trying to achieve meaningful parental involvement. While there was a strong sense that parents were crucial to the educational process, there was a sense that there was work to do in educating parents about the value of involvement. For instance, parents tended to feel that if they were paying for a child's education why should they be asked to do more. Parental involvement was greater for extra-curricular events (e.g. sports, cultural events) than for academics, and greater for young children than for teenagers. The teachers do meet with parents every two months and there is strong attendance at these conferences (about 80%). The school gives formal exams every two months and the grade cards are given directly to the parents. Continued attendance is contingent upon the parents signing the grade card and being in communication with the teacher. This model is based on a program started in Mexico and had been in place for about two years. The administrators felt that more direct involvement of parents in the classroom itself would be very beneficial, but that many parents have obligations that make their presence in the classroom impossible.

The teachers generally echoed these impressions about both the value and difficulty of increased parental involvement in the school. Difficulties included both demands on the parents' time and the lack of education on the part of many parents. They also affirmed that parents do communicate through conferences and through notes. The teachers noted that the religious grounding of the school increased the degree of commitment from the parents.



The parent interviews suggested that parents too believed greater involvement in the classroom would be a good thing and wished there were more opportunities for direct involvement. Parents indicated that they felt there was a good deal of communication with the school through notes, conferences, and frequent visits. Parents communicated positive feelings about the school and relationships with the school and teachers. They also expressed a commitment to having their children receive a good education and affirmed the Christian values of the school.

In addition to interviews with faculty and parents, I was also able to learn a great deal from simply observing the sights and events of the day. Any 'free-time' I had was dedicated to exploring my surroundings at Colegio Shaddai, spending time with the children, and sitting in on classes. To my great surprise and pleasure, I was even made a part of an 'English class,' helping the children to match Spanish and English words.

RESULTS

Back in the United States, I used the data I had collected from the interviews to draw conclusions and make suggestions as to how the parents of Colegio Shaddai could become more involved in their children's education. The following represents an overview of these views and possible suggestions:

What Teachers Are Saying:

- ◆ Think that parents being involved would be a good thing
- ◆ Think that parents being involved would help
- ◆ Think that it's very important for parents to be involved / informed / have good relationship with the teachers and the school

What Parents Are Saying:

- ◆ Really like the idea of helping out in the classroom whenever able
- ◆ Think it's a good idea – you'd be working with school and spending time with children
- ◆ Most feel really good about open relationship with school and teacher

Possible Ways for Parents to be Involved:

- ◆ Walk your child to school
- ◆ Look over your child's notebook when they come home
- ◆ Help your child with homework
- ◆ Know and communicate with your child's teachers

Using these generalizations, and guided by the advise of the Westendorfs, I designed a publication that could be used both to inform the parents of Colegio Shaddai about the new education system and to propose possible methods through which they could become more active in their children's education.

For the actual publication, I selected a brochure-style handout that could be easily passed out to parents attending the annual grading period meetings or sent home with the schoolchildren. To make the brochure visually appealing and eye catching, I selected bright blue, yellow, and red colors to border the publication's primary messages.

REFLECTION

My academic research and first-hand experiences in Guatemala through the McMaster School for Advancing Humanity forever changed my perspectives on life and the human condition. In Guatemala, I was afforded the opportunity to immerse myself in a culture very unlike my own. The nature of my project allowed me the chance to form valuable connections with both parents and faculty of Colegio Shaddai as I conducted interviews with these individuals in order to gauge the level of

parental involvement in the schools. Through the aid of a translator, I succeeded in collecting the desired data, personal perspectives, ideas, and information regarding cultural influences on Guatemalan education and family life. In addition, I also learned a great deal through simply shadowing teachers and observing classes throughout the day.

Returning to the States, I used what insights I had gained to develop a brochure targeting the parents of Colegio Shaddai. In impoverished Central American countries, such as Guatemala, I learned that it is not uncommon for a child to be removed from school after the second grade so that they may seek employment and contribute to the family's income. My brochure, therefore, was dedicated to explaining the benefits of an education and to reveal methods through which parents may take a more active role in their child's learning.

