Engineering a better life

SEAS CULTIVATES LEADERS WITH THE SKILLS AND PASSION TO CHANGE THE WORLD

By Caroline Perry *October 31, 2013*

Children in Kumi, Uganda, learn about water sanitation and health. A team of Harvard students is introducing affordable water filters that can be made at a new, self-sustaining factory there. (Photo by Suvai Gunasekaran.)

When Kathy Ku '13 proposed to build a water filter factory in Uganda for $15,000 last year, her contacts in other African countries advised her to double her budget.

Starting from scratch on a plot of land donated by Kumi University in a country where 10 million people—a third of the population—lack access to clean water, Ku forged ahead. She and a team of Harvard College classmates rented a truck, negotiated prices for each building material individually—cement, wire mesh, and so on—and finished the project with $3,000 to spare.

"We didn't know better, and we didn't realize how difficult it would be," Ku recalls. "But now we can construct a factory, apparently."

When the factory needed a hydraulic press to increase its output of clay water filters, Ku again asked around.

"They said, 'There's no way,'" she remembers. "Everyone said that in Uganda you couldn't

The projects and passions of SEAS faculty, students, and alumni are improving human life around the world. (Photos courtesy of Kathy Ku and SPOUTS of Water.)

Video: What if the world's most accomplished engineers and applied scientists tackled the world's most intractable challenges? At Harvard SEAS, all it takes is a question.

make them: you had to go to Kenya."

Undeterred, and with help from the **undergraduate teaching labs** at the **Harvard School of Engineering and Applied Sciences** (SEAS), Ku bought a cheap hydraulic log splitter, dismantled it at her parents' house in Illinois, and carried the components to Uganda in her suitcase. The scheme gave her a thorough introduction to Ugandan customs regulations—and it solved the problem.

Driven by idealism yet grounded in solid engineering design principles and cultural awareness, the project is anything but naïve. If all goes to plan, by next August, Ku and her classmates will have created a fully functional and self-sustaining water filter factory, employing 14 people and supplying clean water to households across Uganda at half the cost of the filters imported there today.

Equally comfortable taking apart a diesel engine or quoting Adam Smith, Ku is the very picture of a Harvard engineer: fluent in hard science, intellectually well rounded, and doggedly passionate.

Inspired by her early involvement with **Harvard College Engineers Without Borders** and her experience at a secondary school for Ugandan mothers in the summer of 2010, Ku enrolled in Harvard courses ranging from public health to technological innovation. As her interest in addressing the Ugandan water crisis grew, she recruited other students to join her:

"I must have talked about it so much during dinner that somebody said, 'Kathy, why don't you just go for it?' And before I knew it, I had a group of students who were interested in doing what I wanted to do."

Suvai Gunasekaran '13 (biomedical engineering), John Kye '14 (economics), and more than a dozen other students joined the project, which they named "Sustainable Point-Of-Use Treatment and Storage (SPOUTS) of Water." **SPOUTS**, now a registered non-profit, has received support from across the University: the **Committee on African Studies**, **Nectar** and **TECH** at SEAS, and the **Harvard President's Challenge** have all lent a hand.

And Ku, who studied molecular and cellular biology as an undergraduate, is now a master's student in engineering sciences at SEAS.

"No matter where you're coming from, if you want to understand technology, if you want to make a positive impact in a technology-driven world, you belong in a SEAS classroom," says SEAS Dean **Cherry A. Murray**. "This is 'engineering for everyone.'"

Attracted by engaging courses and the real-world relevance of applied research, the students are, in fact, flocking to SEAS' classrooms. Enrollment in SEAS courses and the number of SEAS concentrators have more than doubled since the establishment of the School in 2007, filling lecture halls and laboratories to capacity—and posing new challenges for faculty and staff.

Enabling continued growth at SEAS is one of six top priorities of the Faculty of Arts and Sciences' (FAS) $2.5-billion **Campaign for Arts and Sciences**. SEAS aims to raise $450 million to increase the size of its world-class faculty; create modern instructional spaces for teaching, hands-on design, and laboratory research; invest in "innovation funds" for cutting-edge, high-impact research; and support talented students through graduate fellowships.

"Harvard's School of Engineering and Applied Sciences is reimagining engineering education and research for the 21st century," says FAS Dean **Michael D. Smith**, John H. Finley, Jr. Professor of Engineering and Applied Sciences. "What makes SEAS truly special for undergraduates is that, at Harvard, students receive world-class instruction in engineering as part of a world-class liberal arts education."

SEAS is a place where one student can improve the outcome of **cancer chemotherapy**. Another, tinkering in the small hours of the morning, can help a **tiny robotic insect** take flight. A third can use mathematics and physics to understand **human development**. And insights from all three, cross-pollinating in a hallway conversation, could make extraordinary contributions to the future of science.

"It is not unusual for the ideas developed in courses and labs to take on a life of their own after the end of the semester," says **Fawwaz Habbal**, executive dean for education and research at SEAS. "We are fortunate to have outstanding students, and we are very pleased to work with them and mentor them in a process that adds value. Given the right inspiration, the right mentorship, and access to resources, they have what it takes to change the world."

For example, while taking an engineering sciences course called "Idea Translation" a few years ago, Jessica Lin '09, Jessica O. Matthews '10, Julia Silverman '10, and Hemali Thakkar '11 imagined a soccer ball that could generate enough energy during play to charge a cell phone or power a light in parts of the world where electricity is unreliable. They kept working on the project after graduation, and by July 2013, President Barack Obama was kicking around a functional Soccket ball during a visit to Tanzania. "I don't want to get too technical," the **president said**, "but I thought it was pretty cool."

Indeed, SEAS faculty, students, and alumni are improving human life around the world. Whether designing new **medical devices** in India, improving a **water supply** in the Dominican Republic, searching for **landmines** in Cambodia, recycling **electronic waste** in Ghana, examining **carbon emissions** in China, measuring **pollution** over the Amazon, or tracing the flow of **mercury** in the Arctic, their impact is profound.

For the students working in Uganda, making a difference means understanding how to build change from within a community. Chlorine tablets could be an effective way to sanitize water, but in Uganda no one would relish the taste; instead, the Harvard project's clay filters complement existing practices, where water is stored in terracotta pots to cool.

The SPOUTS project also hopes to encourage participation by selling filters to individual households. "It allows people to take ownership and almost view the filters as a social status," Ku explains. "Once that mindset gets rolling, it becomes a commodity that becomes worth investing in."

The SPOUTS model is designed to be sustainable long after the students have moved on to new horizons. Therefore, partnering with nongovernmental organizations as distributors, Ku and her classmates will require that income from filter sales be used to create jobs and finance local projects.

"Solving complex global challenges requires holistic and long-range thinking. Our students gain that perspective through rigorous engineering courses, exposure to ideas from across the liberal arts, and hands-on practical experience," says Murray. "The SPOUTS of Water project is tackling waterborne illness with real success."

Eventually, when the filter factory no longer needs her, Ku hopes to attend medical school and then to move to rural Uganda more permanently as a physician. "I'm not a hardcore engineer; I'm not a hardcore biologist," she says modestly, "but I think it has allowed me to be a better leader."

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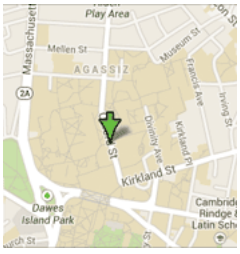

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