TEACHING COMPUTERS IN TANZANIA

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Abstract

I Spent fall of 2012 in Iringa, Tanzania teaching Computer Science at Tumaini University. This paper is a reflection on the challenges and joys of teaching in a far different culture and environment than we have here in the United States. I hope to inspire students and faculty to go outside their comfort box and teach in Africa.

The St. Paul, (Minnesota) Synod of the Evangelical Lutheran Church of America (ELCA) has a long relationship with missionaries in Iringa (1), Tanzania. Missionaries from the church have been in the region for over 30 years. These missionaries worked to create hospitals, high schools, orphanages, and a university. Tumaini University (now called the University of Iringa) is a liberal arts university with courses in business, computer science, theology, law, education,(2). For a number of years teachers, engineers, and others have been able to spend 3 months in Iringa teaching at the University. For my 2012 sabbatical, I spent 3 months teaching a seminar on a senior thesis and discrete mathematics for computer science. (3). These are some of the challenges teaching in Eastern Africa.

Language difference – eastern Africa teaches in English but words can have very different meanings there.

Technical words challenge the students. I use "Petit Math" where we round off numbers to make estimates easy. For example 10 = 2 to the 3rd power. When converting from binary to decimal, Petit Math can give you a rough estimate quickly. African students are very uncomfortable with estimations. They have mobile phones that calculate out to 8 decimal places. (I tried to convince them that we don't know any number to 8 decimal place – except perhaps the speed of light.) Additionally, students are not well acquainted with mathematical symbols. They wondered at the approximately and proportional symbols. When one has only a small blackboard to work with, symbols become important. By all means, explain all symbols and short cuts in great detail.

Just as an example, in discrete mathematics we must often evaluate expressions where some terms dominate and others can be ignored. These students look at a mathematical term and think number ($2 x^2 + x$ = 10 if x is 2 and 20,100 if x is 100). The concept of ignoring the first order term makes no sense. Write out a table of these values and try to convince students that the square term dominates. I suspect that their understanding of calculus and limits is also spotty. They know the derivatives but not what they mean.

Take time to search student's understanding. Do examples many times. Put in real numbers on all examples. Slow down. They hear the words and understand most of what you say but find it difficult to relate the words to the mathematics.

Background differences – Expanding on the language differences, be careful of background differences.

You have lived a very different life than your African students. A couple of examples would help. Probabilities lead us to discuss the possibilities of having two with the same birthday in the room. I posed that question and received a room full of blank stares. Many students do not know their birthday and most do not celebrate as we in the west do. This turned out to be a wasted demonstration and may have appeared insensitive. I went to other statistical examples. Another case arose when discussing mathematical relations. Many of the examples of relations use things such as if Bill knows Tom and Tom knows Ralph, how are Bill and Ralph related? This is difficult for students to understand because their understanding of "knows" may be "related to", "friends with", "of the same tribe" and many others. This leads to students focusing on what "knows" means and not the fact that we are trying to mathematically describe how objects are related.

Teacher/Student Interaction – very important.

We have gotten used to relating with our college students as contemporaries. We can address each other by first name, exchange phone numbers, friend each other and tweet away. African students (and students throughout the world have a much more formal relationship with their instructors . Each class has a class representative whose job it is to distribute assignments, collect assignments, present questions to the instructor and so on. I was fortunate that my class representatives were very active and helpful. This may be a good idea in all of our courses here in the U. S. . Your responsibility will be to open communication with the class representative and keep the communication going. The class representative will copy and distribute anything you may need. I used the MIT Open Courseware Discrete Math course (6.042) as the basis for my course. I provided the class representative with a CD with the MITOCW course and students were able to copy that CD into their computers. Don't assume they understand – probe and use the class representative.

Computer Resources – What will you encounter?

Most university students will have their own laptop computer. They will be fairly up-to-date and easily handle most programming languages and documents. The computers will have a problem with viruses as there are few virus protection systems and many threats. I recommend that if you are to bring software, bring it on a scanned CD that you make from a clean PC. Also, bring AVG or some other free anti virus software to install on students' PC's. I installed Norton on my computer and brought an AVG CD for the class.   Bring any other software (Java SDK, Adobe Reader…) that you think the students may need.

As for the campus computer system, most will be very limited. They will have an on-line grading system and most likely some library management system. But don't count on e-mail or file storage. I found no classrooms with projectors. Bring a projector if you can and it will be very useful (plus, you will be a popular resource on campus).

Don' t assume that there will be printing resources for assignments, hand outs and tests. I found that the printers were there but they had no paper or the paper was there and the toner was empty. Give routine printing assignments to your class representative well ahead of time as they can track down a working printer and paper. You may also have an administrative assistant in the department. Give them tests and such to print – they know the system.

The library will be very scant and especially weak in journals and up-to-date material. You may consider shipping ACM or IEEE journals that you may need or

bringing copies of any articles you may need in class. If you cannot get the copying done at the school there are numerous stationery stores in town that will copy for you. Negotiate the copying prices and with these stores and you will make great friends.

Mobile Phone Culture – cell phones run their world.

