Dear Friends of Engineering World Health,

In 2019, you helped Engineering World Health support the work of 173 student volunteers who gave of their time and skill to improve health care delivery in the low-resource countries in which they served: Guatemala, Dominican Republic, Uganda, Rwanda, Tanzania, Cambodia, and Nepal.

EWH is now a year-round operation. This year, we ran 3 Institutes in the winter and 5 in the summer. Our participants are becoming ever more diverse: As part of our partnerships with universities in our host countries, we have started including local students in our program. For the first time, 10 students from Rwanda’s Integrated Polytechnic Regional Centre worked alongside our international students, 2 Tanzanians from Arusha Technical College worked with us, and 14 Ugandan students from Makerere University lived and worked with students from Duke University and the University of New South Wales.

Together, these student volunteers repaired life-saving hospital equipment that doctors and nurses put to immediate use to save lives. In 2019, our 173 volunteers repaired 2,010 pieces of equipment, worth an estimated $4,020,000.

They taught local technicians, nurses, and doctors how to repair and correctly use equipment – much of it donated, and often arriving without manuals or instructions.

They completed improvements to their hospitals’ infrastructure: creating a call system for nurses, building a water distillation unit, installing a hospital alarm system, stabilizing oxygen canisters, installing privacy curtains, building out workshops and tool racks, and more. They conducted equipment inventories and created digital systems to track repairs.

The contributions the student volunteers make are quantifiable and the value EWH volunteers bring to their hospitals is evidenced by the fact that we are invited back to the same hospitals, year after year. What is harder to measure, but we believe just as important, is the deep impact the program has on the student volunteers themselves.

To test this belief, we conducted a survey of participants who have served sometime in the last 15 years. We asked them to reflect on how their EWH experience influenced their subsequent choices about education, voluntarism, and work. 57% said it influenced their professional choices. 75% felt it influenced the way they think and their life.

Here are a few of their reflections:

A respondent who identified as a working scientist wrote, “My time in Tanzania with EWH has probably been the single most impactful experience in my life that made me start to think like a citizen of the world.”
“EWH opened my eyes to the greater global issues surrounding healthcare technology and inspired me to apply my knowledge to help remedy those issues.”

“EWH broadened my horizons in many ways that I will never forget. I saw a part of the world that I would likely never have seen otherwise, and as a physician now, seeing medical practice in a developing part of the world will forever influence my perspective on medical care.”

“EWH gave me a passion for healthcare. I don’t think I would be working for a medical device company with a desire to improve healthcare globally if it wasn’t for EWH.”

EWH programs “teach something that is almost impossible to learn in any other way: perspective. It teaches you how to survive when thrust entirely out of your comfort zone. It teaches you empathy for those around the world who are combating problems totally foreign to your birthplace, as well as those who are striving to conquer language and cultural barriers in your own backyard. And it teaches you invaluable troubleshooting and hands-on engineering skills that are invaluable to whatever facet of the engineering field you go on to pursue.”

Thank you for supporting this mission and these volunteers. Their energy and dedication to making the world a better place continue to inspire. We hope you are as proud of these terrific young people as we are.

With best wishes,

Michael R. Tracey, Ph.D.
Chair of the Board of Directors

Leslie J. Calman, Ph.D.
President and CEO
Our Mission

To inspire, educate, and empower the biomedical community to improve healthcare delivery in the developing world.

Engineering World Health:
• Provides students from around the world with the life-changing educational experience of repairing vital medical equipment in the world’s most resource-poor communities.
• In collaboration with local partners in Asia, Africa, and Central America, creates locally-sustainable training programs for biomedical engineering technicians (BMETs).
• Engages the next generation through K-12 STEM (science, technology, engineering and math) curricula, university chapters, and design activities to improve global health.

EWH believes we have a responsibility to stay true to these values:
• Ensuring a scientifically-based and creative educational experience.
• Leaving the communities in which we work with greater capacity than we found them.
• Finding workable solutions through innovation and creativity.
• Serving while partnering with local educators, hospitals, and clinics.
• Promoting self-reliance and capacity building.
• Providing challenge without compromising safety.
Summer & January Institutes

The EWH Summer & January Institutes recruit exceptional students to live and work in developing countries, fixing equipment, training and learning from staff, and experiencing first-hand what low-resource hospitals need so that as they go forward in their engineering careers they can creatively meet those needs.

173 volunteers joined the Summer & January programs in eight countries this year. The participants, about half of whom were women, carried passports from 20 countries and represented over 30 universities. In addition, we hosted local students from Makerere University (Uganda), IPRC (Rwanda), and Arusha Technical College (Tanzania). Together, they repaired 2,010 pieces of equipment, worth an estimated $4.02 million.

