Lessons in Tanzania

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Learning by helping: MSU students engineer solutions in Africa

Long before Michigan State University adopted the “Who Will? Spartans Will” brand, a group of Spartan students showed their will—and ingenuity—in building an Internet-enabled, solar-powered computer system. Then they took the system to a remote village in the Rift Valley of northern Tanzania and installed it in an elementary school. This gave Tanzanian students and teachers access to the vast educational resources and information of the Internet in a place that lacked not only computers, but the electricity to power them. That was in 2008.

Unlike many other international projects, this was not a one-time deal. Michigan State University students, primarily engineering and communication arts undergraduates, have returned year after year to improve and expand the project that now encompasses three elementary schools and two secondary schools.

The project was funded in part by corporate partners with start-up funding from MSU. However, to continue the project additional funding is needed.

“It all began when Lenovo, a computer manufacturing company, wanted to sponsor a senior capstone design team in electrical and computer engineering to work on technology for creating cost-effective, solar-powered computers for a developing country,” explained Erik Goodman, professor of electrical and computer engineering (ECE) in the MSU College of Engineering and director of BEACON, an NSF Center for the Study of Evolution in Action.

At the time Goodman was teaching the ECE capstone course where seniors design real-world solutions for a variety of projects. He teamed up with faculty members from the Department of Media and Information in MSU’s College of Communication Arts and Sciences and got the idea approved as a senior capstone design project. In the spring of 2008 a capstone team along with more students in the fall of 2008 took up the challenge of designing an innovative, multi-seat computer system and a solar power system to run it.

Meanwhile, Goodman and Jennifer Olson, an associate professor in the MSU Department of Media and Information whose research is in communication technology in Africa, went to Tanzania seeking a site to install the computer system. Olson’s familiarity with the country helped in finding a town with appropriate housing for MSU students and the perfect rural primary school. The town selected was Mto wa Mbu, southwest of Mount Kilimanjaro.

In December 2008, the MSU students and professors headed to Tanzania. There they were joined by faculty members and electrical engineering students from Tanzania’s University of Dar es Salaam. The group worked from dawn to dusk to assemble, install and test the system in the school—the first primary school in Tanzania to have Internet access. They were undaunted by the lack of electricity, the extreme heat and dust, many large and small critters chewing on wires and parts, and excited users who had never touched a computer before. In the end, the computer system the students had designed turned into a strong, rugged system that uses little power. It has forever changed the lives of Tanzanian students and teachers. However, the project also had an effect on the MSU students.

“My experiences in Tanzania both as an engineer-in-training and as a young man are immeasurable,” said Eric Tarkleson (BS ’09, MS ’13, Electrical Engineering), who went with the first group of students in 2008 and ended up returning 11 times as part of the project. “Traveling to a place like Tanzania as an American for the first time shifts one’s perspective. My views and ideas are different because of my travels and experiences there.”
Today there are five schools in and around Mto wa Mbu with enhanced technology and Internet access that are improving Tanzanian students' learning experience and helping teachers to provide students with more and better information. MSU students continue to develop improved computer, power and communications systems. A few years ago the project became an annual month-long MSU Service-Learning Study Abroad Program open to students from any major.

“When we first went to this village and installed the computers, the teachers had never used computers,” said Olson, “They were afraid to touch them and wouldn’t let the students touch them for fear they would break them.” But Olson and others who have made repeated trips to this village now really see the difference. “Now the teachers are much more familiar with computers,” Olson explained. “They have email and Facebook accounts and are using computers in their teaching. There also are computer clubs for students, many of whom can speak knowledgeably about using computers and the info that is available.”

The project continues to be an exciting challenge for MSU students. “They have to decide what hardware to replace, what to replace it with, and there is a lot of technology that has to be figured out, parts ordered and tested before any of the teams leave the U.S. because once we are on the scene it’s too late for that kind of work,” Goodman explained. Making the computers relevant to the educational system in Tanzania, too, is a challenge. MSU students have developed new software, adapted educational materials for the local setting, written guides for using the computers, and provided computer training to Tanzanian teachers and students.

In addition to the expansion of computer systems, the project has expanded in other ways. “We now have a local Tanzanian with expertise in computers, to keep things running all year long,” explained Goodman “He’s a computer specialist who does training and repairs in between our trips. He knows how to fix anything when something goes wrong, which, as we all know, can happen when working with computers.” So, the teachers and students have working equipment all year long; this regular maintenance, according to Goodman, is a vital part of the project.

The 2014 project was an ambitious effort to address the critical teacher shortage in Tanzania. It involved designing and installing a video conferencing system between the two secondary schools. This system allows a teacher to teach in one school, and simultaneously teach a class in another school. In the distant classroom, students can see and hear the teacher, and the teacher can see and hear them. To make the system work, WiMax antennas were installed at each school along with cameras, projectors, screens, white boards, microphones and speakers. Since communications between schools are ensured with WiMax, access to Internet is not required.

