7 Service to Local, National, and World Communities

Contents

Service to Local, National, and World Communities

Founded with the mission of advancing knowledge to serve the nation and the world, MIT has been strongly committed to public service from its start. Members of the MIT community helped build the Boston Public Library in the late 19th century and dam the Charles River early in the 20th century. Research and development during World War II included radar systems; submarine and aircraft detection systems; a long-range navigation scheme based on radar principles; the SCR-584 radar for directing anti-aircraft fire; the Ground Controlled Approach System for landing aircraft in low visibility; and the Draper Gun Sight which positions a gun at the proper lead angle to fire at moving targets.

In 1985, Eric Chivian, a physician in MIT's medical department and a founder of International Physicians for the Prevention of Nuclear War, shared a Nobel Peace Price for the group's service to humanity. More recently, Amy Smith, an MIT alumna and mechanical engineering instructor in MIT's Edgerton Center, won a MacArthur "genius grant" for her commitment to inventing simple technologies to solve problems in the world's poorest places, such as low cost water-purification systems, or a simple and efficient technology for grinding grain. A recent Washington Monthly article ranking the public service commitment of the nation's colleges and universities named MIT first in the country.

While MIT faculty, students, and staff regularly engage in conventional projects that such as raising money for hurricane victims, renovating old housing, or restoring local nature reserves, MIT's scientific and technological orientation gives its public service outreach a particular emphasis. Many of its public service programs are specifically devoted to inventing new technologies and applying new knowledge that will advance social well-being.

Key Programs

Abdul Latif Jameel Poverty Action Lab (J-PAL)

Founded in 2003 by faculty in MIT's Department of Economics, the Abdul Latif Jameel Poverty Action Lab's (J-PAL) goal is to reduce poverty by ensuring that policy is based on scientific evidence. The lab runs randomized evaluations of poverty programs in over 30 countries, builds capacity of others to run these evaluations (including graduate students at MIT), and works to disseminate results and promote the scale-up of effective policies. Working on issues as diverse as boosting girls' attendance at school, improving the output of farmers in Sub-Saharan Africa, or overcoming racial bias in employment in the U.S., the lab's objective is to provide policy makers with clear scientific results that will enable them to improve the effectiveness of programs designed to combat poverty. The J-PAL has a target that 100 million lives will be reached through the scale-up of programs found to be effective through its research by 2013.

OpenCourseWare

Launched in 2002, OpenCourseWare (OCW) makes materials for MIT's courses freely available on the Web. Materials from more than 2,000 MIT courses – including lecture notes, multimedia simulations, problem sets and solutions, past exams, reading lists, and selections of video lectures – are now posted on the OCW website. OCW records an average of over 40,000 visits a day, with nearly a million unique visitors every month.

About 43 percent of OCW's visitors identify themselves as self-learners, 42 percent as students enrolled in an academic program, and 9 percent as educators who use the material to develop curriculum, enhance their understanding, advise students, and support their research. MIT is pursuing two missions with OCW – sharing its educational materials freely and openly, and, by creating a model other universities can follow and advance, promoting a universally available storehouse for human knowledge. MIT helped to create the OCW Consortium, an association of more than 200 universities worldwide that now share materials from an estimated 13,000 courses.

Service Learning

In 2001, MIT's Public Service Center and Edgerton Center began working with faculty to design service-learning courses that enable students to contribute to society as they learn. At the program's beginning, MIT offered three such courses, with 35 students enrolled. Five years later, the Institute was offering 19 courses to more than 200 students. Students have used these classes to develop a voice-activated toy that helps speech therapists working with children, a technology for converting sawdust, a common waste product in some developing countries, into cooking fuel, and a tree mover that eases the job of public service forestry volunteers who plant trees in urban areas.

