

D-Lab

2013
-
2014

ANNUAL REPORT



massachusetts institute of technology

SPOTLIGHT AGRICULTURAL WASTE CHARCOAL



MORE THAN A DECADE OF WORK The Charcoal Lab

Agricultural waste charcoal—and all the economic, health, and environmental benefits this cooking fuel offers when compared to wood or wood charcoal—has been a central part of the MIT D-Lab story for more than a dozen years.

D-Lab founder and co-director Amy Smith is an acknowledged expert in biomass fuel production and is the co-creator (with Shawn Frayne) of what has become known as the MIT D-Lab press, a hand-held device for small-scale production of agricultural waste charcoal briquettes.

The production of biowaste charcoal has since been featured in countless D-Lab classes, the focus of community workshops around the world, and since late 2012, a centerpiece of the D-Lab Scale-Ups program, through a technical assistance program known as the Harvest Fuel Initiative (HFI).

HFI, a joint project of D-Lab Scale-Ups and a New York-based NGO, The Charcoal Project, principally works with four East African biomass fuel enterprises providing technical and business support.

This past year, D-Lab further ramped up its commitment to agricultural waste charcoal through the addition of a full-time biomass fuel expert, Daniel Sweeney, PhD.

In the past year, Dan has established in-depth research partnerships with agricultural waste charcoal ventures in East Africa (as part of the HFI program), and initiated countless research activities with students, staff, and faculty at MIT and other US universities.

Expanding on the work of Amy Banzaert who completed her PhD thesis on cooking fuel emissions in association with D-Lab, Dan has also set up a new charcoal testing lab at MIT.

The in-house fuel and stove testing lab is equipped with measurement equipment that enables detailed evaluation of performance and emissions of fuels as well as cookstoves. Testing in a laboratory allows researchers to reduce independent variables and investigate the influence of briquette properties (e.g. density, size, chemical composition) on combustion performance. D-Lab will leverage the expertise and analytical methods of MIT's Institute for Soldier Nanotechnologies and the Center for Materials Science and Engineering for these studies.

Dan and a team of students traveled to Uganda in January 2014 to install a system for drying briquettes using solar thermal energy, which had been designed in the D-Lab: Development class. The dryer reduced drying time by 20 percent in addition to offering protection from rain.

In the lab, Dan and D-Lab students conducted 22 performance and emissions evaluations of traditional fuels and agricultural-waste briquettes.

Evaluations confirmed the areas for improvement identified in the 2013 baseline study, but also showed that agricultural waste briquettes had lower emissions of carbon monoxide and respirable particulate matter than wood charcoal – an important finding as indoor air pollution accounts for one in eight deaths globally.



D-Lab's biomass fuel research scientist Dan Sweeney (right) led a student trip to Uganda in January 2014. Here, they are conducting a training on carbonizing agricultural waste.

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SPOTLIGHT D-LAB WORKSHOP



THE HEART & SOUL OF D-LAB

The D-Lab workshop, the heart and soul of D-Lab, is airy, colorful, well equipped, and impeccably organized.

The workshop includes an open space with multiple workbenches, a wood shop, a welding room, and a room where long-term projects can take shape over the course of a semester.

The shop tools range from a large collection of the kind of basic hand-tools and simple power tools that can be found in most developing countries to a state-of-the-art TIG welder.

Organized for High-Use

An average of 150 students, fellows, designers, and staff use the shop each year to test ideas, build prototypes, and refine technologies intended to improve the lives of some of the poorest people in the world. Over 40 prototypes were developed during 2013-2014.

"Jack's organization of the shop is exceptional," commented Pamela Greenley, Associate Director of MIT's Environmental Health and Safety office. And, as Jack has famously put it himself, "Good organization lowers the barrier to awesomeness!"

Learn-It-Yourself

D-Lab attracts students who know their way around a shop and those who have never wielded a hammer.

To support all students interested in learning to build things with their hands, the D-Lab shop features illustrated, poster-sized "Learn-Its" on types of adhesives, fasteners, and material selection, along with well-labeled hand and power tools of all kinds. Resources like these help make it possible for both beginners and seasoned "makers" to get their prototypes made well, and made safely.



SPOTLIGHT DESIGNERS- IN-RESIDENCE

D-LAB DESIGNERS-IN-RESIDENCE

D-Lab has a long history of bringing designers and innovators from the developing world to spend time at D-Lab to mentor our students, work in the D-Lab workshop, and interacting with the MIT community.

The program began to take shape in 2010 when we hosted an Innovators Night. Since then, the series has hosted nine inventors. During the 2013-2014 year, D-Lab brought two designers to D-Lab.

Robert Shamaingo - Zambia

Robert is regarded as one of the most gifted inventors in Zambia. He brings self-taught metal fabrication, machining and welding skills to his work.

His innovations include a rope making machine, a green charcoal kiln, and a vegetable chopper. His current project, a water turbine, addresses the need for power and refrigeration along the Kafue river to facilitate the fish trade.

Elius Muhumbise - Uganda

Elius Muhumbise is a teacher at the Iruhura government primary school in Kabarole District, Uganda and a designer of cookstoves.