“The reason we developed a video conferencing system and why the Tanzanians are so excited about it is because there is a severe teacher shortage in Tanzania, especially for more advanced subjects like physics,” said Olson. “With this system, one teacher can teach in two schools at the same time.”

The 2014 project, as have all the projects, involved expertise from MSU students with varied skills.

Sean Rabaut, a junior majoring in computer science, oversaw the video conferencing system project and trained Tanzanian teachers on how to use the system. Linlin Liang, a graduate student in the Department of Media and Information, worked on a survey to help gauge program progress and make future improvements.

“Tanzania is a beautiful country with friendly people, nothing like the stereotypes about the African continent. Students are eager to learn more and access educational materials. Meanwhile, teachers are attempting to improve their teaching skills and gain more knowledge by using computers,” explained Liang who was impressed with how quickly students learned computers skills. “The project helped me to be more sensitive to cultural environments and appreciate more about multiculturalism.”

Civil engineering sophomore Nathapol “Jame” Wisanphokha downloaded more than 2,000 math and science educational videos. Wisanphokha, an international student from Bangkok, Thailand, believed the project would be a good opportunity for him to gain new experiences in a different country and also to give him teamwork experiences with his fellow American students.

“In Tanzania I had a chance to perform the traditional Maasai jumping dance with some of the Maasai people. That was an amazing experience,” said Wisanphokha who, like others working on the project, found that the Tanzanians love soccer. “I still remember sitting in a middle of a group of Tanzanian people and watching the FIFA World Cup with them. I had a chance to talk with Tanzanians about soccer even though I did not know them because we all like to talk...
Goodman and Olson believe that the most important thing MSU students take away is self-confidence. “They go to a country halfway around the world that has a completely different culture. But our students see that they are able to communicate with people and install or complete the project as planned,” Olson said. “Our students walk away with a better understanding of different cultures and see how they can work in that culture and how they can contribute.”

Wisanphokha used the experience to improve his English. A native of Thailand, he was afraid to speak English because he thought that people would not understand him. “But when I was in Tanzania, I had to communicate with professors and colleagues, so my English improved,” Wisanphokha explained. “I also realized that it is OK to make an error in speaking. Sometimes people may not know what I am trying to say because of my pronunciation, but they always try to understand. So right now I feel more confident in my communication skills.”

For Eric Tarkleson, his many trips to Tanzania have had a major effect on his life. “The experiences like this look great on paper and transfer well to any job environment,” said Tarkleson, who received his BS degree in ECE in 2008 and went on to get a master’s degree in electrical engineering with a concentration in power electronic systems in 2013. “The solar-powered computer project gave me the confidence and the resume to really choose to do something I enjoy,” said Tarkleson. He had been working as an engineer in the Cincinnati, Ohio, area, but in April Tarkleson will return to Tanzania to work for Off Grid Energy, a startup company selling solar energy.

Erica Hays, now a supply chain specialist with ABB Inc. in Houston, Texas, who graduated from MSU in 2014, went on the 2014 trip to Tanzania. “This was by far the best experience of my life to date. If I had known about this program my freshman year, I would have been there all four years.”

The impact of her experiences in Tanzania was “huge” as Hays describes them. “The teachers were so grateful for everything we taught them and are such active learners. They asked questions and absorbed all of the information.”

Like Tarkleson, Hays believes her experiences have changed her career path. “I know I want to help people, especially in developing counties,” Hayes said. “ABB is a global company so there is the potential to work in a developing country. Also because of my experience I place a higher emphasis on relationships. The people in my life are really what matters. It’s not about getting the newest clothes or having the best technology anymore.”

**Bridging the funding gap**

The organizers of the long-running project to bring computers and Internet access to students in Tanzania are now trying to raise private funding to keep the program going.

“We have sought grants working with Tanzanian partners to expand the program, but so far we have not been successful,” explained Erik Goodman, professor of electrical and computer engineering and director of BEACON. Most grants are for developing new technologies, not for adapting existing technologies for a different, if very rugged, environment. Goodman and Jennifer Olson, associate professor of media and information, organized the first project in 2008 using start-up funding from MSU and a donation from a private company. Over the years other companies have provided some support. But the project also has expanded.
“We need support to pay our Tanzanian computer expert who keeps the system running when we are not there and to pay bills from our Internet provider,” said Goodman. In addition to the yearly student trip to Tanzania, Goodman and Olson, who still spearhead the project, make a second trip to Tanzania each year to set up the next year’s program. Also, rental vehicles are needed to transport students and equipment to the remote villages.

For more information on ways to donate to the project, contact Erik Goodman at goodman@egr.msu.edu or

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