



2023 ANNUAL REPORT



engineeringworldhealth

LETTER FROM THE BOARD CHAIR AND CEO

Dear Friends of Engineering World Health,

Our message this year is simple: *Saving equipment is saving lives.* This was true when EWH was founded in 2001, and it continues to be true in 2023. Hospitals around the world don't have the resources they need to keep critical medical equipment in service, and as a result, the quality of care that they can provide is diminished.

Through the EWH Institutes, student volunteers from around the world provide much-needed technical support to hospitals and clinics, directly contributing to improved healthcare delivery for communities in need. In 2023 we operated a Winter Institute in Guatemala and three Summer Institutes in Guatemala, Uganda, and Nepal, through which 50 volunteers repaired 497 pieces of life-saving medical equipment - their work and repairs are worth an estimated \$934,000 invested in improving healthcare delivery around the world.

Throughout 2023, we continued work in each of our five strategic focus areas: Institutes, Chapters, STEM Education, Virtual Programs, and Cultural Exchange.

Our team facilitated exceptional learning and service opportunities for young engineers around the world through virtual programs - like this exchange between UC Berkeley and the University of Nairobi - and provided over 400 engineering education kits to under-resourced K-12 schools across the US. Hundreds of university students connected and collaborated through 30 EWH Chapters around the world and competed in our 14th annual college design competition with the goal of using technology to make the world a better place.

On the leadership front, in 2024, we are happy to welcome Dr. Cori Lathan as the new Chair of the EWH Board of Directors. Cori has been a dedicated member of EWH's Board since 2010 and brings a wide range of expertise in biomedical engineering research and development as the founder and former CEO of AnthroTronix, Inc.

We hope you enjoy reading about the accomplishments of these talented and passionate students from around the world in this report, and will join us in supporting this incredible community in 2024. As always, thank you for being here!

Sincerely,



A handwritten signature in black ink that reads "Tojan Rahhal".

Tojan B. Rahhal Ph.D., LL.M
President & CEO



A handwritten signature in blue ink that reads "mtracey".

Michael R. Tracey Ph.D.
Board Chair



OUR MISSION

Our mission is to inspire, educate, and empower the biomedical engineering community to improve healthcare delivery around the world.

Many hospitals around the world rely on donated medical equipment to treat patients. Unfortunately, much of this potentially life-saving equipment arrives unusable in the local environment, and over time, nearly all of it falls out of service.

When medical equipment breaks down in low-resource countries, it often stays broken. There are usually few supply chains to get replacement parts, and local technical expertise is sparse. Hospitals face large challenges accessing skilled technicians who can install, repair, and maintain this critical equipment. Infant incubators, oxygen concentrators, and patient monitors lay abandoned in equipment "graveyards."

We believe that saving equipment is saving lives.



GUATEMALA



UGANDA



NEPAL

2023 THE INSTITUTES

EWH was founded in 2001 on the belief that university students can meaningfully contribute to low-resource healthcare systems across the globe.

EWH Summer Institutes provide intensive hands-on training to university students and young professionals in STEM and then place them in hospitals in low-resource areas of Central America, Southeast Asia, and East and West Africa to serve as volunteer biomedical equipment technicians.

Participants collaborate with local hospital staff to repair medical equipment and improve the facilities' overall healthcare technology situation, improving their ability to provide quality care to patients in need. On average, participants are able to repair 75% of broken equipment, leaving hospitals with dozens of repaired machines worth hundreds of thousands of dollars.

Across three countries and dozens of EWH partner hospitals, our 2023 Institute volunteers repaired 497 pieces of medical equipment; their work and repairs are worth an estimated \$934,000 USD.

