Projects Overview

Empowering the Physically & Mentally Challenged

For nearly a decade students and educators in the Collaboratory, including Dr. Ray Norman and Dr. David Vader, have partnered with *Handicapés en Avant*, a ministry of Serving in Missions (SIM) that is run for and by disabled persons in Burkina Faso, West Africa. The ministry reaches one of the most marginalized peoples in one of the world's poorest countries. *Handicapés en Avant* helps all people with handicaps, physical, mental, visual, or auditory, and regardless of gender or religion. Services include physical rehabilitation, assistive technologies, education, and employment assistance to more than 300 children, young adults and their families. *Handicapés en Avant* also works with family members and the public raise awareness about the potential and the needs of the disabled among them. The Collaboratory has partnered with *Handicapés en Avant* to provide assistive Energy, Mobility, and Water Access technologies (see below), and instructional resources to increase Math Literacy. Considering our experience with handicapped persons in Burkina Faso, World Vision Mali, with encouragement from Water Aid and Handicaps International, has asked Messiah College to study the issue of water accessibility for the handicapped.

Microenterprise & Entrepreneurship

The Microeconomic Development Group (MED) of the Collaboratory partners with communities to develop, analyze, and expand business opportunities with the goal of supporting and growing local economies. We are currently partnering with *Eglise du Christ au Congo-Direction des Oeuvres Médicales* (ECC-DOM) in the Democratic Republic of the Congo to establish palm oil based biodiesel production in the Congo. Our Energy Group (see below) is developing the technology, while the MED Group is working with a doctor to developing a business plan for linking profits to community health care. Another important partnership is with Compassionate Ministries of the Zambian Brethren in Christ Church (BICC) and the local Dillsburg BICC congregation. Funds and personnel provided by the Dillsburg congregation are enabling a Collaboratory team to work with partners in Zambian to identify best practices for economic development in Compassionate Ministries Simaubi Economic Development zone. We are identifying small business opportunities and gather data needed to create business plans and equip local entrepreneurs. The purpose of this project is to provide work that will enable HIV/AIDS orphans and survivors to live with dignity.

Fraud and Internal Auditing and Controls

Accounting Professor Jim Krimmel worked with an alumnus and accounting majors to develop a week-long workshop on Fraud Prevention and Detection. Jim and his team spent 2 weeks in the summer of 2005 in Ghana providing a workshop for 30 World Vision Finance Officers from 18 African nations. Fraud prevention is imperative for World Vision, the world's largest relief and development agency, particularly since the organization receives a substantial portion of their funding through child sponsorships. The team also worked with the Ghana National Office of World Vision to develop internal controls, and plans to visit additional National Offices in future years. In 2006, professor Krimmel assembled another team and delivered a workshop in the Ukraine for Hope International staff.

IT Applications for Service & Missions

Professor Brian Nejmeh and his students are developing a computer application to help program managers in World Vision to track ministry activities and assess outcomes. Two of Professor Nejmeh's students spent 10 weeks in Mali in the summer of 2005 developing a proof of concept prototype. The team has now worked with the World Visions IT leadership team to refine the application, and we are in conversation with World Vision about implementation throughout this international organization. World Vision has awarded funding for field testing through the Mali and Sierra Leon national offices. Professor Nejmeh also has a Project Development Grant from the Collaboratory to promote active partnership between Messiah College and the Central PA non-profit community with respect to information technology projects. The project solicited area Non-Profit Organizations (NPO) for IT-related projects, and developed an evaluation framework for selecting IT projects to be performed by faculty-student teams.

Aviation for Development & Disaster Relief

The Collaboratory's Transportation Group has, under the leadership of Dr. Donald Pratt, constructed two ultra light aircraft. One aircraft was subcontracted by a missionary aviator. The group is presently developing a new aircraft that meets the FAA's requirements for the Light Sport Aircraft (LSA) classification. They seek Very Short Take Off and Landing (VSTOL) capability and lifting capacity suitable to carry persons and/or goods to remote areas for development or relief work.