International Development Initiative

With a focus on invention, wide-spread dissemination, and technology transfer, MIT's International Development Initiative works with impoverished communities around the world to help them develop and deploy appropriate solutions that enable them to improve their ability to provide for their basic needs and develop their economies. Its programs let MIT students travel to developing countries, work with partner organizations to identify needs and the challenges in meeting them, and develop solutions.

Key Programs
(continued)

D-Lab

A year-long series of classes and field trips, D-Lab enables students to learn about the technical, social, and cultural aspects of development work in selected countries, then provides them with the opportunity for field work and implementation. Among D-Lab's achievements are a low-cost, low-maintenance device that allows health care workers in Uganda, who lack access to conventional – and expensive – electrically-powered equipment, to test for microorganisms in local water supplies and determine which chemicals will kill them; a technology developed for Haiti that makes cooking fuel out of sugar cane waste, thus helping the island nation preserve its forests and prevent health problems caused by inhaling wood smoke (D-Lab students are now adapting this technology for paddy straw to use in India); and an automated flash-flood warning system developed with engineers in Honduras.

IDEAS Competition

The IDEAS Competition encourages teams of students to develop innovative solutions that address community needs. With a grant that covers the cost of materials and mentoring from faculty, staff, and industry professionals, competing teams of students work through a needs analysis, the products development process, and group organization. Winners receive cash grants that provide seed money for launching their projects.

International Fellowships

These fellowships provide stipends that enable students to work full-time on capacity-building community projects all over the world. Projects can be initiated by students or by community organizations or donors.

International Development Grants

These grants support international development projects that involve MIT students. Faculty, students, and other MIT community members can use them to cover materials, travel, and other expenses in projects that serve communities in developing regions.

Selected Recent Projects

Cell Phone Applications in Developing Countries

With more than 4 billion users worldwide, cell phones have become one of the world's most readily available technologies. MIT students are using these common devices to bring life-changing technology to developing countries. Students from MIT Media Lab's NextLab program have created an opensource medical diagnosis application called Mobile Care, or Moca. The application gives residents of underdeveloped rural areas easy access to diagnostic medical care. Zaca, also a NextLab project, aims to economically empower farmers in the Mexican state of Zacatecas. The application connects farmers to a peer-to-peer network to help them obtain fair pricing for their crops. Yet another NextLab project, Celedu, short for cellular education, is teaching children in rural Indian villages to read using cell phone-based games and quizzes. Adnan Shahid, a fellow at the Legatum Center for Development and Entrepreneurship, is developing a cell phone recycling program in Pakistan. Another Legatum fellow, Ravi Inukonda, is developing a program to bring mobile services, such as updates on water and power shutdowns and current market rates for produce, to rural phone users in India.

Legatum Center for Development and Entrepreneurship

The Legatum Center for Development and Entrepreneurship operates on the premise that economic progress and good government grow from the bottom up. Founded in 2007, and led by Iqbal Z. Quadir, the founder of GrameenPhone and Emergence BioEnergy, the Center supports individual entrepreneurship in low-income countries. The Center provides seed grants for MIT students who intend to launch enterprises in these areas. In the summer of 2009, the Center awarded grants to eight student teams. One team, IDC India, plans to manufacture wheelchairs to help handicapped people in Mumbai, India, start their own businesses. Another team, Creaciones Norteñas del Peru: Scaling Up, plans to help women and their families achieve financial stability by expanding a Peruvian women's knitting cooperative, Creaciones Nortenas.

Bicilavadora – The Human-Powered Washing Machine

In areas without electricity, laundry is time consuming and washing clothes in lakes and streams creates pollution. The bicilavadora, winner of the 2004-2005 MIT IDEAS Competition, is a pedal-powered washing machine designed for use in the developing world. MIT students and staff created the machine as an inexpensive solution that uses bicycle parts and empty barrels. The bicilavadora can be assembled locally, and the washing mechanism can be taken apart and stored flat for transportation. In 2009, students tested a prototype in an orphanage outside Lima, Peru.