3

COUNTRIES

4

PROGRAMS



50

VOLUNTEERS



497

REPAIRS

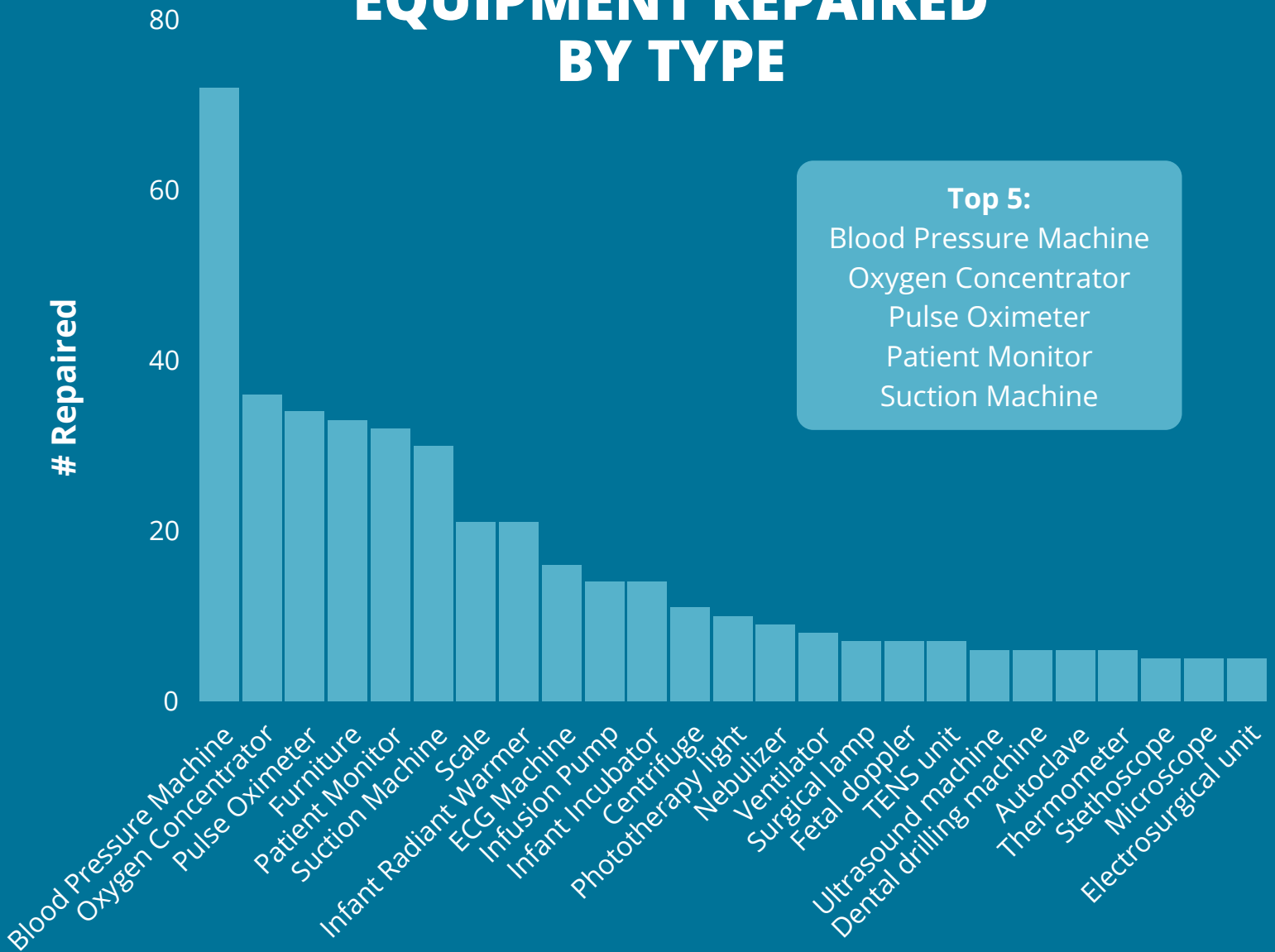


\$934,000

VALUE

EWH estimates the mean value of each repair to be at least \$2,000 USD

EQUIPMENT REPAIRED BY TYPE



Institute participants keep detailed records of the equipment they work on. Each team documents the pieces of equipment they encounter, the reason the piece of equipment is broken or disused, and whether or not they are able to bring it back into service. The most common barriers to repair are typically lack of necessary parts and those which require more advanced knowledge.

In 2023, participants were able to repair 74% of the broken equipment they encountered. The most commonly repaired types of equipment were blood pressure machines, oxygen concentrators, pulse oximeters, patient monitors, and suction machines. Participants also repaired a large amount of hospital furniture.

74%
OF EQUIPMENT
RETURNED TO
SERVICE



Medical professional in blue scrubs and hairnet, standing with arms crossed, observing the patient area.



Penlon anesthesia machine with various dials and controls.



Medical professional in blue scrubs and hairnet, seated and looking at the monitor.