He works with students and neighbors to build stoves, adapting the design depending on access to materials, layout of the home, and cooking preferences. At D-Lab, he was able to recreate these stoves to test emissions, fuel use, temperature, and cook time to better understand the current design.



FROM THE CO-DIRECTORS

When D-Lab started more than 12 years ago in a shared classroom at the Edgerton Center with one part-time staff member—I don't think we could have envisioned where we are today—with nearly 30 full-time employees on an entire floor in the MIT Museum building with a colorful, well organized four-room workshop, 20 course offerings with projects in dozens of countries, and two five-year programs funded by USAID—all while maintaining the same agile and innovative spirit.

A retrospective of our recent past allows us to put the report that follows in context:

Seven years ago, we gathered an eclectic group of people from around the world at MIT for the first International Development Design Summit. Two years later, we moved the summit to Ghana, so that we could engage local communities in co-creation; three years after that, we envisioned the summits as just the starting point for a growing global network of innovators, and the International Development Innovation Network was established.

Five years ago, we traveled to the post-conflict areas of northern Uganda to share D-Lab technologies with people returning home from refugee camps. This work led us to developing a methodology called Creative Capacity Building that trains people, regardless of their educational backgrounds, in the design process, empowering them to be active creators of technology, rather than passive recipients.

Four years ago, we started conversations with Mohammed Jameel in which we envisioned how D-Lab technologies could have a bigger impact. With his thoughtful guidance and generous support we created the Scale-Ups program, which has supported 16 social entrepreneurs as they launch companies to bring their visions to reality and their products to scale.

The one thing that binds all of these programs together is our belief that innovation and technology can and should play an important role in addressing issues of poverty. Whether engaging a student at MIT or empowering a farmer to use a hammer for the first time in her life, we believe that engineering and innovation are key to development. And at D-Lab, we are developing novel approaches, creating tools, and training the next generation of innovators and entrepreneurs.

While we look back with fondness and a speck of surprise, we look forward with enthusiasm and excitement as we consolidate our programs and determine how and where D-Lab will grow in the future. Our accomplishments and your support propel us forward! We hope you will enjoy our first annual report – the first of many more to come.

Amy Smith, Founder & Co-Director and Victor Grau Serrat, Co-Director



STUDENT & ALUMNI ENGAGEMENT



HANDS-ON, PROJECT-BASED LEARNING IN REAL-WORLD SETTINGS

A SHORT HISTORY OF D-LAB COURSES & ENROLLMENT

D-Lab's academic mission is at the heart of the program. D-Lab began as a single class known as *The Haiti Class*, an experimental seminar taught by Amy Smith at the Edgerton Center in the fall of 2002. This course eventually evolved into D-Lab's flagship course *D-Lab: Development*. Twelve years later, D-Lab has created a total of 18 MIT courses which emphasize experiential learning, real-world projects, and participatory development.

D-Lab's agility in responding to students' appetites for new classes coupled with an environment at MIT that encourages start-up subjects and entrepreneurial instructors, have shaped the growth and success of D-Lab course offerings.

Year after year, D-Lab courses prove popular among MIT students, as well as with cross-registrants from Harvard and Wellesley. This past year, 181 students, mostly undergraduates, enrolled in 13 D-Lab subjects across the fall and spring semesters.

D-Lab's blend of engineering education with real-world problem solving for poverty alleviation attracts students from all disciplines. The resulting multidisciplinary collaborations of D-Lab students are essential for addressing such complex development problems. (Fig. 2).

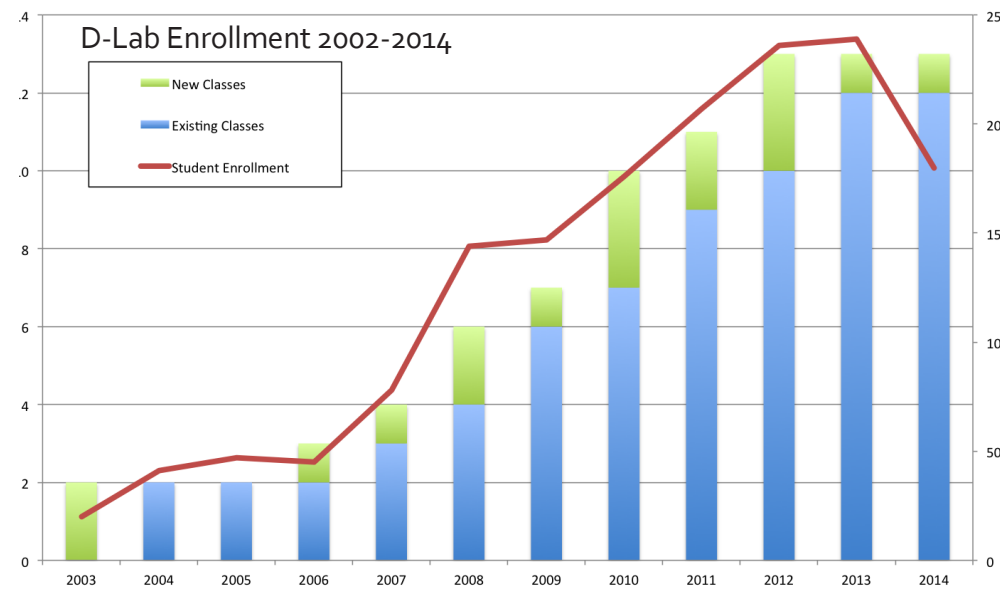


Figure 1: Student enrollment (red line, right axis) and number of courses offered (bar chart and left axis) plotted over the years. Green portion of bars signals offering of new classes; where green bars overlap laterally signifies that new classes were offered at the same time that older classes stopped being offered. Source: MIT Office of the Registrar.

