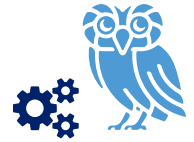

RICE360

INSTITUTE FOR GLOBAL
HEALTH TECHNOLOGIES



YEAR IN REVIEW

2022-2023



“The Rice360 summer internship addressed all my (previous) concerns and equipped me with rich perspectives about global health ethics. My project was focused on assessing the challenges to hypothermia prevention in the neonatal units of Tanzanian hospitals. Through this study, I figured out not only how to conduct qualitative research, but also what my positionality is and how to negate power imbalances. I am so enthralled by this line of research that I am continuing into the fall semester and hope to see it to the finish line in order to develop “change packages” for hospitals. This internship was a launch pad for me to a life in global health work, and for that, I am deeply grateful.”

OJAS DUMBRE '25
Majoring in Anthropology
Minoring in Global Health Technologies, Biochemistry and Cell Biology

LETTER FROM OUR CO-DIRECTORS



Dear Friends,

Greetings from Rice360! It is with great joy that we reflect upon the year. It is the dedication and collaborative spirit that define our shared journey toward global health innovation. We find ourselves humbled by the progress Rice360 students, engineers, and partners have achieved, progress that would not have been possible without your unwavering support.

Collaboration and innovation drive the progress of Rice360 and the community-focused health solutions that are making a difference in the lives of our students and globally. In the pages that follow, you will read about the successes of our students and partners and their transformative projects.

As we celebrate this year’s achievements, we are grateful to you, our partners and funders, for being an essential member of the Rice360 global team and making global health innovation possible. We look forward to another successful year ahead.

In gratitude,
Rebecca and Maria

LETTER FROM OUR ADVISORY BOARD CHAIR

On behalf of the Rice360 Advisory Board, I extend my heartfelt gratitude to you. Your steadfast support, in collaboration with Rice University’s leadership and our global partners, has played a pivotal role in shaping the success of the Rice360 Institute of Global Health Technologies this year.

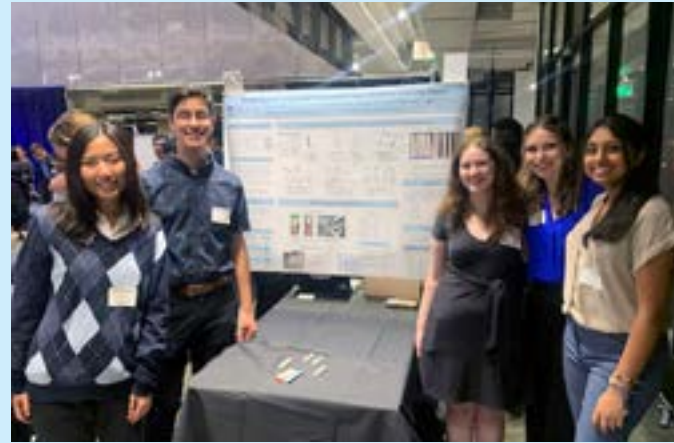
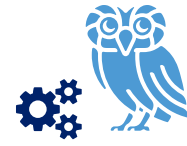
Rice360 and its dedicated partners achieved remarkable progress in advancing technology and enhancing innovation education. These achievements stand as a testament to the unwavering commitment and resilience of our community of partners and supporters. Our students’ contributions in addressing global health challenges highlight the potential of a healthier, more equitable tomorrow.

Your support empowers us to foster innovation and education, making progress in global health solutions. Thank you again for being an integral part of our journey.

Jay Collins



Rice360 Education Program Highlights



Pictured: Team Test TSH members (from left) Margaret Li, Alex David, Alison Maniace, Elise Erickson and Vanshika Jhonsa pose beside their project stand at the 2023 Huff OEDK Engineering Design Showcase held April 13 at the Ion. (Photo courtesy of the Oshman Engineering Design Kitchen/Rice University)

Global Health Technologies Minor Congenital Hypothyroidism Test for Newborns

Team Test TSH addressed the need for early diagnosis of congenital hypothyroidism by developing a low-cost screening point-of-care test in May 2023 for their capstone project. The students' ability to draw from their diverse expertise in multiple fields of study earned them the Best Interdisciplinary Engineering Design Award at the George R. Brown School of Engineering's annual Huff OEDK Engineering Design Showcase held last month at the Ion. The team also won first place in the global health track of the Johns Hopkins Healthcare Design Competition and second place in the Rice360 Global Health Technologies Design Competition."