EWH has created a variety of partnerships with universities in both the US and abroad. We wish to thank our 2019 US partners: Duke University, Texas A&M, Rochester Institute of Technology, George Mason University, Catholic University of America, the University of Portland, and the Rose Hulman Institute of Technology. We were very pleased in 2019 to continue our international partnerships, too, with the University of New South Wales in Australia, the Technical University of Denmark, Makerere University in Uganda, and IPRC in Rwanda.
We worked on the children’s ward for our secondary project. As a kid who grew up in Uganda, I knew exactly how beneficial making the ward child-friendly could be. The staff at the hospital were very happy to receive us and highly appreciated the work we were doing. I am thankful for the opportunity I had to put a smile on a kids’ faces.” — Victor Gume, Uganda

<table>
<thead>
<tr>
<th>January Institute Country</th>
<th>University Partner</th>
<th>Number of Participants</th>
<th>Pieces of Equipment Returned to Service</th>
<th>Estimated Value</th>
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<tr>
<td>Cambodia</td>
<td>UNSW</td>
<td>35</td>
<td>303</td>
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<tr>
<td>Uganda</td>
<td>UNSW</td>
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<td>$1,018,000</td>
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<td>Guatemala</td>
<td>RIT &amp; GMU</td>
<td>10</td>
<td>69</td>
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<th>Summer Institute Country</th>
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<td>9</td>
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<td>Dominican Republic</td>
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<td>6</td>
<td>45</td>
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<td>TAMU</td>
<td>30</td>
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<td>Uganda</td>
<td>Duke</td>
<td>15</td>
<td>164</td>
<td>$328,000</td>
</tr>
<tr>
<td>Tanzania</td>
<td>Duke</td>
<td>20</td>
<td>310</td>
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<tr>
<td>Nepal</td>
<td>Nordic 5 Tech</td>
<td>24</td>
<td>246</td>
<td>$492,000</td>
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“I fixed a dental chair which had been out of use for over a year! I replaced practically all the tubing in the chair and it was big challenge figuring out which tube was supposed to go where. After reading many, many service manuals for different chairs, I finally fixed it and it was so rewarding to see the dentist operating it almost immediately.”
— Serena Luong, Cambodia
“My perspective has forever changed - I love learning a different language, and I love speaking and working with other people. I now know I want to keep doing things like the Institute program, and hope to do something like this professionally.” — Alec Huynh, Dominican Republic

“My favorite experience was when we shadowed one of our BMETs, Baptiste, for a day. We first went to the HIV department to change light bulbs and repair door locks, then we went to change oxygen for babies in the NICU and also pumped water in the Maternity and Neonatology building. After lunch, we went to hang curtains in the Isange One Stop center. It was rewarding to see all the work we had done in a day. I learned that Baptiste was always right when he said they were not only BMETs, but also carpenters, plumbers, and electricians. This was my favorite experience because it opened my eyes to the needs of the hospital.” — Pascale Kunda, Rwanda

“Learning about how technology is used and treated here will help me improve my biomedical designs so they are more sustainable for every country and not just the US.” – Lindsey Alumbaugh, Dominican Republic

“My favorite fix was an examination lamp of the OB/GYN clinic. Although the lamp was not a difficult fix, I was really glad to know that the lamp actually helped the doctor a lot.” — Cady Zhou, Tanzania

“I learned quickly that the difference between the US and Guatemala was not found in appearance, but in accessibility.” — Kel Hakim, Guatemala
“I really enjoyed getting to know the people in the hospital and town. The happiness when returning machines and watching the patients use it at once was very satisfying, knowing that we were the ones that helped them directly.” — Simon Steinvoll, Nepal
Chapters

University Chapters raise awareness among students regarding healthcare challenges that beset the developing world and the medical technology issues unique to resource-poor settings. Participation in EWH Chapters helps students connect to a global network of biomedical engineers committed to solving health challenges and introduces them to ways they, too, can make a difference.

In 2019, 35 student chapters from universities all over the world affiliated with EWH.

US Chapters

Case Western University
Clemson University
Duke University
Elon University
George Washington University
LeTourneau University
McMaster University
Michigan Tech University
SUNY at Buffalo
University of Arkansas

University of Bridgeport
University of California San Diego
University of Illinois-Chicago
University of North Carolina
University of Portland
University of Rochester
University of Texas-Austin
University of Vermont
Vanderbilt University

International Chapters

Autonomous University of Mexico State
Chung Yuan Christian University, Taiwan
Makerere University, Uganda
Technical University of Denmark
University of Aalborg, Denmark

University of Auckland, New Zealand
University of Canterbury, New Zealand
University of Ghana
University of New South Wales, Australia
University of Queensland, Australia

Design Competition — EWH Chapters are invited to participate in our annual Design Competition for cash prizes. Through extensive interviews with healthcare providers in developing countries, EWH identifies healthcare needs specific to the developing world and then challenges teams to design new technologies that might deliver the most positive impact for patients in these settings. This year, EWH received 15 entries.