DESIGN FOR SCALE

The latest addition to the D-Lab family of courses is *Design for Scale*, a new subject focusing on the late stages of product design for users in low-income settings. Through relationships with businesses in countries such as India, Tanzania and Nicaragua, students worked in interdisciplinary teams to move established technologies toward manufacturing-ready products designs. The course, taught by D-Lab staff member Eric Reynolds, Cooper Perkins CTO Harald Quintus-Bosz, and Kate Bergeron, senior director, Macintosh Product Design.

ENROLLMENT BY GENDER

While overall enrollment of female students at MIT has hovered around 45%, D-Lab's enrollment of female undergraduates averages around 65% and peaked at 74% this past year.

D-Lab's student gender balance is in sync with research that indicates that service learning, education combined with meaningful community service, attracts women and underrepresented minorities in disproportionate numbers. ¹

¹) Burke, Ronald J. and Mattis, Mary C. *Women and Minorities in Science, Technology, Engineering, and Mathematics*. Edward Elgar Publishing: 2007. Google eBook.

SOLVING HARD PROBLEMS IN SERVICE TO THE WORLD

D-LAB ALUMNI

By the end of fiscal year 2014, the number of alumni of D-Lab classes reached 1,670. In the coming year, D-Lab is planning to gather feedback on the student experience and determine the impact of the program on students through an evaluation of its alumni during the upcoming year.

D-Lab has already reached out to colleagues at the Teaching and Learning Laboratory at MIT to begin vetting and selecting independent evaluators to evaluate the program and its outcomes and impacts on the students.

UROPS

Fifty-one students were involved in MIT's Undergraduate Research Opportunities Program (UROP) at D-Lab during the 2013-2014 academic year.

Research topics covered a wide variety of topics including cellphone integration of air quality sensors, design and evaluation of improved kiln prototypes in Uganda, multicrop thresher design in Tanzania, environmental impact assessment of waste recycling in Nigeria, and the development of a fruit dryer in El Salvador to name just a few.

D-LAB STUDENT ENGAGEMENT BY THE NUMBERS 2013-2014

- 13 Subjects offered
- 181 Students enrolled
- 70% Undergraduates
- 63% Female students
- 79 Students who traveled internationally
- 51 UROPs
- 11 Countries visited in Africa, Asia, and South America

STUDENT TRAVEL & FIELD EXPERIENCE

Over the course of the year, 79 D-Lab students traveled to Uganda, Kenya, Ghana, Zambia, South Africa, India, Indonesia, Brazil, El Salvador, Nicaragua, and Panama to work intensively with community partners. Students traveled over the Independent Activities Period during the month of January, as well as during spring break and summer vacation.

In spring of 2014, D-Lab revised its Study Abroad program, a collaboration between D-Lab and the Global Education and Career Development office that gives students the chance to spend a semester living, working, and learning in a remote community while earning MIT credit.