All students will have at least one mobile phone. In Tanzania, one buys a phone ($80 or so) and a SIM card for a particular service (another $40 or so) to get started. Almost all phone use is pre-paid. You get a scratch-off chit from a little kiosk and enter the number to give you another $10 or more of phone use. Calls to phones on the same service are typically $.01/minute and calls to phones on other services are $1.00/minute. Faculty members carried 3 phones (Airtel, Tico and Vodacom) and laid them on their desks as they arrived in the office. I used an Airtel phone that one of the St. Paul missionaries uses whey he is in Tanzania. Texting is very useful and students will text you before they e-mail or call. I spent about $20/month for cell phone use and I highly recommend you get a local phone wherever you go.

Internet Connectivity – mostly wireless but not quite up to 3G standards.

The same mobile phone companies provide Wide Area Wireless networking for your computer. The Airtel system was $40/month for wireless connectivity. The first 2 Gigabytes operated at 300 kbps to 500 kbps and covered most of the city. After your 2 Gigabytes, the speed dropped to 50 kbps for the rest of the month. You won't find that information anywhere in the documentation and most users don't use their Internet connection for significant amounts of data. I ended up getting two Airtel wireless modems (they connect to the USB port on your computer). One was used to download large items until its 2 Gigabytes was used and then I used that one for e-mail and other slow needs. I kept the second modem for large jobs that would take forever at 50 Kbps. The campus had a wired network, but it was so slow and unreliable that I used my own wireless Airtel modem on campus as well.

Culture – personal relationships are vital.

More than anything in the world, the Africans value interpersonal relationships. A typical encounter with a student or faculty goes like this:

"How are you? How is your family?
"Fine, thank you. I spent the weekend at the choir completion at the Lutheran Synod. My wife is sewing table runners today. How are Samuel and Grace?" (His children.)

"Fine and they are hard at work on their school work. Samuel is learning some geometry and Grace is working on her spelling."
"Do have plans for the upcoming holiday? We are going to Matema Beach."
"We are visiting my wife's family in Ilula."
"Good to see you and blessings to you."
"Thank you, and best of health to you too.."

You might think this is two long lost friends meeting after years of separation, but no! This is a typical daily meeting and often stretches longer than this. As an example, I made an appointment to meet with the Department Chair at 3:00 PM. At 3:05 PM I noticed the Chairman had started to walk the 100 yards from the classroom building. At 3:10 I looked up to see him talking to one of the other faculty. At 3:30 PM he had moved a few feet to talk to a student. At 3:35 PM he made it to the office. Time is not a constraint in their lives. Expect to wait and give them lots of time. Classes start on time; but, often the buses are late and students will wander in for 20 minutes.

The Educational System

Their high school and college experience is different. Most East African school systems used the English system naming high school grades as "Form 1", "Form 2" and so on. Students advance through secondary school (our middle school and high school) with tests that determine if and where they may go to college. Most students can enter the University at 17 or 18, but few in Africa do. Most of the university students are well beyond the traditional "freshman" age. This has the advantage that the students are often more mature and worldly inn the African University. Unfortunately, you will encounter students who have had long gaps in their schooling and will be very rusty on the fine points of mathematics, for example. This was my biggest hurdle. To teach discrete math, one must use symbols and concepts which may be were covered in secondary school but maybe not. I had to step very slowly through mathematics such as:

> Summation – did they understand the sigma symbol?
> Statistics – what are independent events?
> Integration – how does discrete summation relate to integrals?
> Power Series – why can we just use some of the terms of a power series?

College Scheduling

Classes are scheduled in different classrooms and different times during the week. Often class schedules are modified in the morning if the faculty is called away for a meeting or training. We had a speaker come in to talk about effective class management on a Saturday. I had one of the faculty who lived close by text me when

the speaker was to start and we would rush down there... No text. Then on Monday the secretary said the speaker would be there and we should attend the training session... No speaker! Finally on Wednesday – unbeknownst to students, the Dean had the faculty come to the training session now that the speaker was really there. Of course, I had scheduled student interviews about their thesis papers for that day and couldn't really postpone those interviews as the semester was getting late. I did not attend the training and tried to tell the class representative that interviews were on as scheduled. Students kept most of the appointments, but the school really doesn't understand scheduling and working with complex calendar requirements.

School Administration -- different priorities from western managers may make things difficult. As in the section above, the administration is trying to do the right thing, but their priorities may be hard to understand. Money is a big problem as the students have very little. There are government programs for grants and loans to the students, but these are burdensome and slow. Often the money is awarded after the semester starts. Students are forbidden from registering without the tuition money, so they will start coming to class and not show up on the class list for a month or so. I didn't know how to handle this so I accepted everyone into the class and made grades for all the students who participated. In one class, my class list had 28 names and I gave in grades for 43 students. You will have to be aware that the finances and student attendance are closely coupled and have to check with the policy of the school in each case.

General observations

1. In addition to the challenges, teaching in eastern Africa is an incredible experience. You will be able to see some of the last remaining African wildlife and experience a culture and people not seen in the rest of the world.
2. You will learn to appreciate the resources of your home school and be thankful for the facilities we take for granted.
3. You will provide a vital service to a growing system of higher education that really needs experienced teachers.
4. You will make some great friends and learn again how important you are to your students and your students are to you.

References:

1. St. Paul Area Synod Bega-Kwa-Bega Program – http://www.begakwabega.org/

2. University of Iringa: http://www.tumaini.ac.tz/

3. Noel Petit Blog for 2012: http://tanzaniapetit.blogspot.com/