Antenna Communications and Telemetry Systems

Dr. Harold Underwood and his students began a Communications Group following Dr. Underwood's completion of a workshop sponsored by organizational partner PACTEC on the use of Very Small Aperture Telemetry (VSAT) to assist development and disaster relief work in remote areas. Dr. Underwood also completed site survey work for PACTEC in Kabul, Afghanistan in January 2005. The Communications group is currently developing an Automatic Position Recording System (APRS) to assist PACTEC and other partners in aviation needing to track small aircraft flying to and from difficult locations to complete relief and development work. Most recently, the Communications Group has partnered with SymBionyx, a central Pennsylvania company, to develop wireless-enabled cognitive and social prosthetics that connect the marginally abled to a life or workplace coach.

Water

The Collaboratory's Village Water Ozonization System (VWOS) project team has partnered with CURE International to design, build, and implement a water purification system in two villages, *Laguna de la Capa* and *Mojiman*, in the country of Honduras. The purification system uses several sediment filters and an ozone generator and injection apparatus to dissolve the ozone into the water. Ozone works similarly to chlorine in the way that it kills bacteria and viruses in the water. The water purification work is lead by Adjunct Professor Ariela Vader. Additional work to increase water access is led by Drs. Timothy Whitmoyer and Ray Norman. One of the group's principle accomplishments has been the development of a human powered pump and actuator that permits disabled persons in Burkina Faso, West Africa to draw irrigation water from hand dug wells. Participation in agricultural activities, such as drawing water for irrigation, is basic to social acceptance in subsistence agriculture economies. The group has implemented several prototypes, and continues to work with local fabricators to devise sustainable manufacturing processes and know-how. The Conrad Hilton Foundation has now funded a study of water access challenges and solutions for persons with disabilities who need to draw water from village wells in Mali. Our client for this work is the Mali National Office of World Vision.

Energy Applications

The Energy Applications group, led by Mr. Steve Frank, designs and installs power systems that serve the underprivileged around the world. The group has implemented solar electric water pumping and power systems for schools and medical work in Burkina Faso, Mozambique, and Zimbabwe. The same night that the group's first system went online, medical staff in Burkina Faso put away their flashlights to deliver babies by electric lamps. Systems were also installed in Uganda to power homes that welcome AIDS orphans. The group has also designed a solar charged flashlight that can serve its owner for hand held use and on bicycles, scooters, and other mobility solutions. Finally the group is partnering with a medical doctor to develop a process that farm coops in the Democratic Republic of Congo can use to convert palm oil to bio-diesel fuel, and a business plan for linking profits to community health care. Messiah's Dining Services and Grounds Departments are assisting with this work by providing waste cooking oil for process development research, and the use of diesel powered Gators for product testing.

Mobility Solutions

Dr. Timothy VanDyke and Mr. John Meyer lead the Disability Resources Group to create adaptive personal transportation technologies to empower disabled persons in rural West Africa. The team's low-cost, adult-sized hand and electric-powered three-wheeled vehicles are freedom and empowerment for persons with physical disabilities. They provide mobility to farm, care for family, and commute over some distance to school or work. The group has recently improved the frame design of an existing hand-powered design. Through partnership with SIM we learned that there are more than 100 persons within a day's motorbike ride of the *Handicapés en Avant* center whose disabilities are so severe that they are unable to operate the hand powered tricycle. A team of engineering majors designed a low cost electric powered tricycle that can be locally fabricated, maintained and improved. In July of 2004 they traveled to Burkina Faso to teach local fabricators how to construct the tricycle, and to learn from them how we might improve the design. At that time they constructed a tricycle for Yempaabou, a 13 year-old boy with cerebral palsy. Yempaabou has provided extensive feedback to the team from a user's perspective. Refinement of the electric tricycle for cost reduction and manufacturability continues.