Distribution of Majors at D-Lab 2001-2014

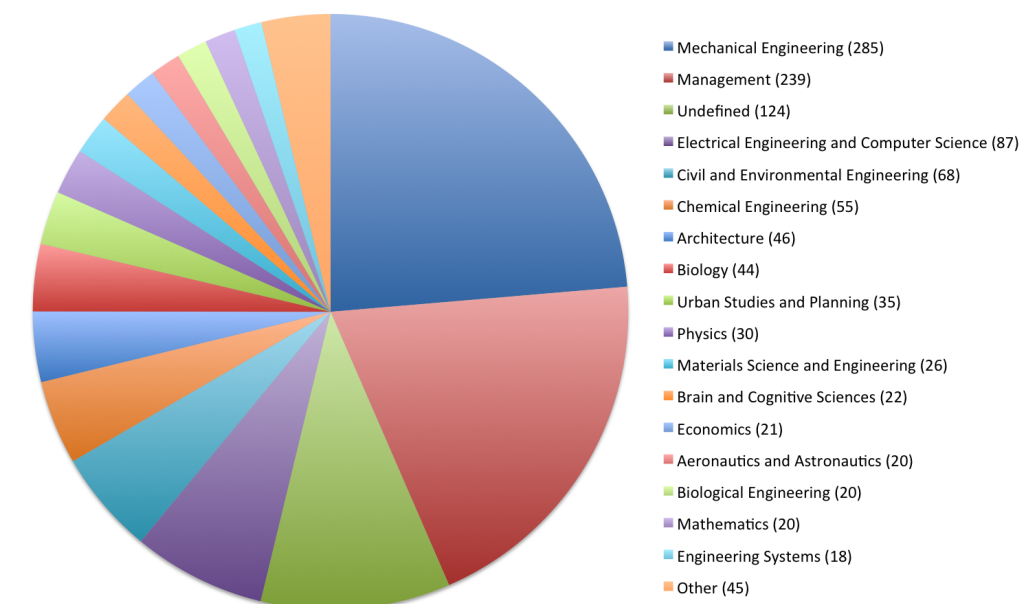


Figure 2: Breakdown of MIT students by major enrolled in D-Lab courses. Distribution starts clockwise at 12:00. Undefined category: students who had not declared a major.. Source: MIT Office of the Registrar.

INTERNATIONAL DEVELOPMENT INNOVATION NETWORK



FOSTERING COMMUNITY-LEAD, LOCAL INNOVATION WORLDWIDE

WHAT IS IDIN?

The International Development Innovation Network (IDIN), a consortium led by MIT D-Lab, is a five-year program funded by the US Agency for International Development's Global Development Lab that began in 2012.

IDIN empowers a diverse, global network of innovators to design, develop, and disseminate low-cost, practical solutions to alleviate poverty.

In its second year, IDIN fostered and supported its growing network through a variety of channels, including design summits, the establishment of local innovation centers, and the support of new chapters. IDIN also supported network members' project work with microgrant funding, mentorship, and training.



A GROWING NETWORK

This year, IDIN's network of innovators grew by 76 members to more than 350 individuals representing 50 different countries. While all IDIN network members are alumni of the International Development Design Summits, the people that make up the network are incredibly diverse. IDIN innovators vary in levels of formal education, gender, interests, occupation, nationality, and socioeconomic status, making for a strong and dynamic network.

Local IDIN chapters have been established in Brazil, Ghana, Kenya, and Zambia. These chapters provide innovators with support for further developing prototypes and ventures with IDIN's guidance.

Throughout the year, IDIN awarded 21 microgrants to promising prototypes and ventures and helped connect its network members to other funding opportunities. IDIN also developed a new microgrants mentorship program to facilitate global collaboration, from innovators in one country to those across the globe.

IDDS ZAMBIA & TANZANIA

The International Development Design Summit (IDDS) is a cornerstone of the IDIN program. Now in its eighth year, the annual summits are traditionally month-long, hands-on design experiences guided by the idea that people living in poverty are creative and capable of designing solutions to improve their own lives.

This past year, IDIN held two design summits: one "traditional" month-long summit in Lusaka, Zambia and a two-week-long summit focusing on maternal and neonatal health in Arusha, Tanzania.

Through these summits, 76 innovators were trained and created prototypes with the potential to solve development challenges. Nearly 75 percent of projects started at IDDS Zambia are still active, and of those, all are receiving support and training from at least one IDIN consortium university or other educational institution.

IDIN also conducted a one-week training of trainers on Creative Capacity Building in Pader, Uganda in June using curriculum similar to that used at IDDS. The training was conducted in partnership with Kulika, a community development and education nonprofit based in Uganda. The communities that received training will be part of a three-year randomized control trial run by Makerere University and IFPRI and supported by the US African Development Foundation, 3ie, and IDIN to test the effectiveness of IDIN training methodology.

POVERTY ALLEVIATION THROUGH SIMPLE TECHNOLOGIES

INNOVATION CENTERS RESEARCH

This year, IDIN established innovation centers in Brazil, Tanzania, and Uganda. IDIN Innovation centers are maker spaces for innovators who seek to make a social impact. They connect promising innovators to the resources and training they need to develop prototypes and bring these poverty-alleviating solutions to scale. Innovation center staff—many of whom are local innovators themselves—provide ongoing training and resources for IDIN network members to create, learn, and grow.

STUDENT ENGAGEMENT

As part of its core mission, IDIN consortium universities engage undergraduate and graduate students in practica and field experiences, as research assistants and student workers, and sometimes as participants in design summits.

In the past year, around 80 students took part in IDIN's activities, supporting various projects and experiencing hands-on work in the international development field.

idin.org



IDIN has also established a research program. This year, the IDIN research team conducted exploratory literature review of the local innovation and development field. Researchers have also produced 13 profiles of IDIN network members that illustrate and document the range of work, varied contexts, and diverse backgrounds of IDIN members. In addition, the research team has completed an innovator case study that will be used in a D-Lab class in the fall of 2014.

LOOKING FORWARD

Next year, IDIN will establish local chapters in Colombia and Uganda while helping existing chapters expand their collaboration and activities. IDIN will also explore establishing innovation centers in India, Kenya, Nepal, Sierra Leone, and Zambia.

IDIN will also launch a research study to examine community-based innovation in both a local and global contexts. IDIN researchers will examine the innovation process, factors that help that process succeed, and mechanisms by which innovations can create global social impact.