The 2019 winners are:

1st place: LeTourneau University, Noninvasive Hemoglobin Screening Device

2nd place: Clemson University, Kifua Pampu: Breast Pump to Help Reduce Mother to Child HIV Infections

3rd place: University of Minnesota Twin Cities, Low Cost Infusion Pump

Honorable Mentions: Clemson University, Save Your Breath: A Cost-Effective Oxygen Concentration Sensor from Zinc-Air Batteries

Northwestern University, SensO2r: A Low-Cost Oxygen Analyzer

Visit https://www.ewh.org/chapters/design-competition/ to read more about the winners!
EWH University Chapters provide students with the unique opportunity to participate in a variety of student programs:

The University of Auckland started a new Chapter this year. They’ve already held several STEM Outreach events, partnering with nearby schools to host Kit builds with Year 8 students. Next year, they look forward to innovating new medical device designs and entering EWH’s Design Competition.

The Makerere University Chapter had an incredibly productive year. They hosted two embedded systems training sessions using Arduino, Raspberry Pi, and EWH Kits. The Chapter also ran their 6th annual freshman design challenge, and their 4th BME Hospital Outreach Program to local Ugandan hospitals.
BMET Training & Support

From 2009 to the beginning of fiscal year 2019, EWH partnered with the GE Foundation, local Ministries of Health, hospitals, and school of higher learning to educate Biomedical Equipment Technicians (BMET) students in Honduras, Rwanda, Cambodia and Nigeria. Vital to the program’s success and sustainability is the training of faculty who continue to instruct local students after EWH has departed.

Our most recent training program was conducted in partnership with Nigeria’s Ministry of Health and the Lagos University Teaching Hospital (LUTH). Led by Program Director Carmen Walker, MD, EWH trained 20-25 BMETs each year for 4 years. We developed curricula that have since been certified by Nigeria’s National Board of Technical Education for 2-year and 4-year degrees.

LUTH provided the space in which we built a “Center of Excellence” – a modern, fully-equipped classroom and laboratory. LUTH has continued the program since EWH concluded its participation in December 2018. It is a fully sustained program.
BMET Library — Now in its fourth year, EWH’s online, open-access BMET Library continues to be a resource for technicians and engineers around the globe.

Over 1,700 users visited the library this year, with India, Mexico, and Uganda among our top 10 user-locations.

The Library — which can be found at http://library.ewh.org/ — now hosts over 1,000 items, including 37 textbooks, 156 items on professional development, and 24 articles focused on healthcare technology maintenance. The library includes a Spanish section, with 49 items. This year, we also added a User Manuals section, which hosts 590 user manuals. Summer & January Institute participants continue to share the library with the technicians with whom they work, helping this resource reach those who need it most.
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Ex-Officio
Engineering World Health
Statements of Financial Position

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<th>Statement of Activities</th>
<th>FYE 9/30/19</th>
<th>FYE 9/30/18</th>
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<tbody>
<tr>
<td><strong>Revenue, Support, &amp; Other Income</strong></td>
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<tr>
<td>Grants &amp; Contributions</td>
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<td>Program Fees</td>
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<td>Investment &amp; Other Income</td>
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<td><strong>Total Revenue, Support, &amp; Other Income</strong></td>
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<td>Program Expenses</td>
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<td>Management &amp; General</td>
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<td>Fundraising</td>
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<td><strong>Total Expenses</strong></td>
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<td>Net Assets at End of Year</td>
<td>$788,040</td>
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**Income**: 69% Program Fees, 29% Grants, Contributions, 2% Investment & Other

**Expenses**: 85% Program Expenses, 7% Management & General, 8% Fundraising
Spending by Program

- Institute Programs 84%
- BMET Programs 8%
- Student Programs 8%

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<th>Programs</th>
<th>Spending</th>
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<td>Institute Programs</td>
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<td>Student Programs</td>
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<td>BMET</td>
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### 2019 Funding Partners

**Foundation and Corporate Donors:**

- Cantel Medical
- Coca-Cola Nigeria
- Corning Foundation
- Danaher Corporation
- Derfner Foundation
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*Special thanks to the Wallace H. Coulter Foundation for the early and generous support that enabled us to grow.*

**Individual Donors:**

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Saving Equipment Is Saving Lives