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A new kind of development professional: The development engineer

By Catherine Cheney (/news/search?filter%5Bauthors%5D%5B%5D=Catherine+Cheney) 23 September 2015

Sonia Travaglani and Emily Woods hold up two very different research studies on handwashing assignments outside the UC Berkeley course on Development Engineering.

Students gather in groups of three. At the back of the classroom, there are plastic bins with glue sticks, colored paper, and ribbons. The focus for class today is how we wash our hands. Believe it or not, this is not a kindergarten class. These students will use the arts and crafts materials for design thinking exercises to address some of the biggest challenges facing our planet. Welcome to development engineering, a course for Ph.D. students at the University of California, Berkeley.

At Berkeley, engineers and computer scientists are in the same rooms as economists and political scientists, working together to test, implement and scale technologies in a way that can reframe global development as we know it. As momentum grows behind development engineering as an interdisciplinary field in academia, Devex spoke with some of the students, faculty, and alumni who are shaping this story.

With $20 million in (http://news.berkeley.edu/2012/11/08/usaid-gives-20m-for-global-development-initiatives-at-uc-berkeley/)support from USAID (http://news.berkeley.edu/2012/11/08/usaid-gives-20m-for-global-development-initiatives-at-uc-berkeley/) for global development initiatives at UC Berkeley, the Blum Center for Developing Economies and the Center for Effective Global Action are working together to formalize development engineering as a field of research. They have taken steps including to the creation of a " (http://deveng.berkeley.edu)Designated Emphasis (http://deveng.berkeley.edu)," or graduate minor, and are working on a "Development Engineering (http://www.journals.elsevier.com/development-engineering/)" journal expected to launch by the end of the year.

"I see this as a sort of Peace Corps for the STEM crowd," Tamara Strauss, editorial director of the Blum Center, said from her sunny office on the Berkeley campus. "It's a no brainer for a top research university like Berkeley with a really clear social progress agenda." Perhaps development engineering will become the next biological engineering, or the application of biological concepts and methods to solve real world problems. Established in 1998, Berkeley's Department of Bioengineering (http://bioeng.berkeley.edu/about-us) was the first new department in the College of Engineering in four decades. And the campus has continued to shape the new discipline.

Inside Berkeley's Development Engineering course

Alice Agonino discusses the Development Engineering Design Thinking Model.

Certainly, Berkeley is not the first or only university to offer new pathways for engineers who seek to make a social impact. Even before students combined the words development and engineering, Stanford's multidisciplinary (http://extreme.stanford.edu/)Design for Extreme Affordability (http://extreme.stanford.edu/) course produced alumni like Krista Donaldson (http://d-rev.org/about/), CEO of dRev, and Jane Chan (http://embraceglobal.org/who-we-are/), CEO of Embrace. And Devex recently featured (https://www.devex.com/news/a-global-engineer-education-what-you-need-to-know-86875) other examples like Mortenson Center in Engineering for Developing Communities at CU Boulder, for example, or Arizona State University's Ira A. Fulton Schools of Engineering, which is integrating communication and entrepreneurship into its curriculum.

More programs are sure to emerge, linking the built world to its potential for greater social impact, particularly with funding opportunities like USAID's Higher Education Solutions Network. The partnership between U.S. Agency for International Development (https://www.devex.com/en/organizations/usaid) and seven top universities was (https://www.usaid.gov/hesn)launched in 2012 (https://www.usaid.gov/hesn) in part to connect practitioners with university innovations but also to educate development professionals who can bring a broader education and perspective to their future work in U.S. government agencies.

"In my opinion, this pedagogical movement is about three elements: humanity, our intentions, and the connections we make between the work we do and the communities we hope to engage," (https://twitter.com/ticoravjones)Ticora Jones (https://twitter.com/ticoravjones), an engineer by training who serves as USAID's division chief for the network, said (http://dil.berkeley.edu/ticora-jones-the-federal-governments-scientist-for-global-development/)in interview (http://dil.berkeley.edu/ticora-jones-the-federal-governments-scientist-for-global-development/).

While there will be opportunities for students across the country and around the world to combine qualitative and quantitative skills to develop solutions for the developing world, California's Bay Area is uniquely positioned to build an academic framework for this new field. "We have faculty who go between tech companies and academia," explained Temina Madon, executive director (http://blogs.berkeley.edu/author/tmadon/) of the Center for Effective Global Action. She mentioned Eric Brewer, who bounces all over the Bay Area as he teaches computer science, leads Berkeley's Technology and Infrastructure for Emerging Regions research group, and designs the next generation of infrastructure (http://www.wired.com/2012/09/meet-the-man-whos-rewiring-google-from-the-inside-out/) at Google. "Out here, universities are more likely to break down barriers across departments."