SECONDARY PROJECTS

While their primary objective is to repair medical equipment, EWH Summer Institute participants do so much more to help improve healthcare delivery in their host communities!

Each team is encouraged to complete a secondary project for their hospital during their placement. Through interviews with hospital staff, the participants identify a need in the hospital and are given a budget of \$100 per person to use in a creative way to provide for that need.

You can read more about the secondary projects completed by Institute participants this year [in each program's Final Report](#).



📍 Nepal

Hand sanitizer stands made from PVC pipes: a low-cost project that will enable hospital staff to clean their hands more regularly!



📍 Uganda

One of many projects this group completed was rewiring old bili lights with LEDs to make them more effective at treating babies with jaundice



This group designed and built covers for deep drainage trenches running across high-traffic areas and creating a safety risk at their placement hospital



📍 Guatemala







THE LYNN FISHER FUND

Thanks to support from EWH's Lynn Toby Fisher Scholarship Fund, twelve students from Uganda and Guatemala were among this year's Summer Institute participants.

Lynn Toby Fisher was a brilliant, warm, and generous woman who was deeply committed to the values exemplified in Engineering World Health's work. A member of EWH's Board of Directors from 2014 until her untimely death in 2020, Lynn was especially passionate about EWH's outreach to, and support of, engineering and science students from the countries in which Engineering World Health provides services. To support EWH in this mission, friends and family established the [Lynn Toby Fisher Scholarship Fund](#).

To date, the Lynn Fisher Fund has enabled dozens of students from around the world to participate in Engineering World Health's programs and improve healthcare delivery in their own communities.



The program made me realize in the grand scheme of things, biomedical engineers play a big role in saving lives at hospitals.

Natasha, 2023 Uganda Volunteer

MAKE A GIFT



12

LOCAL STUDENTS
FULLY SUPPORTED

THE STUDENT EXPERIENCE

This year's Institute participants joined us from 11 countries around the world, including United States, Canada, Mexico, Guatemala, Denmark, the Netherlands, Hungary, Rwanda, Uganda, India, and Singapore.

When asked about the most valuable part of the program, students overwhelmingly responded with two things: being able to make a difference, and having the opportunity to meet and learn from so many other people, including other students, EWH staff, and medical professionals.

Several participants said that the program helped them not only gain skills, but also the confidence to try new things. According to one, "During these two months I really integrated myself into a new community and new people, and I think that itself has given me more confidence to do it again in the future - to take risks and do things that might make me nervous... It was definitely an experience of a lifetime for me and I'll never forget it!" When asked to describe the Institute experience in one word, students said it was *life-changing*, *unforgettable*, and *transformational*.

100% WOULD RECOMMEND THE PROGRAM TO A FRIEND

For me, the most valuable part of the program was meeting other engineering students from all over the world. I really enjoyed learning about different cultures. Every single participant brought something unique to our group!

Virginie, 2023 Guatemala Volunteer







2023 CHAPTERS

Through EWH Chapters, the next generation of engineers raises awareness of global health challenges and innovates solutions to medical technology issues.

EWH University Chapters provide students with a unique opportunity to connect with a global network of biomedical engineers and other students who share their passion. EWH University Chapters have designed and implemented STEM outreach programs in their local communities, participated in EWH and international design competitions, launched hackathons and campus wide design-athons, hosted fundraising galas, planned their own hospital outreach campaigns and much more.

In 2023, more than 30 EWH Chapters in 11 countries connected and collaborated to advance EWH's mission and improve healthcare delivery around the world.

30+
CHAPTERS

400+
MEMBERS

11
COUNTRIES



DESIGN COMPETITION

The University College Dublin EWH Chapter took first place in the 2023 [EWH Design Competition](#) with their project [PneuDetect](#). Current clinical methods for diagnosing pneumonia include X-ray imaging, biopsy procedures, and blood tests, however, these methods have limitations in terms of specificity, invasiveness, and availability in resource-limited settings. In low and middle-income countries (LMICs), pneumonia diagnosis relies on a set of WHO guidelines, which primarily depend on subjective clinical signs and symptoms, despite the fact that studies have revealed that relying solely on a single clinical sign, such as respiratory rate, is unlikely to enhance diagnostic precision for pediatric pneumonia.