[Read the full article here.](#)

Global Health Technologies Minor Neonatal Health – Low-cost Solution for Oxygen Delivery

Team [Avatar The Last Air Blender](#), made up of Harlan Cook, Ojas Dumbre, Brennan Keogh and Leora Maksoud, worked at the Oshman Engineering Design Kitchen (OEDK) to advance a prototype design for a low-cost device that blends oxygen to improve safety for newborns needing breathing support.

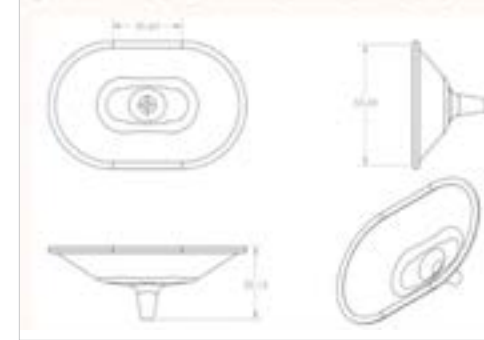
Retinopathy of prematurity can damage the eyesight of infants receiving oxygen support. Blending a pure oxygen supply can decrease the risks, but the equipment to do so is costly. These talented students developed a 3D-printed blender that relies on the Venturi effect to diffuse pure oxygen to a safe level for premature babies.

While the team is still fine-tuning its device, it hopes it will eventually be available for mass production and distribution to areas in need.

[Read the full article here.](#)



OUR SOLUTION: CUSTOM URINE COLLECTION CUP



Global Health Technologies Design Competition International Innovation and Design

Rice360 hosted its [13th annual design competition](#) in April 2023, its first hybrid competition in its' history. Participants included teams from universities in Africa, North America, South America, and South Asia. The teams presented their global health innovations to a panel of judges who selected the winners.

Team Fistula Fighters, from Washington University, St. Louis took home first place for their design of a low-cost discrete urine collection system designed for those suffering from incontinence related to fistulas.

Team TestTSH, from Rice University received second place for their hypothyroidism test design.

Team Anemia Assessment, from St. Louis University took third place for their low-cost test.

Team BabyBelt, from Bangladesh University of Engineering and Technology was awarded The Crystal Sea Award for materials science and digital innovation for their low-cost fetal heartbeat and uterine contraction monitor. This award is provided in honor of Haiqing Du, a material scientist.

Team Pathfinder, from Ladoke Akintola University of Technology in Nigeria took home the Diversity, Equity and Inclusion Award. Their design focused on for a accessible and sanitary toilet seat to be used with open toilets.

Team BambasúAid, from la Universidad de Los Andes won the People's Choice Award for their design of a pediatric monitor for congenital heart conditions which captured more than 14,000 votes on the design competition's People's Choice website.

[Read more about the competition and finalists on our website!](#)



Rice360 Global Health Technologies Internships

The 2023 SEED and Rice360 internship programs welcomed students from Rice University and our partner institutions in Malawi, Nigeria, and Tanzania to iterate on global health design projects aimed at solving local challenges. We appreciate the support of Chevron who sponsored the participation of students from Nigeria with their Carbon Sequestration Education Model, Smart Helmet Haptic Interface System, Recycled Bottles to 3D Printer Filament System, and Neonatal Gastric Suction Device.