IDIN BY THE NUMBERS 2013-2014

27	Prototypes developed
76	New network members
350	Total members
28%	Growth in the network
46%	Projects started at IDDS that are ongoing
3	New innovation centers
4	New local chapters
50	Countries represented
80	Students engaged
20	Microgrants awarded

COMPREHENSIVE INITIATIVE ON TECHNOLOGY EVALUATION



THE CONSUMER REPORTS FOR POVERTY ALLEVIATING PRODUCTS

WHAT IS CITE?

Established late in 2012, the Comprehensive Initiative on Technology Evaluation (CITE) is developing a rigorous methodology for evaluating technology solutions to challenges in the developing world to help donors and implementing agencies select the best of these solutions.

There are an abundance of products designed to address pressing issues faced by people living in low- and middle-income countries. Yet there is very little assessment as to what works best. Many of these products, whether in the field of health diagnostics, reliable lighting systems, or clean water, have not undergone rigorous comparative evaluations.

As a result, many development resources are spent on inappropriate or ineffective products. CITE is designed to fill this major gap.

CITE's multidisciplinary approach is user and context-driven, with three main evaluation components: suitability, scalability, and sustainability:

- *Suitability* – Laboratory and field performance according to technical metrics with respect to consumer expectations and use patterns.
- *Scalability* – The manufacturer's capability to supply and support product sales considering its supply chain design and the resulting cost constraints and risks.

- *Sustainability* – The ability to affect positive impact over the product life-cycle, taking into account technical, social, economic, institutional, regulatory and environmental factors.

Together these factors define CITE's 3S Framework, which is designed to account for complexity in deploying products in developing countries.

This year, CITE conducted its first product evaluation on solar lighting options in the Ugandan marketplace. CITE also embarked on its second product evaluation of water filters in India. Each comprehensive evaluation results in a published study with a comparative rating chart that graphically displays how each solar lantern or water filter rates in comparison to its competition along one or more of the three axes of evaluation.

CITE PARTNERS @MIT

Department of Urban Studies & Planning

MIT D-Lab

Sociotechnical Systems Research Center

MIT Center for Transportation & Logistics

Public Service Center

SOLAR LANTERNS: UGANDA

CITE worked closely with its donor, the Global Development Lab, to identify the first product family for evaluation. Solar lanterns were chosen for their widespread availability in the developing world and because of the wide range of products that are now available on the market.

CITE collaborated with Uganda-based social enterprise Solar Sister to conduct the evaluation throughout Uganda. Eight students and five MIT faculty and staff collected data on 11 models of solar lanterns from field and laboratory tests, interviews, and surveys of solar lantern users in Uganda.

Preliminary results of the solar lantern evaluation are now available at cite.mit.edu.



WATER FILTERS: INDIA CITE STUDENTS

CITE's evaluation of water filters is underway in India. The research is being led by Department of Civil and Environmental Engineering Lecturer and D-Lab Instructor Susan Murcott, an expert in household water treatment and safe storage.

The CITE team is evaluating water filter technologies designed for use in developing countries using its three key evaluation components: suitability, scalability, and sustainability. CITE is closely collaborating with the Indian Institutes of Management and Technology in Ahmedabad and Gandhinagar as well as researchers from TERI University to conduct its field evaluation. Field evaluations include water sampling in urban and rural households; interviewing supply chain actors; and gathering market data in India through secondary research and mystery shopping.

Up to 2,500 people in India will be interviewed or surveyed during the course of this research begun in spring of 2014. In addition, CITE is working directly with Consumer Reports to design and implement a water filter testing regimen that reflects actual use patterns in the field. The test protocols developed with Consumer Reports will inform the performance section of a water filter comparative rating chart. Initial results are expected to be available by November 2014.

cite.mit.edu

SUITABILITY, SCALABILITY, AND SUSTAINABILITY

CITE engaged 28 undergraduate and graduate students in the past year. Students play a myriad of roles as interns, research assistants, or seminar participants.

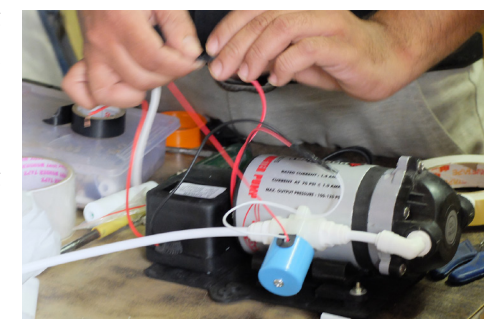
Students also gain valuable field and laboratory experience supporting CITE's work in Uganda, India, and beyond.

LOOKING FORWARD

Next year, CITE hopes to conduct four to five product family evaluations all with different levels of depth.

Those evaluations may include post-harvest storage loss prevention products, educational technologies, cell phone-charging devices, and water testing kits. CITE also plans to continue work on this year's water filter evaluation.

CITE looks forward to welcoming new student interns and researchers to its team as well as welcoming back several familiar faces from past work in the field.



Both CITE and IDIN are five-year programs funded by the United States Agency for International Development's (USAID) Global Development Lab.

The Lab was established to engage a global community of inventors, entrepreneurs, academics, researchers, investors, and corporate leaders in science and technology to invent, test, and scale the most promising and cost effective solutions to end extreme poverty.