PneuDetect is an easily deployable device that can be used by healthcare workers in the infants' homes, providing quick and accurate diagnosis. The device utilizes an exhaled breath condensate (EBC) analysis module and an electrochemical sensor. EBC samples have a composition similar to blood and lung fluid and contain compounds which can be examined for potential biomarkers for non-invasive pneumonia diagnosis. Through the use of a face mask, EBC may be effectively collected from newborn infants. With pneumonia claiming the lives of 800,000 children annually, the device has the potential to avert nearly 9 million child deaths in this decade. Using a 3-D printer, PneuDetect costs just €102 (about \$109 USD) to create, making it much cheaper than other options currently available.

The PneuDetect team hopes to establish the device as a start-up enterprise and leverage partnerships with charities, NGOs, and by participating in entrepreneurship programs, the aim is to establish a sustainable business model and bring the device to market. Congratulations to design team members Sarthak Jain, Beryl Johnson, and Nathan Hens on this achievement!



Second place in EWH's annual College Design Competition went to The University of Texas at Austin EWH Chapter for their design,

ThermoRevive. ThermoRevive is a low-cost neonatal incubator designed to empower low-and middle-income countries (LMICs) through repurposed hardware.

Neonatal hypothermia is a major concern among low birth weight premature infants - an issue which is particularly pronounced in LMICs where access to essential neonatal care, including adequate thermal protection, may be limited. To address this issues, the UT Austin Chapter focused on creating neonatal incubators from affordable everyday electronic parts so that part specific expertise isn't required to bring a broken incubator back into operation.

Congratulations to Maansi Srinivasan, Sriya Cheemalamarri, Arshiya Choudhary, Dhara Purohit, Lizzy Young, Manasa Sripathi, and Varsha Kotamreddy for their second place win!



The University of Minnesota - Twin Cities EWH Chapter took 3rd place with their design for "A Low Cost Autoclave Temperature and Pressure Monitor" which monitors the temperature and pressure inside of the autoclave in real time using sensors connected to an Arduino microcontroller.

In order for autoclave sterilization to be considered successful, the autoclave must reach a minimum threshold temperature, and hold the contents of the autoclave at that threshold for a defined length of time. Their design features an LCD and series of indicator lights to communicate the status of the autoclave and alert the user in the event that pressure drops below the threshold pressure or temperature. The device was designed to use minimal, easily replaceable, low-cost electrical components.

Congratulations to project team members Kristy Allen, Matthew Brown, Aidan Decker, Nora Fritcher, Austin Lange, Adam Lavine, and Nicholas Stenlund!

CHAPTER OF THE YEAR



The EWH Chapter of the Year Competition recognizes the hard work and innovation of the most outstanding EWH Chapter during each school year. Chapter of the Year submissions allow EWH to share and inspire Chapters across the globe.

Engineering World Health named the EWH Chapter at Makerere University in Uganda our 2023 Chapter of the Year. The Makerere University Chapter is very active in their community. In 2023, they launched a new outreach initiative to reduce the amount of out-of-service equipment at the university's hospitals. Students worked primarily at the dental school hospital, where they learned how to maintain, operate, and repair dental chairs.

35
PIECES OF
EQUIPMENT
EVALUATED







2023 VIRTUAL PROGRAMS

Virtual engineering courses and exchange opportunities enable EWH to reach more young engineers around the world than ever before.

