AC 2009-1089: BUILDING TRUST DURING INTERNATIONAL DEVELOPMENT WORK: A CASE STUDY OF A RECENT EWB PROJECT

Marissa Jablonski, University of Wisconsin, Milwaukee

Marissa R. Jablonski is a Graduate Student of Civil/Environmental Engineering at the University of Wisconsin-Milwaukee (UWM). She has served as Co-chair of UWM's Student Chapter of Engineers Without Borders since its beginning in 2007 in which time-span they have successfully completed a water distribution project in Guatemala. Her research efforts focus on water resources and the role of ionic strength on the adhesion and detachment of E.coli bacteria in its transport through porous media. Marissa was a 2008 recipient of the National Science Graduate Fellowship Honorable Mention, the 2008 Wisconsin Water Association Scholarship, and the 2007 and 2008 UWM Chancellor's Graduate Student Awards. Marissa is a member of ASEE. She received her B.S. degree in Natural Resources and Spanish from the University of Wisconsin-Stevens Point in 2003, and will receive her M.S. degree in Civil/Environmental Engineering from UWM in 2009. Marissa has been accepted to continue her Ph.D. in Civil/Environmental Engineering at UWM next fall.

Christopher Papadopoulos, University of Puerto Rico-Mayagüez

Chris Papadopoulos is a faculty member in the Department of Engineering Science & Materials at the University of Puerto Rico, Mayagüez. His research interests include nonlinear structural mechanics, biomechanics, engineering education, and engineering ethics (with particular interest in appropriate technologies to serve impoverished and developing communities). He is an active member of the American Society for Engineering Education (ASEE), American Society of Civil Engineers (ASCE), and Association for Practical and Professional Ethics (APPE). He holds BS degrees in Civil Engineering and Mathematics from Carnegie Mellon University, and a PhD in Theoretical and Applied Mechanics, Cornell University. He was previously a faculty member in the Department of Civil Engineering & Mechanics at the University of Wisconsin-Milwaukee.

John Reisel, University of Wisconsin, Milwaukee

John R. Reisel is an Associate Professor of Mechanical Engineering at the University of Wisconsin-Milwaukee (UWM.) He serves as Director of the Combustion Diagnostics Lab, Associate Director of the Center for Alternative Fuels, and co-Director of the Energy Conversion Efficiency Lab. His research efforts focus on combustion and energy utilization. Dr. Reisel was a 2005 recipient of the UWM Distinguished Undergraduate Teaching Award, the 2000 UWM-College of Engineering and Applied Science Outstanding Teaching Award, and a 1998 recipient of the SAE Ralph R. Teetor Educational Award. Dr. Reisel is a member of ASEE, ASME, the Combustion Institute, and SAE. Dr. Reisel received his B.M.E. degree from Villanova University in 1989, his M.S. degree in Mechanical Engineering from Purdue University in 1991, and his Ph.D. in Mechanical Engineering from Purdue University in 1994.

Building Trust During International Development Work:
A Case Study of a Recent EWB Project

Introduction

For over a decade, engineering students have traveled to developing countries to assist in local development efforts through groups such as Engineers Without Borders (EWB) and Engineers for a Sustainable World (ESW). These efforts are well meaning, are often beneficial, and reflect the reality of the interconnected global community. However, inherent disparities between the visiting students and host community, including differences in wealth, education, and cultural priorities, illuminate a debate regarding the appropriateness of such projects.

Riley, for example, questions whether the allocation of significant resources for student travel to project sites in developing communities is justified; whether the benefits are mutual between the visiting students and the local community; and whether a loose collection of even hundreds of small-scale volunteer engineering projects can effect necessary development in poor nations[1,2]. Riley and others further raise the point that international development work, including with engineers, must be done in cooperation with, and not simply for, the recipient developing community[3,4]. Some argue that funding agencies should remove contingencies that specify procedures that are conventional in the rich world, but inappropriate for developing communities; instead, funding allocated for developing communities should allow local designation and specifications[5]. In particular, technologies that are truly appropriate are generally simple and can be understood and maintained by the local recipient community[3,6].

With reasonable awareness of these questions and issues, we reflected upon our motivations, usefulness, and impacts as members of a new EWB chapter at the University of Wisconsin-Milwaukee (UWM). We recently completed our first project in the small village of Quejchip, in the northwestern highlands of Guatemala. Quejchip's potable water comes from natural mountain springs located at various elevations throughout their village. As the village's population of 460 residents grows, they will inevitably build new homes and move up the mountainside. In 2007, the village purchased a spring at the highest altitude available in hopes of building a distribution system for the upper part of the village located above the existing water system. After our initial site assessment visit in June 2007 and a year of subsequent planning and designing, our EWB student chapter returned to Quejchip in June, 2008 to build a water distribution system fed from the newly purchased spring. These visits and related activities were funded by the UWM Student Association and several other fundraisers organized by our membership.