Monitoring Drug-Resistant TB with PDAs

Treatment of drug-resistant Tuberculosis is a two-year process that involves close monitoring of treatment schedules. In areas without electronic records, this process generates huge amounts of paperwork. Joaquin Blaya, a Harvard-MIT Health Sciences and Technology Ph.D. student, worked with MIT faculty and experts at Brigham and Women's hospital to create a personal digital assistant (PDA) application to track these treatment schedules. The program's goal was to improve doctors' access to timely and accurate test results. When it was launched in Lima, Peru, the application reduced the average time it took test results to reach doctors from 23 days to 8 days. The program has since been implemented in all five of Lima's districts.

Selected Recent Projects
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Portable Pedal-Powered Corn Processor

In Tanzania and other parts of Africa, processing the corn harvest is a labor-intensive process that can last as long as two weeks. A bicycle-powered machine, adapted by MIT undergraduate Jodie Wu, can make this process up to 30 times faster. Wu designed the bicycle add-on as a D-Lab: Design class project, creating a machine that was both affordable and portable. Previous models had required complete conversion of a bicycle, making the bike unrideable. Wu refined the corn sheller so it could be attached to the chain of a regular bicycle and then later removed. Wu then spent a summer visiting villages in Tanzania introducing the device.

MIT Public Service Center

Created to motivate, facilitate, and celebrate the ethic and activities of public service at MIT, the Public Service Center supports more than 15 service programs. Many of these programs focus on connecting MIT students with the local community. CityDays, which is part of freshman orientation, places MIT students with community agencies for a day to complete service projects, including painting, cleaning, working with children, and working in food distribution. Every spring, MIT hosts the MIT/Cambridge Science Expo, an event that gives 7th and 8th grade students from Cambridge public schools the opportunity to meet student volunteers from MIT. The Public Service Center also co-sponsors the ReachOut: Teach a Child to Read program, which connects tutors with local children who are identified as needing help with reading.

Post-Katrina Environmental Issues

Members of the Department of Urban Studies and Planning (DUSP) participated in a variety of projects in response to the devastation of New Orleans by Hurricane Katrina. Included among them was the spring 2006 “The Katrina Practicum” taught in New Orleans by DUSP faculty members. The class researched affordable housing, community development, and post-disaster environmental issues on behalf of two community development corporations in New Orleans. The MIT practicum group focused on the historic Treme neighborhood, sometimes identified as the oldest African-American neighborhood in the United States.

Lake Pontchartrain Ecosystem

The Department of Civil and Environmental Engineering has participated in several Katrina-related projects. Instructors and students from the Aquatic Chemistry and Biology Lab traveled to New Orleans to focus on the impacts of dewatering operations on the Lake Pontchartrain ecosystem. The project also saw collaboration with professors from Louisiana State University who were examining the occurrence and distribution of pathogens in the sediments.

Inexpensive Glasses: Sight for the Poor

As many as 1.4 billion people around the world need corrective lenses but can’t afford them. Not only is their quality of life significantly reduced, but their productivity also slows, they are more prone to accidents, and, in some cases, they can’t function. As an alternative to far more expensive glass molding machines currently in use, MIT Media Lab graduate student Saul Griffith invented a portable machine with a programmable mold that in about 10 minutes forms a low-cost acrylic lens in the exact shape required. Griffith also has a patent pending for a low-cost prescription testing device that will make vision evaluation much more accessible.

Clean Water for Developing Countries

According to UNICEF, 1.7 billion people lack access to clean drinking water. Waterborne diseases are a major cause of illness and death across much of the developing world. In Nepal alone, 44,000 children under the age of five die annually from such diseases. In 1999, Susan Murcott, a research engineer in the Department of Civil and Environmental Engineering, launched the Nepal Water Project, a Master's program whose goal is to develop quick, cheap, and relatively simple systems that Nepal's rural poor can use to clean their water. In collaboration with the Environment and Public Health Organization in Katmandu and the Rural Water Supply and Sanitation Support Programme in Butwal, Tommy Ngai, one of Murcott's students, developed an arsenic-biosand filter (ABF) constructed of a round plastic bin, layers of sand, brick chips, gravel, and iron nails. The system removes both arsenic and pathogens that can lead to dehydration, malnutrition, stunted growth in children, and sometimes death. In 2004, with an award from the World Bank, Ngai, his MIT team, and their Nepali partners, installed ABFs in 25 Nepalese villages and established a center to forward research and provide villagers with training in the ABF technology.