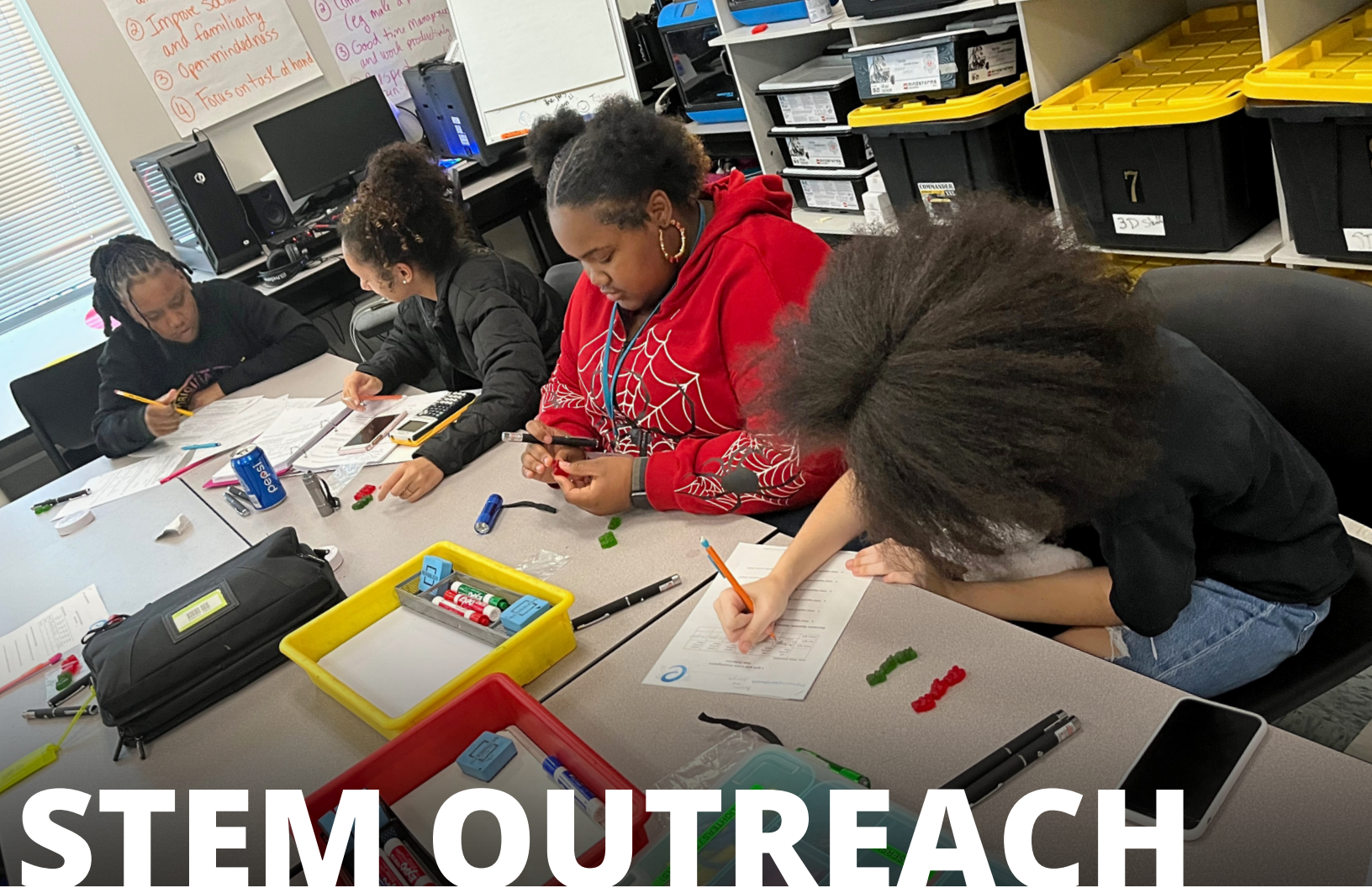
In 2023, we hosted the second ever iteration of EWH's High School Design Competition and awarded three talented teams prizes for their unique solutions to global health challenges, including a low-cost rainwater collection and steam distillation system and a portal oxygen supply powered by solar panels.

In the spring, we partnered with UNSW Sydney to facilitate a project for over 100 high school girls in Australia to broaden their understanding of humanitarian engineering through a virtual course focused on low-resource design in healthcare settings. This summer, our team facilitated a virtual engineering exchange between students at the University of California, Berkeley and the University of Nairobi in Kenya.

Participants in these programs not only learned about the engineering design process and the unique needs of low-resource healthcare systems, but gained valuable skills in project development, public speaking, and critical thinking.

3
PROGRAMS

150+
STUDENTS

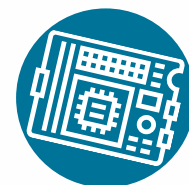


STEM OUTREACH

EWH's Kits for the Classroom program provides free, hands-on STEM education to Title I K-12 schools across the U.S. Our three Kits are based on biomedical devices and are designed to introduce students to engineering and circuitry through hands-on experience. Kits engage students in STEM learning, while the resources EWH provides emphasize the real-world applications of each lesson.

Thanks to support from EWH partners and donors, in 2023 we provided free Kits and learning materials to Title 1 schools around the U.S. for use with 1,185 students.