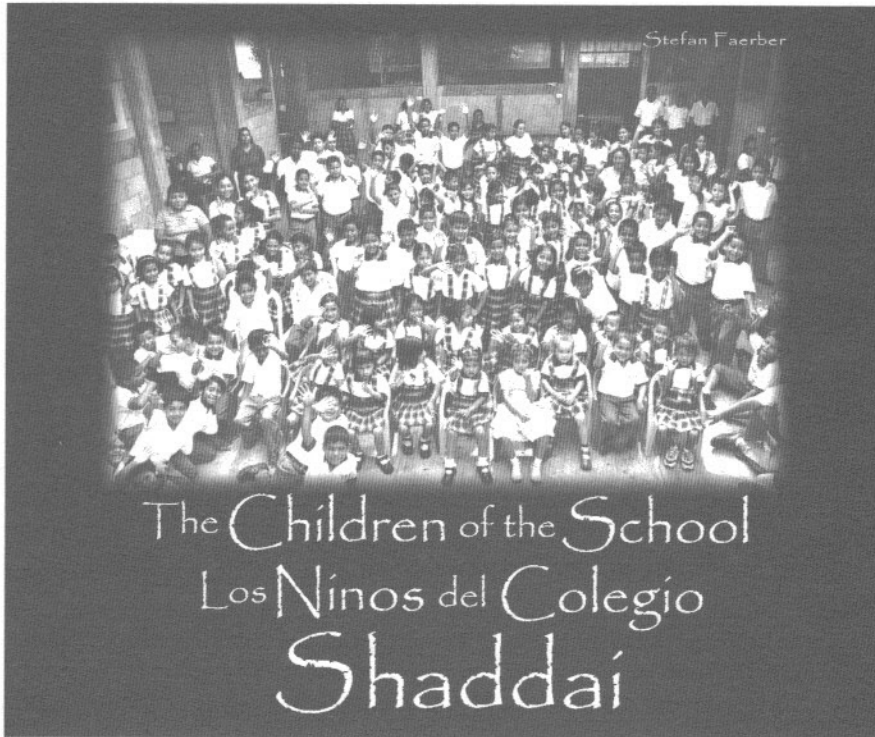
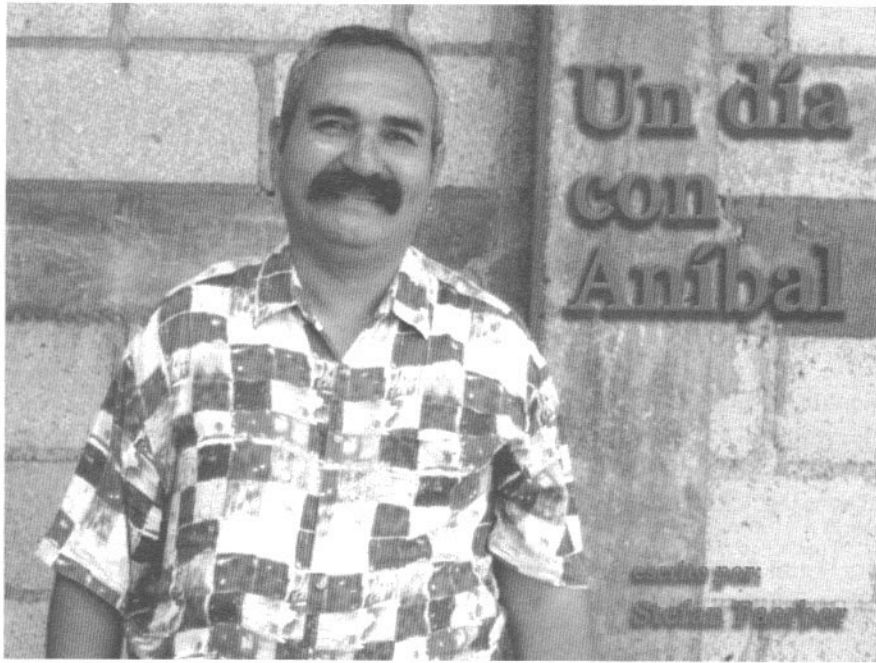
As is perhaps evident through the pages of this report, I am not sure who benefited from this project more, the children and parents of Colegio Shaddai or me. It is my solemn hope that this project has indeed touched the lives of these wonderful people even a fraction of the amount it has touched mine.

EDUCATION THROUGH PHOTOGRAPHY

Stefan Faerber

Stefan Faerber, a Graphic Design major, created two volumes of photography as part of his work as a McMaster Scholar. His research focused on the development of culturally-appropriate learning materials for early readers. The first book, a text for emergent readers, is *Un Dia con Anibal*, or *A Day with Anibal*. The book is illustrated with photographs of Anibal Westendorf, co-director of Colegio Shaddai.

Stefan also produced *Los Ninos del Colegio Shaddai* or *The Children of the School*, a collection of photographs of children. He delivered 100 copies of *Un Dia con Anibal* to the Colegio Shaddai to be used as a reading text in the early childhood classrooms. In addition, he has sold copies of both books to raise funds for the purchase of textbooks for the school.



SOIL TESTING IN RURAL GUATEMALA

Joy Stoller

BACKGROUND

When applying to become a McMaster Scholar, my initial proposal was to work in Jamaica focusing on Jamaican agricultural education. My plan was to research how future agriculturalists are trained and what is offered to current agriculturalists to further their education in the field of agriculture.

However, as I saw the benefits of being part of a learning community, I really wanted the experience of working with other McMaster Scholars and Fellows. For this reason, my project changed from Jamaica to a region surrounding Chiquimulilla, Guatemala.