Water-chemistry variation among countries makes it difficult to find one technology that will suit all areas, so Murcott and her students have been developing a collection of water-treatment systems that are low-cost, easy to maintain, and match the targeted country's needs and resources. The program has now expanded to include water and wastewater research in Bolivia, Brazil, Haiti, and Nicaragua.

Gasoline Storage Tank Leak Detection

Developed by Andrew Heafitz, a graduate student in Mechanical Engineering, and Carl Dietrich, a graduate student in Aeronautics and Astronautics, this new low-cost technology enables owners of gasoline tanks in developing countries to continually test the water in the tanks' monitor wells, thus reducing the risks of environmental and health damage caused when the tanks leak. If the system detects gasoline in the well, a window in the well cover changes from green to red; and because they no longer have to unbolt the cover, tank owners can check wells for contamination much more frequently. The new system replaces the need for both unaffordable electronic detection equipment and the tedious process of testing water manually. A simple practical, and inherently safe mechanical system, the technology is particularly useful for a very cost-sensitive industry.

Passive Incubator for Premature Infants

Every year, 4 million infants die within the first 28 days of life. Of this number, 3.9 million live in the developing world. Complications of prematurity — most frequently heat loss and dehydration — cause 24 percent of these deaths. Electric incubators can minimize this problem, but in the developing world the lack of electricity in most rural regions and the frequent loss of power in urban areas render this technology worthless. Using phase-change material that once heated, for example by wood or coal fire, maintains its temperature for 24 hours, and devising ways to use indigenous raw materials for an outer shell, a team of MIT students are designing a low-cost incubator that will operate without electricity. The students now are reviewing their design with Médecins Sans Frontières in Sri Lanka, and once they have built a working model, they will meet with Sri Lankans to implement field tests.

Selected Recent Projects
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iMath – Keeping Kids Interested in School

Invented by MIT undergraduate John Velasco while visiting his own middle school in San Diego as a volunteer, iMath is an interactive Internet-based curriculum that, with its mentoring component, helps eighth graders understand and apply math concepts and expand their technical skills, while motivating and inspiring them to pursue their education. When he returned to MIT, Velasco implemented his new program in the Cambridge public schools. iMath now involves 70 eighth graders and MIT undergraduates, graduate students, and alumni – with teachers and parents reporting a dramatic change in students' attitudes toward math and learning in general. In 2005 Velasco received the prestigious national Howard R. Swearer Student Humanitarian Award, presented annually to five students across the country for outstanding commitment to community service.

Understanding How to Serve the Homeless

Lack of data is one of the major barriers to combating the root causes of homelessness. Because groups undertaking research on questions concerning the links between homelessness and poor health or education have little hard data, their results and proposed solutions are often questioned. Furthermore, with no good way to collect data, organizations that serve the homeless have no way to evaluate their clients' needs and monitor the effectiveness of their services. The Salvation Army of Cambridge, Massachusetts, came to a group of MIT students on MIT Graduate Student Volunteer Day and asked if they could help with this problem. The students designed a system that, instead of asking clients who came to the shelter for services to sign in with paper and pencil, enabled them to register with a bar-coded card. Now able to collect data accurately and reliably, the shelter can study how to best use its resources to meet its clients' needs. To encourage use of the card, the Salvation Army worked with community partners to provide benefits such as meal discounts and free use of public transportation. The students also designed the system to ensure users' privacy. The Cambridge Salvation Army has been using the system since 2003.