Above: USAID administrator Rajiv Shah with former US Secretary of State Hillary Clinton.

D-LAB SCALE-UPS



BRINGING POVERTY-ALLEVIATING PRODUCTS TO MARKET AT SCALE

WHAT IS SCALE-UPS? FELLOWSHIPS

D-Lab Scale-Ups was founded in 2011 to bring poverty-alleviating technologies to market at scale. In the past three years, Scale-Ups has developed three programs—fellowships, technical assistance, and research and development—to accomplish this mission.

In the 2013-2014 year, Scale-Ups awarded seed funding and support to seven entrepreneurs through its fellowship program.

The Harvest Fuel Initiative, completed its first year of technical assistance to small and medium enterprises working on agricultural waste briquette fuels and clean cookstoves in East Africa. Scale-Ups' Research and Development program is engaged in needs assessment and technology evaluation projects in Morocco and Kenya.

Alongside these programs, Scale-Ups works to capture and share knowledge, and inspire collaboration among other actors working toward market-driven solutions to poverty. In spring 2014, the 2nd MIT Scaling Development Ventures conference convened 250 attendees to explore this topic.

Finally, the Practical Impact Alliance, was designed by Scale-Ups to foster collaborative action among corporations, non-governmental organizations, and social enterprises with a demonstrated commitment to scaling solutions to global poverty.

Since its launch in 2012, the Scale-Ups Fellowship program has been providing grants, mentorship, skills-building, and networking opportunities to entrepreneurs, helping them on their journey from proof-of-concept and business model development to early-stage growth and commercialization.

Scale-Ups fellows operate in four continents and in sectors including healthcare, waste management, water sanitation, solar energy, and agriculture.

This year, Scale-Ups awarded fellowships to seven entrepreneurs, bringing the total community of Scale-Ups fellows to 16.

For the first time, the fellows' cohort included not just MIT alumni, but also two alumni of the International Development Design Summits (IDDS) through the support of the International Development Innovation Network and funding from USAID's Global Development Lab.

The 16 D-Lab Scale-Ups fellows that have participated in the program to date, have gone on to garner significant support and recognition beyond MIT. For the \$350,000 that Scale-Ups has awarded to these entrepreneurs, they have gone on to raise more than \$900,000 from such organizations as MassChallenge, Saving Lives at Birth, Echoing Green, World Vision International, and the Bill and Melinda Gates Foundation.

TECHNICAL ASSISTANCE

Scale-Ups' technical assistance program, the Harvest Fuel Initiative (HFI), completed its first year of activity at the end of 2013. A collaboration between D-Lab Scale-Ups and The Charcoal Project, HFI provides financial and technical assistance to four East African enterprises working in the areas of biomass fuels and clean cookstoves: Teso Women Development Initiatives (TEWDI), Nakabale Integrated Development Group, and Green Bio Energy in Uganda, as well as ARTI-Energy in Tanzania. Impact indicators from the four enterprises are encouraging.

HFI's technical assistance happens both in the field with the four enterprise partners and in the new Charcoal and Stove Laboratory at MIT equipped to test charcoal briquette emissions and cookstove efficiency.

In summer 2013, Scale-Ups conducted a baseline assessment of customer satisfaction with biomass fuels and cookstoves produced and sold by TEWDI and Nakabale in Uganda, which indicated that in general, the "green" briquettes were preferable to traditional wood charcoal but could be improved through standardizing the quality, size, and look of the briquettes, making them easier to light, and including information in the packaging as to how the briquettes are made.

d-lab.mit.edu/scale-ups

MARKET-BASED APPROACHES TO POVERTY ALLEVIATION

RESEARCH & DEVELOPMENT

The research and development team has been hard at work both in the lab and in the field on three projects initiated in 2013.

With a gift from Grameen-Jameel Microfinance, Scale-Ups completed a technology needs assessment focusing on the livelihoods of Morocco's poor in the spring of 2013 and is currently working with Morocco's leading microfinance institution, Al Amana, on projects addressing two areas of identified need.

Morocco: Improving livelihoods of small-scale farmers through rain-fed silage

Scale-Ups is aiming to help small-scale farmers who are vulnerable to feed price fluctuations and drought events during Morocco's dry season to capture a share of the fast-growing milk market by exploring scale-appropriate silage systems, which could extend the availability of nutrition.

Morocco: Solar lighting solutions for rural households and ambulant merchants

In 2014, Scale-Ups is conducting a lab- and field-based evaluation of two solar lantern models that could address the needs of an estimated 250,000 households who are unable to access Morocco's grid, due to either the high cost of connection or, in some cases, remote location. Scale-Ups is engaging users to determine usage patterns, appropriate products, and dissemination strategies.

Kenya: Water storage, transport, and dispensing solutions

In September 2013, with the support of Greif, Inc., Scale-Ups began work on a comprehensive needs assessment related to water transport and storage technologies and practices in Kenya. The needs assessment identified three primary needs: less costly access to water (both in terms of time and money), easy-to-use dispensing solutions with no recontamination risk, and maximized household water storage capacity. D-Lab is currently working to define the next phase of work.