Madon says the genesis of development engineering as a field of research was a water sector project (http://www.povertyactionlab.org/es/node/6678) led by Edward Miguel (http://emiguel.econ.berkeley.edu/), now Oxfam Professor in Environmental and Resource Economics, and Michael Kremer (http://scholar.harvard.edu/kremer/home), now Gates Professor of Developing Societies in the Department of Economics at Harvard University. Their studies showed that water chlorination at the point of collection was more effective in increasing access to safe water than marketing bottled chlorine.

"The safe water dispenser was a simple product, but it was effective because it was behaviorally designed," Madon said of the project which spanned from 2003 to 2010. "But it took so long to do that, so they started to ask, well what if we started by linking up engineers and economists?"

The International Conference on Information and Communication Technologies for Development (http://ictdconference.org/), which got its start on (http://www.ischool.berkeley.edu/ictd2006/)the Berkeley campus (http://www.ischool.berkeley.edu/ictd2006/) in 2006, was one of the original gatherings convening "social and technical scientists" to discuss technological solutions for developing economies. Some of the original leaders to drive this kind of collaboration were there, including computer scientist and international development researcher Kentaro Toyama. He was the founding assistant director of (http://research.microsoft.com/en-us/labs/india/about.aspx)Microsoft Research India (http://research.microsoft.com/en-us/labs/india/about.aspx), a computer research laboratory that has hosted many blooming development engineers as interns over the years. Though it is worth noting that the former tech evangelist has grown skeptical of the role technology can play to improve lives, as he explores in his recently released book, "Geek Heresy: (http://www.publicaffairsbooks.com/book/hardcover/geek-heresy/9781610395281) Rescuing Social Change from the Cult of Technology."

Alumni of Berkeley's emerging development engineering field keep in close touch, and many gather annually at the Center for Effective Global Action's annual research retreat (http://cega.berkeley.edu/events/cega-research-retreat-r-2-2014/), coming up next week.

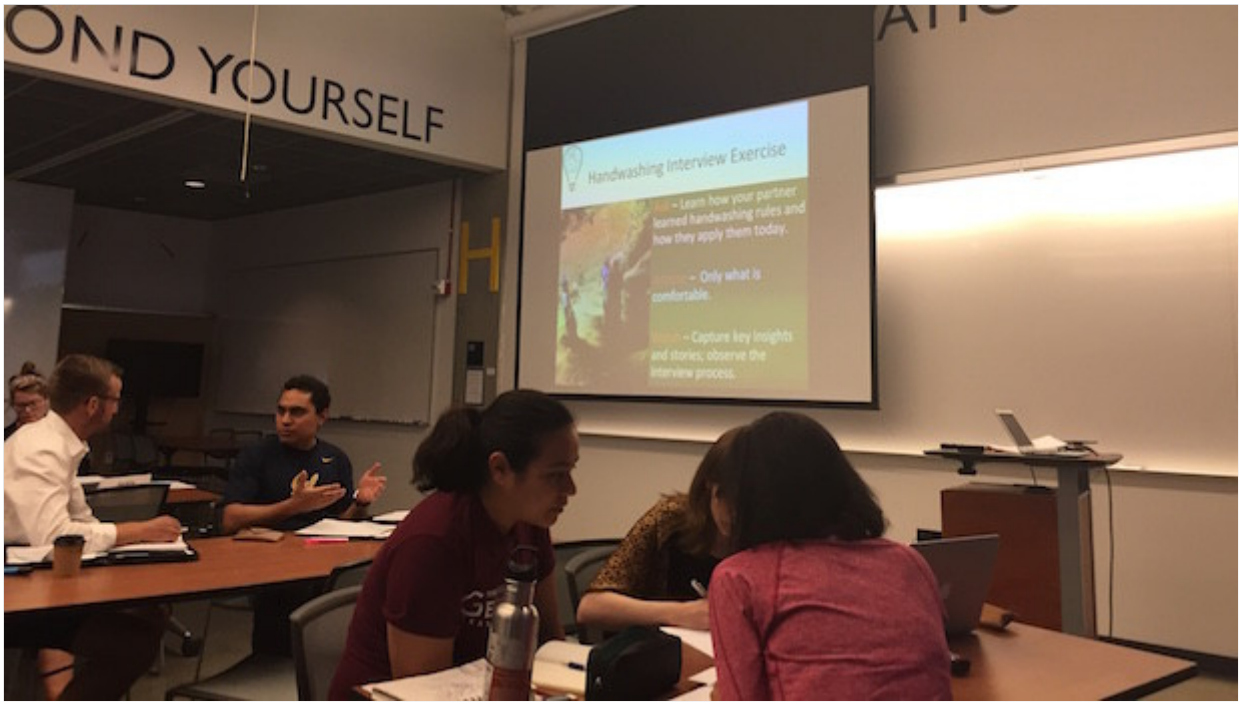
One example is Michael Callen (https://www.hks.harvard.edu/about/faculty-staff-directory/michael-callen), whose recent work at the John F. Kennedy School of Government at Harvard University focuses on solutions for accountability and service delivery failures in the public sector in Afghanistan and Pakistan. "I think one of the great opportunities of development engineering is that many of the innovations solve thorny issues that have long been obstacles for governments in developing countries," he said, pointing to "ICT for Accountability" as "only a small part of the DE movement." Callen called the movement synergistic with the smart policy movement, adjusting policy based on data and evidence.