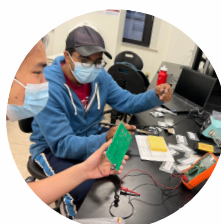
In addition to parts to build the Kits, EWH provides each classroom with supplies and lesson materials, works with teachers to fit the activity into their curriculum, and even helps implement the activity by guiding students through virtual build sessions.



358
KITS



1,185
STUDENTS



Students loved "being" biomedical engineers and creating something useful for health applications. I'm glad they got a chance to discuss equity and how others live outside of their communities and experiences. Empathy is an excellent quality to encourage.

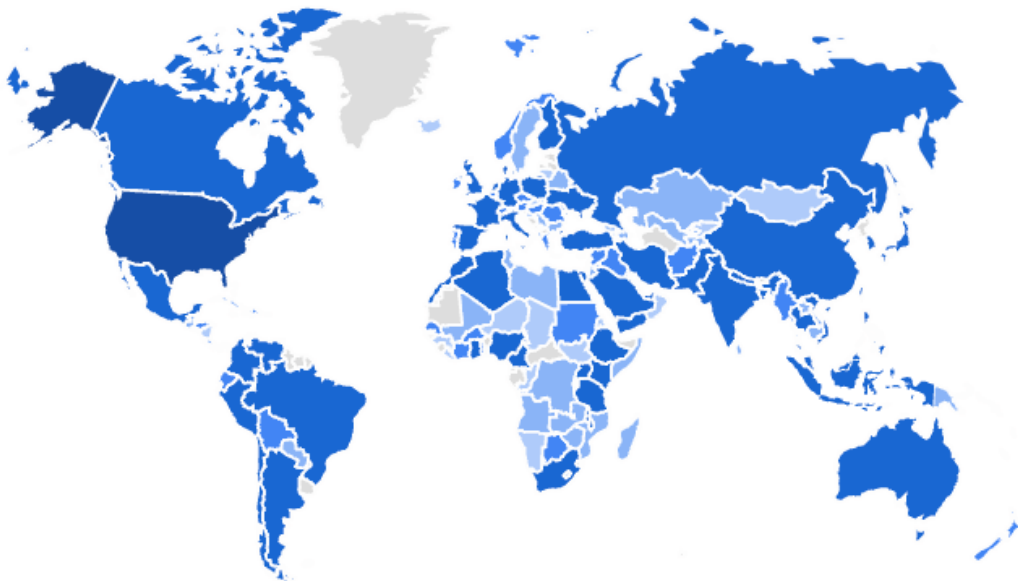
Mrs. C, High School Science Teacher in North Carolina

BMET LIBRARY

Through the BMET Library, Engineering World Health fosters information exchange among engineers and technicians around the world. We believe that a stronger biomedical community will lead to more equipment designed for a variety of environments, more people with advanced biomedical knowledge, and - ultimately - more hospitals with the technology they need to provide quality care.

Now in its eighth year, EWH's online, open-access BMET Library continues to be a critical resource for technicians and engineers around the globe. The Library hosts thousands of open-source books, training guides, equipment manuals, and other resources, primarily targeted toward supporting biomedical equipment technicians in low-resource environments. As part of our efforts to support BMETs, EWH has grown its collection of resources from just over 1,000 in 2019 to 3,214 in 2023

BMET Library Use by Country in 2023



3,214
RESOURCES



2,849
USERS



Do you have resources that you think should be included in EWH's BMET Library?

Share them with us by emailing library@ewh.org



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In Memoriam

Lynn Toby Fisher, JD



Corinna E. Lathan, PhD Incoming Chair

We are excited to welcome Dr. Cori Lathan as the incoming Chair of the EWH Board of Directors!

Dr. Lathan is the founder and former CEO of AnthroTronix, Inc., a biomedical engineering research and development company. Her work on technology for children with disabilities has been featured in Forbes, Time, and the New Yorker magazines as well as led to such distinctions as Maryland's "Top Innovator of the Year," and one of MIT Technology Review Magazine's "Top 100 World Innovators." She has also been named a Technology Pioneer and a Young Global Leader by the World Economic Forum. Dr. Lathan is actively involved in educational outreach programs that empower women and minorities in engineering and science including the FIRST and VEX robotics programs. Dr. Lathan received her B.A. from Swarthmore College, and an S.M. in Aeronautics and Astronautics and a Ph.D. in Neuroscience from MIT.

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Special thanks to the Wallace H. Coulter Foundation for the early and generous support that enabled us to grow.

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