We agree that there are many problems associated with engineering students performing work in developing communities, and that there is a profound need for greater institutionalization of engineering efforts that are focused on serving impoverished and developing communities[6]. However, we also realized that groups such as ours can, in fact, play a critical role for some communities as long as some of the basic tenets of

appropriate technology – particularly those of simplicity of design and listening to the recipient community – are followed. As we conducted our work with this understanding, we profoundly discovered that trust is the foundation on which a project with truly lasting and mutual benefits must be established.

Therefore, we explore the concept of trust and how it relates to the broader disparity-based tensions outlined above. As is well established in EWB projects, we worked closely with an in-country coordinator. Certainly we relied on him as the catalyst to establish our credibility with the local community, but equally importantly, we noticed key differences in attitudes amongst all parties that seem to have resulted after we made a repeat visit. The repeat visit not only allowed us to take advantage of prior knowledge, but it also demonstrated our continuing commitment to the community, and allowed us to earn their trust. This, in turn, further opened channels of communication that enabled closer collaboration and exchange of ideas as our project continued.

In particular, we identify four types of trust-building that we experienced: (1) trust that we earned from the community as we handled and tested their drinking water; (2) trust that the community earned with us while they changed our design to appropriately fit their needs; (3) trust that we built amongst ourselves within our EWB chapter learning to depend on our preparedness and sensitivities; and (4) new levels of trust that emerged within the local community as they confidently claimed ownership of their new water distribution system.

As we will articulate, our ability to cooperate in future development projects that embody indigenous needs depends on continuing to cultivate this trust. More broadly, we argue that trust-building, centered around long-term relationships, is a central principle that must be incorporated into engineering projects in developing countries.

The Four Trusts

The first major trust that we describe is the trust that Quejchip community placed in the EWB student chapter. Because of the recent violent civil war in the area, the people were suspicious and doubtful that we were who we said we were and that we were going to help. We experienced this suspicion during the data acquisition trip in 2007 when we collected water samples. Knowledge of "invisible" bacteria in water, and water testing procedures, were essentially foreign to the villagers. Although we collected the water samples in the open, we conducted the actual testing in the car because we saw villagers watching us from the mountain side. This was because our in-country coordinator cautioned us that, based on his experience, trouble could brew if on-lookers suspected that we were poisoning their water source. We therefore made an effort to avoid suspicion that could have started a devastating misunderstanding between the villagers and our EWB group.

However, during the follow-up implementation trip in 2008, the villagers of Quejchip were much more open to our analysis of their water. They assured us each day that their water was clean and good, this was always followed with the question "right?",

indicating that they were now relying on us for information. A few days later when the coliform tests showed results and we were all able to see the great numbers of colonies of bacteria that had grown on the Petri dishes, they understood that their water was contaminated with fecal coliforms. They then asked us to return and chlorinate the new system in 2009. The fact that we were invited back for a third visit showed the trust that this community now has for us.

The second major form of trust that was developed was the EWB student chapter learning to trust the community. As college students we perhaps assumed that we were smarter than people who do not have a formal (American) education. But we learned that people who live off the land know a lot about that land's capacity and how it creates life for them, and therefore they know what does and does not work in their environment. We were shown this when our plan for piping water from the spring boxes – a plan that we had spent more than a year developing with consulting engineering professionals, professors and our in-country coordinator – was changed by the village elders prior to our arrival.

Our plan had professional specifications and was drawn on CAD, whereas theirs was a rough hand-drawn sketch that no American engineer would have even considered. Whereas our design called for the pipeline to circumvent a mountain, the villagers' new plan directed it over the mountain. Although skeptical, we re-surveyed the land and discovered that the new route was feasible. In the process, we discovered the wisdom of the villagers' design. The ground around the mountain consisted of very dense rock that would virtually prevent the digging of a trench for the pipeline. But the soil traversing the top of the mountain was rich, deep, soft, black soil that easily allowed us to dig a trench for the pipeline.

The villagers' new plan also addressed their deepest concern, which was that everyone in the village have direct access to water. It linked all of the spring boxes and distribution tanks of the old system with the new box and tank to be constructed. This impressed us with their depth of thought and their ability to plan for the future, anticipating Quejchip's growing population that is building homes and farms up the mountain above the present water distribution system.

We not only learned to trust their knowledge of the land but also to trust that they would supply workers and transportation to the site. Although the in-country coordinator told us this was not a problem or a worry, he did express doubt that the transportation would be reliable. The villagers, however, picked up our group every morning and dropped us off every afternoon proving that they were indeed reliable. Once on the site they never failed to be ample manpower from villagers. Moreover, they provided daily lunches including bottled water to make sure that our health was not impaired so that we could complete the planned project.