MIT SCALING DEVELOPMENT VENTURES

In February, the second MIT Scaling Development Ventures conference, a joint effort of Scale-Ups, the MIT Public Service Center, and the Media Lab Entrepreneurship Program, convened more than 250 students, practitioners, and experts for a day-long exploration of innovative, market-driven approaches for poverty alleviation.

Anchored by keynote sessions from international development experts Paul Polak, author of *The Business Solution to Poverty*, and Nancy Wimmer, author of *Green Energy for a Billion Poor*, the day also included three panel sessions - *Appropriate Solutions for Real Needs*, *Partnering for Scale*, and *MIT Alumni Scaling Up Innovation*.

In addition to the speaking program, the conference featured an "affinity group" networking session and a poster competition showcasing work done by MIT students in international development and social entrepreneurship. Connections made at the conference and networking dinner have already seeded new collaborations for poverty-alleviating projects.

LOOKING AHEAD

In the coming year, Scale-Ups will continue to grow and evolve these programs. A retreat is in the works for spring of 2015 that will allow our growing community of Scale-Ups fellows to capitalize on the potential of this network of entrepreneurs.

The Harvest Fuel Initiative will focus on the development and implementation of a new quality standard for green charcoal, addressing the identified needs of current consumers and catalyzing further market growth for the HFI enterprise partners and the growing industry.

The fall 2014 launch the Practical Impact Alliance attracted world leaders from industry, academia, non-governmental organizations, and social enterprises actively engaged in scaling up innovative, market-driven solutions for poverty reduction. PIA promises to be a powerful initiative, creating new opportunities for D-Lab and MIT to harness and disseminate valuable knowledge and contribute innovation and talent to large-scale, practical poverty solutions.

SPOTLIGHT D-LAB ALUMNI



SPOTLIGHT CREATIVE CAPACITY BUILDING



Elliot Avila '14 Mechanical Engineering



D-Lab Courses: D-Lab: Development, D-Lab: Design, D-Lab: Cycle Ventures.

D-Lab Trips India: Solar dryer project; natural crayon manufacturing. **Tanzania:** Bicycle-powered corn sheller; multicrop thresher.

D-Lab Take-Away: "You can learn so much at MIT but sometimes it's hard to know why you're learning in the first place. D-Lab was a place where I have learned the value of my education and the opportunities it affords me."

How D-Lab Changed Him: "When I arrived at MIT, I was interested in science for the sake of science. Now it feels like the problems I work on have much more meaning, and it's a constant motivator for me to take on new challenges."

Life After D-Lab "I expected that I would end up working for a financial firm or at a lab like JPL or NASA. Now I'm much more interested in how science and technology play a role in people's every-day lives." Elliot is currently working with Global Cycle Solutions in Arusha, Tanzania.

d-lab.mit.edu

Shammi Quddus '10 Environmental Engineering



D-Lab Course: D-Lab: Development.

D-Lab Trip Ghana: High-school science workshop, creative capacity building, Shea oil press, and community bore-well digging.

D-Lab Take-Away: "PROTOTYPE! I didn't even know the word before. It was inspiring to see people getting down on their hands and knees building and testing."

How D-Lab Changed Her: "The D-Lab trip changed my life in a fundamental way: we lived in communities and shared in their daily experiences.

Now I take my colleagues to the field, to live in the village, and pump water and trek the miles with our users because the insights you get are fascinating. I learned the confidence to do it because of D-Lab."

Life After D-Lab: Business Development Head for Amader Doktor (Bengali for "Our Doctor") at mPower Social Enterprises Ltd.

Caroline Hane-Weijman '11 Mechanical Engineering



D-Lab Courses: D-Lab: Development, D-Lab: Design, D-Lab: Dissemination, D-Lab: Health, D-Lab: Development Ventures.

D-Lab Trips: **Ghana:** Worked on a hydraulic jack press for producing Shea nut oil butter. **Nicaragua:** Conducted field research for development of a breath-actuated, dosage monitoring attachment for nebulizers.

D-Lab Take-Away: "The importance of economic, social, cultural, and environmental factors when designing and developing technology in collaboration with the individuals and community whose lives the technology could improve."

How D-Lab Changed Her: "I refer to my time at D-Lab as when I felt the most empowered and happy. I learned to create, build, and contribute in a way that I have never experienced before. D-Lab has a vision to meaningfully improve the lives of people living in poverty. I know I will work towards contributing to that same vision."

Life After D-Lab: Business management consultant, McKinsey and Company.

Creative Capacity Building (CCB) is an assets-based methodology that encourages communities to design technologies that improve their livelihoods and quality of life. The cornerstone of this approach is a four-day, village-level design training that is accessible to people with little or no formal education.

Since its inception in 2009, the CCB curriculum has been field-tested and modified based upon feedback from participants in Ghana, Tanzania, Zambia, Uganda, Haiti and El Salvador. In 2013-2014, this evolution continued as D-Lab shifted its focus to training local trainers as CCB facilitators.