Another is Kurtis Heimerl (https://www.eecs.berkeley.edu/~kheimerl/), a postdoctoral researcher at Berkeley whose thesis topic on The Village Base Station, a low cost and low power cellular system, evolved into Endaga (https://www.endaga.com), a company that commercializes this research to empower people to run their own cellular networks. He represents the fluidity between academia and tech that is characteristic of so many development engineers. Heimerl revealed to Devex that he will be moving to Seattle, Washington, next year for a faculty position at the University of Washington.

"People need to think about what they are building and what kind of world is going to exist once they build that," he said, expanding on why he is eager to transition from negotiating interesting business deals to asking interesting questions. "I want my students to take a slightly more critical analysis of the world they're constructing and how they can make different engineering decisions to construct a better world."

Heimerl and Callen shared the view that one of the challenges for turning development engineering into a true field will be to attract alumni to remain in academia. Because they disrupt the incentive structures in place, hybrid fields make it more difficult to answer questions that go on to determine tenure, questions like: What is considered a scholarly contribution? That is part of the push for the Development Engineering journal, which will publish the work of scholars drawn to interdisciplinary problem solving. "We have to give them a forum that is highly recognized, that's visible, that fits in the academic incentive system," Madon said.

"I think whether development engineering succeeds depends on whether it delivers, both for policy and for research," Callen added, drawing a comparison with randomized control trials. "RCTs did that and they are quickly being institutionalized among academics and policy actors. It is easy to point to clear successes from RCTs where both knowledge and policy got substantially better. I think this will happen with development engineering, and we've had some early successes. It's just not clear, just yet, exactly which problems it will solve and which problems will persist."



Engineers and economists alike gather in groups as part of the interdisciplinary Development Engineering approach.

Back in the Development Engineering course, tucked into the Berkeley football stadium, students watched as their professors described a graphic of the Development Engineering Design Thinking Model.

"We're really interested in impact, so we want to scale for impact at the very get go," Alice Agogino (http://www.me.berkeley.edu/people/faculty/alice-m-agogino), a legendary mechanical engineering professor who teaches the course along with David Levine (http://facultybio.haas.berkeley.edu/faculty-list/levine-david) from the Haas School of Business, said over the microphone.

Agogino, the first woman to receive tenure in her field at UC Berkeley, often taught classes without a single woman enrolled, but that's changing with the Development Engineering designated emphasis and this required course, which achieved 50 percent enrollment of women in one academic year.

Emphasizing the link between engineering and social impact might have carryover effects in attracting more women to the discipline. As Lina Nilsson, innovation director for the Blum Center, wrote in the New York Times (http://www.nytimes.com/2015/04/27/opinion/how-to-attract-female-engineers.html?_r=1): "The key to increasing the number of female engineers … may be about reframing the goals of engineering research and curriculums to be more relevant to societal needs."

This year, the course includes Emily Woods (http://erg.berkeley.edu/people/woods-emily/), who founded Sanivation (http://www.sanivation.com), a social enterprise that turns human waste into charcoal in Kenya, before enrolling in Berkeley's interdisciplinary Energy Resources Group graduate program. "Different academic disciplines have you perceive and head toward a problem in very different ways," she said after class, while trying to convince Levine that she needed an industrial engineer in her group for a capstone project on turning feces into energy. "When I can bring someone in from another academic discipline, I can see something in a way I've never seen it before."

"We're trying to understand what are the really fundamental research questions and challenges and extend the state of the art," Agogino said of the way she and other faculty involved in the Designated Emphasis are establishing the research agenda.

Too often, international development work happens in silos, with agricultural economists talking to agricultural economists and behavioral scientists talking to behavioral scientists. But development engineers are used to working together in the spirit of companies like SpaceX and Tesla (http://waitbutwhy.com/2015/05/elon-musk-the-worlds-raddest-man.html), where the factory floors pair engineers in white-collar jobs with technicians in blue-collar jobs. It may take a while to formalize the field of development engineering, but in the meantime, any engineers can follow these tips to think more globally (https://www.devex.com/news/5-fast-tips-for-your-career-as-a-global-engineer-86913), and all development professionals could learn from a budding example of collaboration.

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Catherine Cheney covers the West Coast global development community for Devex. She helped to build NationSwell, a media company and membership network. She reported on foreign affairs for World Politics Review and built the social media presence for a Middle East news site. A graduate of Yale University, where she earned bachelor's and master's degrees in political science and distinction as a Yale Journalism Scholar. Catherine has also worked for POLITICO and The Washington Post. She is an ambassador for the Franklin Project at the Aspen Institute.

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