All of the above would not have been possible if we had not developed the third type of trust – the trust gained within our chapter's membership. Traveling with peers to a developing country where our usual daily amenities were unavailable is a bonding

experience. Together we encountered dirty tap water, latrines, bunk house sleeping facilities, bugs, dirt, rain, cold, and diarrhea. Needless to say, even though everyone was physically uncomfortable, we needed to get the job done. Each traveler had a role in the group. One carried the walkie-talkies, one carried the water testing equipment, one offered Spanish translation, and one carried the tape measure. Communication at the work site, which spanned a distance of 1.5 kilometers, was vital. We instinctively listened to and respected each other from the moment we arrived on site. We did not even realize how well we began to work as a team until part of the group returned home after one week, leaving the others to complete the project phase. We realized as we began to forget various items at the bottom of the mountain, for example, that we had to redevelop the group structure and communications.

Because of the great trust that was built within our group and the successful completion of phase I of the water distribution project in Quejchip, we have since gained the National EWB trust. In order for our student chapter of EWB to complete a project in Quejchip, Guatemala our group had to gain the trust of the national EWB who basically gave us permission to use their name and travel to Guatemala to implement a project. Since that first risk taken by EWB-USA and since the trust growth within our student chapter, EWB National has learned that we are reliable and therefore awarded us grants and support that make it easier to complete future projects.

The fourth type of trust that we observed developed within the village community. At first glance, the villagers did not seem to need to cultivate internal trust because they already did rely on one another. They were confident that they knew the design that would be best for them. They knew they had the ultimate decision on what the project design layout would be.

During construction, the trench diggers hit a pipeline that traversed the mountain and brought water from another spring to a different area. The pipe was patched and buried. When one of the EWB students suggested that we mark a spot on a large rock or flag on a nearby tree, so that the villagers would remember the location of the leak in case the patch deteriorated and further repairs were necessary. But the water committee leader assured us that they would remember the location of the patch. We clarified that the marker would be for future generations to let them know of the weak spot. He replied with great respect that we had a good point, but assured us that they know their mountain. This seemed to display the confidence that the villagers placed in each other, even in the presence of our suggestions.

The villagers also trusted their people to report for work, perhaps in part because they had formed an agreement allowing families of the male villagers who worked with the project to receive free water from the system. Men over the age of 70 were exempt from the work requirement and were still eligible to receive free water. A bookkeeper wrote the names of the volunteers who worked each day to settle possible disputes.

In general, the Quejchip villagers take pride in their water. They trust that it gives them life and they drink it without question. Once we showed them the coliforms in the water

samples, the desire to chlorinate the system seemed to come from a desire to take care of their people and their way of life and their lifeblood. They trust their community and elect officials to govern and protect their way of life. The leader of the water committee was so well trusted that he made sure that he understood the system and the new methods that we introduced. He visited with the water tester daily to report any new information to the entire community. He trusted his leaders and those he led by listening and appreciating what they said, but ultimately he knew he was in charge of the water.

Conclusions

Our experience in Quejchip has taught us many lessons about the need for developing trust, the types of trust, and how to establish trust. The willingness of both the students and the villagers to trust "the other", as well as "each other", were all important for the benefit of the project. Correlated to these types of trust building was a true exchange of ideas in which the students and the villagers both provided key contributions to the project, leading to its maximum success. We believe that our continuing relationship with the community of Quejchip will allow us to make even further progress by building on our previous experiences.

More broadly, we believe that the awareness of and openness to trust building is an essential tenet that should be held by members of "rich-world" communities who conduct international development work, including engineering students and practitioners. While we acknowledge some fundamental limitations of student volunteer projects, we see that trust, if sincerely sought and earnestly built, can maximize the efficacy of the project by enabling the students to directly incorporate the community's needs, and the community to continue operation and maintenance even after the students have returned home.

Bibliography

1. Riley, Donna. "Resisting Neoliberalism in Global Development Engineering", *Proceedings of the American Society for Engineering Education Conference & Exposition, 2007.*
2. Riley, Donna. *Engineering and Social Justice*, Morgan & Claypool, 2008.
3. Smith, Amy. "7 Rules of Design From MIT's Guru of Low-Tech Engineering". *Popular Mechanics*, July 16, 2008. Available at http://www.popularmechanics.com/technology/upgrade/4273680.html.
4. Parsons, Laura Brigitte. "Engineering in Context: Engineering in Developing Communities". *Journal of Professional Engineering Education and Practice*, October, 1996.
5. Ricigliano, Robert, Director, Institute of World Affairs, University of Wisconsin-Milwaukee. Personal Conversation, November, 2008.
6. Papadopoulos, Christopher, and Andrew T. Hable. "Engineering as an Enterprise of War and Peace", in *Engineering in Context*, Academica, 2009.