In partnership with Kulika Uganda and Makerere University, with support from the U.S. African Development Foundation, the International Initiative for Impact Evaluation, and USAID's Global Development Lab, 32 facilitators were trained in Uganda. Twenty-five of them will help implement a three-year randomized control trial evaluation of the impacts of CCB on income, technology adoption, and self-esteem.

In Tanzania, in partnership with Innovations in Gender Equality and Land O'Lakes International Development, over 150 farmers were trained resulting in 32 technology projects.

The outlook for 2014-2015 includes the official launch of the Kulika study in 54 communities across nine districts in Uganda, support for the expanding farmer training project in Tanzania, and increased use of the CCB curriculum in the network of innovation centers being developed as part of the International Development Innovation Network (IDIN).

Sector-specific curriculum modules focused on electronics and electricity are also in development.

d-lab.mit.edu/creative-capacity-building

SPOTLIGHT D-LAB YOUTH PROGRAM



During 2013-2014, D-Lab continued with its second year pilot of youth outreach activities, engaging K-12 students through hands-on STEM and creative design activities at D-Lab, at schools in the greater Boston area, and at public events aimed at youth.

In 2014, a few highlights included joining efforts with the MIT Museum and the Edgerton Center for the Needham fifth grade science teachers' Professional Development day; running design activities and joint ideation sessions with teachers from the

Advent School in Boston; and hosting visiting teachers from Colorado, California, Rwanda, and Afghanistan. Through a collaboration with the Brookwood School, D-Lab Youth brought in its first international teacher-in-residence, Elius Muhumbise, a primary school teacher at the Iruhura government primary school in Kabarole District, Uganda.

2014 will see a continuation and streamlining of these programs and increased collaboration with the Edgerton Center.

d-lab.mit.edu/youth-outreach

D-LAB YOUTH BY THE NUMBERS 2013-2014

650	Boston-area students
350	International students
37	Youth D-Lab tours
12	US schools
9	International schools
1	MIT course - D-Lab: Education

D-Lab Annual Report 2013-2014

D-Lab Staff 2013-2014

Amy Smith, *founder & co-director*
 Victor Grau Serrat, *co-director*
 Kofi Taha, *associate director*

Derek Brine, *CITE manager*
 Kendra Leith, *evaluation manager*
 Sue St. Croix, *administrative officer*

Nancy Adams, *communications administrator*
 Libby Hsu, *study abroad coordinator*
 Jessica Huang, *youth program coordinator*
 Rich Fletcher, *research scientist*
 Melissa Mangino, *administrative assistant*

INTERNATIONAL DEVELOPMENT INNOVATION NETWORK

Tricia Matthews, *program manager*
 Laura Budzyna, *monitoring, evaluation & learning*
 Elizabeth Hoffecker Moreno, *research coordinator*
 Nai Kalema, *administrative assistant*
 Lauren McKown, *communications coordinator*
 Sharmarke Osman, *financial & program administrator*
 Jona Repishti, *network coordinator*
 Sher Vogel, *summits coordinator*

SCALE-UPS

Saida Benhayoune, *program director*
 Nadia Elkordy, *research project coordinator*
 Megha Hegde, *research project coordinator*
 Becca Smith, *research project coordinator*
 Eric Reynolds, *fellowship administrator*
 Gwyn Jones, *research technical specialist*
 Daniel Sweeney, *biomass fuel research scientist*
 Eric Verploegen, *technology evaluation specialist*

WORKSHOP

Dennis Nagle, *special projects coordinator*
 Jack Whipple, *workshop manager*



D-Lab students and D-Lab's Amy Smith (right rear) work with local residents in El Salvador to create a bicycle-powered blender.

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Images not captioned (left to right, top to bottom)

Cover: D-Lab field trip, El Salvador. Pi: Drying briquettes at Teso Women Development Initiatives, Uganda; clay stoves from Nakabale Development Integrated Group, Uganda. P1: CITE researcher Amit Gandhi, Uganda. P2: Students in D-Lab workshop; Designer in Residence Robert Shamaingo and D-Lab's Jack Whipple in D-Lab shop. P3: Worker sorting recyclables for Wecyclers, Nigeria. P4: D-Lab students, Zambia field trip. P5: D-Lab students, Uganda field trip; Design for Scale class, D-Lab students in workshop. P6: Maternal and Neonatal Health Summit, Tanzania; IDIN network member IDDS, Tanzania. P7: Maternal and Neonatal Health Summit; Miguel Chavez (left) of the IDIN Innovation Center, Brazil; IDDS, Zambia. P8: CITE interview, Uganda (both images). P9: CITE water evaluation field trip, India; CITE solar lantern evaluation; comparing water filters; CITE water filter test, India. P10: Scale-Ups fellow Zubaida Bai, India; Scale-Ups fellowship enterprise Wecyclers, Nigeria. P11 MIT Scaling Development Ventures conference; Scale-Ups fellowship product the Leveraged Freedom Chair from GRIT. P12: D-Lab alumnus and Scale-Ups fellow Sidhant Pai (center). P13: Community Capacity Building, Uganda; D-Lab: Education field training.



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 Community Initiatives