My original intention was to work with the owners of family farms and develop a farming manual which would have some simple, straight-forward suggestions for organically enhancing the soil. For example, adding sand to the soil to improve drainage, using chicken manure for fertilizer, and alternating crops to replenish the soil with certain nutrients.

However, as my field research progressed, the project took on a new focus. The farmers with whom I was fortunate enough to work already knew a great deal about the benefits of organic matter and were using some organic fertilizer to enhance their crops. It became clear that they did not need a manual of suggestions. Instead, it would be far more useful to provide them with specific information about the soils with which they were working.

SOIL TESTING

My first order of business is to identify the proper terms and vocabulary. Soil, dirt, it's all the same, right? Wrong, *dirt* is what is under your fingernails. *Soil* is what our food grows in. This McMaster project is all about the latter of the two. While in Guatemala, I spent my time working with soil and soil testing.

Soil tests disclose specific information about soil composition. With that analysis in hand, one can make specific suggestions to improve crop quality and yields. Soil testing is common practice in the United States; often, fields are tested every two years. However, for various reasons, regular soil testing in Guatemala is not nearly as common. Several of the



fields I sampled had been tested in the distant past. The majority of the fields had never been tested.

A&L Labs in Fort Wayne, Indiana, was the lab I worked with. They were extremely generous and helpful throughout the entire research project. Not only did the lab run all my soil tests free of charge, they also sent me information, answered questions, and helped me get all the papers I needed to get the soil samples through customs. I am so very grateful for all their work and generous help.

METHODS AND DATA COLLECTION

Sixteen different soil samples were collected from five different farms. The soil samples were collected in a standard way: at least three soil prods were taken from different areas of each field. In order to get the soil below the surface, where the roots grow, I used a soil prod. A soil prod is similar to a shovel except it has a hollow tube on the end. This allows for a combination of all the soil, including where the roots will be found, not just soil from the surface.

After samples from a given field were collected, they were mixed together and the large pieces of debris such as leaves and roots were sorted out. The soil was then laid out on newspaper to dry in the sun for several hours. After drying, it was labeled and packaged for shipment back to the

United States. Since it is illegal to bring live specimens across the border through an airport, the soil samples had to be shipped back with a professional delivery company.

The lab ran several different tests and analyses on all 16 samples over the next several weeks. One set of tests yielded the percentages of sand, silt, and clay in the sample which allowed the soils to be classified scientifically. A second set of tests revealed the different levels of various elements such as phosphorus, potassium, magnesium, and sodium in each sample. The latter test results were the most beneficial for the farmers insofar as they helped determine which minerals and other treatments were needed for better soil fertility.

RESULTS AND DISCUSSION

The test results came back from A&L Labs a few weeks after I returned from the first trip to Guatemala. The next task was to translate the reports into Spanish. Of the sixteen samples, all except one had low or very low levels of phosphorus. The only sample that did not have low levels of phosphorus was soil used specifically for starting coffee plants. Because the coffee seedlings were planted in this soil, it was closely monitored. Nine of the sixteen soil samples were classified as "clay," and the remaining seven were classified as "clay loam." Clay soil results in poor drainage, reduced air circulation, and compaction of roots. Clay loam soil has around 33 percent of sand, silt, and clay, which makes a better agricultural soil than clay.

Each soil report also included a section of the analysis giving suggestions to improve the soil fertility. Depending on what crop was previously planted and what would be planted, the lab gave specific suggestions. For example, if a field were previously pasture and would be planted with corn, one recommendation was for a one-time application of lime that would last for a three to four-year time period. These specific suggestions were the most needed by the farmers.

When I returned to Guatemala the second time, I was able to present each farmer with a set of test results. These results will assist the farmers when they make decisions on the best types of crops to plant or what fertilizers would be most beneficial for replenishing elements in the soil. The farmers were receptive to the results and extremely appreciative. In fact, one farmer informed me he planned to use the information the following week when he ordered fertilizer.

REFLECTION

I am very grateful for the chance I had working with the McMaster Scholars and Fellows. The knowledge and experience I gained through my research was invaluable. I now realize the true value of my experience is not the assistance I supplied or the project I conducted. Rather, it was in what I learned and how I have changed. In the process I assisted several farmers in learning specific information about the land they farm. I helped provide them with suggestions for growing better crops with higher yields. However, what I learned was even more valuable and precious.



I began my project with a very arrogant attitude thinking "America is the place with the best technology and therefore, the best practices; let us share our knowledge about farming." However, I soon realized how very wrong I was. Farming is more than being able to use technology; it is being able to use the land. America is not the only place where the most valuable agriculture resource is found. Rather, it is found wherever farmers are located. The best resource farmers can possess is the knowledge gained when they are able to use the soil well and, with the resources and talents they have, manage that land to the best of their ability to create a prosperous and successful product. It doesn't take computers and technological devices to get crops to grow. Rather, it takes hard work, dedication, and a love for the land God created.

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