

West African Capstone Project Update

We are building a student based collaborative partnership between Elizabethtown College (EC) and the University of The Gambia (UTG) with the goal of establishing and maintaining a sustainable business in The Gambia. This effort is being sponsored by and mentored through the EC Social Enterprise Institute. The business will be built on the social business model designed to alleviate the effects of poverty in this developing country through affordable technologies centered on sustainable energy systems. The two institutions involved will support the startup with ongoing technology and business research and development. The program is being developed by expanding existing courses to include this international/multidisciplinary collaboration centered on developing appropriate technologies in the sustainable energy sector.



During the 2015-16 academic year, a group of 3 engineering students developed a prototype of a supercapacitor utility light which could be charged off the PV phone charger. The lamp should be further developed into a commercial product that could sell for approximately \$15 each. Using a capacitor for energy storage will allow for a much longer product life than battery powered lamps. To date, 20 EC students have contributed to this project along with a similar number of UTG students.

Our work relies on regular peer to peer interaction with our partners at UTG.

In January 2014, we left 12 PV phone chargers in the field for extended testing. Based on those results we improved the design of the charger to resolve a couple of concerns revealed in testing. With that new design proved out in bench testing over the summer of 2015, we completed a two week August 2015 site visit to UTG:

1. Brought supplies for 250 phone chargers. These supplies will be assembled into PV phone chargers in West Africa as the first trial run of a start-up cottage social enterprise managed by a group of UTG students and staff.
2. We consulted with the UTG students and faculty regarding the social business pilot. Dr. Dmitriy Krichevskiy (Elizabethtown College, assistant Professor of Economics) joined the travel team to help foster this consultation.
3. Retrieved field testing results to confirm reports of successful use. Some failures of wiring connections were reported. We believe these failures were limited to the area

where the wire insulation was removed and the regulating circuit was wrapped in heat shrink tubing.

4. Researched local materials available relevant for the gravity light design. Detail design and prototype development will occur during the 2015-16 academic year.

Participating students and faculty also continued our effort of building a peer to peer mentoring network and gain firsthand understanding of the cultural, social, political and economic conditions in The Gambia.

For our first product, the PV phone chargers provided us with a simple device, with the potential to make a major impact in the lives of Gambians. Our current design could be assembled in The Gambia and sold at cost for no more than the equivalent of \$10/unit. The device can fully charge the typical basic phone used in the rural areas in a few hours in full sun. During the 2015/16 academic year a team of physics students at UTG have been piloting a social enterprise to manufacture and distribute 250 of these PV phone chargers. The team is making good progress and should begin the sale of finished units soon. With the sale of each unit, the material and labor costs to produce and distribute each unit are recovered. These revenues will then fund the next production run. The students are operating this social enterprise under the UTG umbrella as a practical training program. The students' work is paid as student employees of the social enterprise, so that the model could eventually spin off as an autonomous enterprise, allowing technology to propagate across the country without charity input.



Elizabethtown Professor Dr. Kurt DeGoede (Engineering) has been collaborating with Dr. Momodou Jain (Physics and Engineering) at the University of The Gambia (UTG), since Dr. DeGoede spent a year as a visiting professor at UTG in 2010-11. Yusupha Touray the Director of Planning and Research at the Ministry of Education also works closely with the team. Through Dr. Jain and Mr. Touray the team has strong connections throughout the ministries of education, energy and justice. We are also working closely with Saikou Njai a US and New Zealand trained Gambian engineer and project manager who is the field placement coordinator for 20 US Peace Corps volunteers positioned throughout the rural areas of the country.

As with other international service learning experiences the professional perspective of the EC student participants was shaped by participation in this project. The students identify increased interest in seeking employment or graduate school programs focused on improving quality of life for others, and scrutinizing the social ethics of potential employers. The process of acting across cultures changed how they approach problems and understand the world, helping them understand how to define the real problem in a difficult situation.

- “This project really solidified my decision/want to work in international based companies that will better the life of someone else.”
- “The strength of this program lies in connecting cultures and experiences to work towards a common goal.” “It has changed how I approach problems and how I view the world as a whole.”
- “Working directly with a customer is an eye opening experience. It gives context to problems and helps to establish what is truly needed in a solution.”
- “Participating in the solar phone charger project reinforced the idea of working in a field where I may be able to have a larger impact on communities and people’s lives.”
- “I am hoping to go to graduate school to continue research in methods to help improve quality of life for individuals all over the world. Also, I look into companies business practices, and a major quality I look for in a company is its business ethics. I see the much bigger role that engineering has on individual people, families, and entire communities.”

Unlike most other projects, we have also been able to observe the impact of this collaboration on the professional development of peer students in the developing nation. The UTG students speak of improved career opportunities, praising the practical training in the community based projects. Alumni of the program identified specific skill development that led to their employment: PV system design, determining the root cause of a problem and systematically formulating a solution to that problem. Through the program they came to understand the connection between engineering and business to develop an economically successful enterprise.



- “I have had the opportunity to choose a career that is related to renewable energy and Physics in general. I was able to make such a decision through my participation in the projects which subsequently enhanced my capacity in career decision making.”
- “I was able to decide without ambiguity or doubt that I want a career in Renewable Energy technology after completing the courses experimental physics I & II (which involved mainly the design and or sizing for solar PV systems)”
- “I better understood engineering as an area which deals with solving real life problems and a tool that can be used to turn businesses into success.”
- “It has enabled me view engineering and Physics as a fruitful and problem solving oriented career than just an academic discipline. It helped greatly in rendering service to the community, particularly those of pressing concern to the people.”

- “I for example used the skills and knowledge acquired from this program to get a job at a private solar firm as my first job after graduation.”

These students also paralleled the EC students in experiencing an awakening of a humanitarian spirit: “[...] having been a part of the community based projects that emerged from the Photovoltaic course at UTG (the pioneering badge) had helped me harness my zeal to serve others. I had always perceived Physics to be self-involved field [...] Those few months of my Photovoltaic project was an eye opener for me as it was what helped me aware that I had always had a dormant quality in me that was never awakened, a quality of being a humanitarian and using my love for science for the greater good. It was a moment that I wouldn't change for anything.”

Portions excerpted from EESD15
(<https://open.library.ubc.ca/cIRcle/collections/52657/items/1.0064749>)