

## Engineering World Health: A Novel Approach to Teaching a Global Viewpoint

Robert Malkin  
The University of Memphis

### Abstract

Engineering World Health has partnered with The University of Memphis to create The Engineering World Health Summer Institute. This unique study abroad program offers students an opportunity to receive hands-on technical skills in a foreign country while earning college credit. The program is aimed at undergraduate and graduate students in engineering. However chemistry or physics majors can qualify. Students should have completed their coursework in chemistry, physics and calculus. Participants in The Summer Institute begin with an intensive, four-week training session at The University of Memphis. Every morning, students are immersed in Latin American culture, taking language classes spoken entirely in Spanish and eating lunch in a simulated immersion environment. In the afternoons, students attend courses in instrument repair. Finally, the training is put to use during a four-week internship in a foreign hospital. Students continue taking Spanish lessons every morning, devoting the afternoons to biomedical engineering duties at the hospital. Students who complete the entire program can earn up to 12 college credits. Involvement in The Engineering World Health Summer Institute is unlike any class or internship currently available, supplying study-abroad experience, first-hand knowledge of medical device use and a second language.

### Introduction

Imagine living in a place where the hospital may receive electrical power only two hours a day or where a simple blown fuse can bring surgery to a halt. Sadly, there are many places such as this worldwide. But now an organization has been created to answer the needs of disadvantaged areas through providing and maintaining appropriate medical technology: Engineering World Health (EWH).

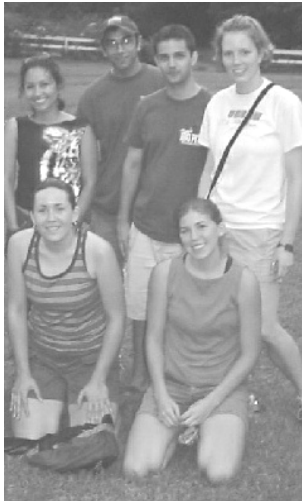


## The Organization

Engineering World Health is an extraordinary fusion of engineers, scientists and physicians who donate their time and talents to positively impact the quality of healthcare in disadvantaged areas around the world. EWH's vision is embodied in the "Cycle of Caring," which begins with donated medical equipment and parts, and relies on professional expertise to recycle and restore the technology for reuse. They then deliver and install the refurbished machinery for a community in need. The commitment does not end there. Unlike any other organization in the world, volunteer engineers and students return to that same equipment year after year to ensure that it remains in good working order. The ultimate goal is to train local engineers and technicians to maintain their own equipment.

## The Educational Program

Engineering World Health has partnered with The University of Memphis to create The Engineering World Health Summer Institute. This unique study abroad program offers students an opportunity to receive hands-on technical skills in a foreign country while earning college credit. The summer program is open to juniors and above in undergraduate or graduate engineering degree programs (however chemistry and physics majors as well as pre-meds may qualify). Students must have completed their coursework in chemistry, physics and calculus.



Participants in The Summer Institute start with an intensive, four-week training session at The University of Memphis. Each day begins with language training appropriate for the students target country. Currently Spanish is being offered, but French will soon be available. Students may also take a course in the politics of the region. At lunch they eat with their fellow team members, speaking only the language they will encounter during their hospital experience. Graduate students fluent in the target languages facilitate the lunches. In the afternoons, participants attend courses in instrument repair and participate in a laboratory designed to refine their abilities to diagnose and repair medical equipment. These sessions are guided by local volunteer engineers from area hospitals. Finally, the students construct some of their own test equipment which they can then donate to their host hospitals at the end of their stay.

The training is put to use during a four-week internship in a foreign hospital. Internships are currently being offered in Nicaragua, but Haiti will soon be available. Students continue taking foreign language classes every morning, devoting the afternoons to their biomedical engineering duties at the hospital. Students who complete the entire program can earn up to twelve college credits: six for language training, three for the technical training, and three for an optional course in regional politics or history.

## Costs and Sustainability

Costs to the student for the summer of 2003 are \$3,800. While no doubt considerable, this fee includes insurance, airfare, housing, food, tuition and a small processing fee. Because students receive six credits for their participation in the program, many find the overall fee to be considerably less than what they would have to pay for six credits at their home institutions. In the end, students who can use the EWH summer to reduce their tuition burden at their home institution find the experience to be reasonably priced.

However, many students do not need the credits or can't use them to offset the tuition at their home institution. Fortunately, many universities are offering funding for students who want to dedicate a summer or semester to service-oriented activities. Approximately half of the students who participate are receiving funding from their home institution. The home institution's contribution may not cover the full cost. Many participants receive additional funds from parents, relatives and friends. Finally, EWH has been fortunate to attract a number of private donors and foundations to fund students with financial need. To date, we have not had a student withdraw from the program due to financial considerations.

The University of Memphis is currently subsidizing the costs of space and personnel. As the program grows, we expect the processing fees to be sufficient to cover the personnel costs.

## Evaluation

We conduct three surveys of participants. When a student applies, they are asked a number of written questions in an attempt to evaluate their attitude toward the experience and the developing world. Candidate finalists are also interviewed over the phone with a similar aim. Midway through the program we gave a second, written evaluation. The second evaluation attempts to judge the students' satisfaction with the first half of the program, as well as attempts to assess any shifts in the students' attitudes towards the foreign half of the program. Finally, a survey is conducted at the end of the program. For the final survey evaluation, each student is interviewed personally, interviewed in a focus group, and asked to complete a written form.

To date, we do not have a large enough sample to complete a statistical evaluation. However, anecdotal information suggests that students who participate in our program find it to be of very high educational value. Stephanie Patnode from The University of Southern California said "I'd go back tomorrow. ... I finally felt like an engineer. ... I would like to take next year's students to Nicaragua and introduce them to the hospital, the people and the culture." Elizabeth Perepezko from Case Western Reserve University said her EWH summer was "...a life-changing experience. When we arrived, only one ventilator at the hospital had been working, and then it broke. A nurse was actually ventilating the patient by hand. Surgeries were stopped until we were able to get the ventilator working again. We were successful. I made a huge difference just being in Nicaragua and working at the hospital."

## Educating, Changing lives

There have been some problems developing this program. Most students are unfamiliar with the developing world, leading them to inaccurate images of their coming developing world experience. When the reality of their experience does not match their images, stress can ensue,

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especially in the first weeks of their foreign experience. To address this problem, we are modifying the Memphis portion of the program to provide participants with more realistic expectations.

A management problem has been the creation of the student teams. Students are assigned to partners on the first day of the program. They work, travel and live with these partners throughout the eight week program. The intensity of this interaction can be a challenge for some. As the program grows we will need to develop strategies to dissipate this problem.

A recurring problem is in the need to identify future for sites for expansion of the program. The hospitals must have a need for medical equipment. Yet, they must be politically stable, so that the student's experience is safe. Engineering World Health personnel are constantly visiting new potential sites to determine their appropriateness for the program.



Involvement in The Engineering World Health Summer Institute is unlike any other class or internship currently available, supplying study-abroad experience, first-hand knowledge of medical device use and second language training. It's a life changing experience.

### **Biography**

Robert Malkin is the Herbert Herff Associate Professor of Biomedical Engineering at The University of Memphis. He is also the director of the Engineering World Health Summer Institute. He has traveled extensively in the developing world including living in Thailand, and traveling to Nicaragua, Haiti and Sierra Leone.