[Watch a video recap of our 2023 internship here.](#)





Maternal Health SPOTLIGHT

This spring, Rice360 hosted a panel discussion on how bias and racism impact maternal healthcare, the status of African American maternal health in Texas/the U.S., and how healthcare providers and innovators can advance meaningful change, titled, *African American Maternal Health Outcomes: Transcending the legacy of racism and bias impacting healthcare quality and medical technology design.*

Panel participants included:

- Dr. Carey Eppes, the chair of the Texas Collaborative for Healthy Mothers and Babies, who spoke about the latest Texas Department of Health and Human Services report showing concerning trends for maternal health in Texas.
- Dr. Anne Gill from the Baylor College of Medicine provided insight from her work establishing implicit bias training for medical students at Baylor.
- Dr. April Lovelady from Texas A&M's School of Engineering Medicine addressed the importance of inclusive design of medical technologies.

More information and a recording of the panel discussion are [available on our website.](#)

We discover & evaluate the biological, social, economic, & structural factors that give rise to health inequities



Innovations and Progress



Low-cost Universal Cervical Cancer Instructional Apparatus (LUCIA)

LUCIA provides realistic hands-on training materials to educate providers in cervical cancer screening, diagnosis, and treatment. Over the past year, we have optimized the model to include a easy-to-clean, realistic silicone labia and vaginal canal, a quick-reference user manual and a carrying case. To date we have produced and donated over 50 models throughout the world.



Celsi Warmer (with 3rd Stone Design)

We completed a benchtop assessment of Celsi Warmer, a conductive warmer that uses a physiological closed loop to achieve normothermia in newborns. Afterwards, we completed a clinical study and usability study, validating the beta prototype. A larger clinical study and regulatory assessment are in progress while the project moves to commercialization.



BreathAlert

Development continued on BreathAlert, a respiratory monitor that also detects apnea designed to be suitable for low-resource settings. BreathAlert is compatible with Celsi Monitor — both devices use a single display for temperature, respiratory rates, and alerts for caregivers. Clinical evaluations continued at Texas Children's Hospital (TCH) in Houston, Texas, where 10 newborns were enrolled in testing the device. The TCH study together with the data gathered from studies at Queen Elizabeth Central Hospital, Malawi, have demonstrated the accuracy of the respiratory rate monitor falls within the Target Product Profile within ± 2 bpm. Refinements continue in preparation for regulatory submission.



Celsi Monitor (with 3rd Stone Design)

A 510(k) premarket notification was submitted this year to seek FDA clearance for Celsi Monitor, a continuous temperature monitor that consists of a reusable temperature probe, reusable abdominal belt, and monitor. In August 2022 -July 2023, we implemented a large validation study (n=75) at Kenyatta National Hospital, in Nairobi, Kenya, confirming accuracy between our novel temperature monitor and a reference temperature monitor.

Global Health Technologies Fellowship Spotlight

Rice360 Institute for Global Health Technologies offers post-baccalaureate fellowships for exceptional early-career engineers with an interest in medical technology for low-resource settings. During their time as Rice360 fellows, they become part of our international teams and often travel to support the development of Rice360 supported projects.



ABBY CHAPIN
PROJECT: COLOSTOMATES



Abby Chapin joined the Rice360 Fellowship in August 2021 to begin work on Rice360's Colostomates, a project to design a low-cost and reusable ostomy bag system, after completing her bachelor's in mechanical engineering and M.S. in Design Science with a focus on healthcare at the University of Michigan.

Colostomates aims to provide a low-cost, quality, easy-to-use, sanitary ostomy care package to individuals who cannot access or afford expensive commercial ostomy care supplies. This project began as a student project in the Rice360 Global Health Technologies Minor in 2017.

Abby's design improvements advance compatibility with a generic adhesive, cutting user costs. She and her team also improved the design concept by introducing a drainable, reusable bag while maintaining the ability to use disposable plastic bags, such as produce bags, for waste containment. This choice of waste collection options offers flexibility for those who will ultimately use Rice360's ostomy system.

"I wanted to focus on what someone in a struggling financial situation would need from their ostomy care products. Currently, people try to make their own options or make commercial supplies last as long as possible, risking their skin and stoma health by doing so. I took the general design of commercial supplies and removed the proprietary components to increase accessibility, and utilized more durable materials so they could be safely reused over and over again... My proudest achievement this past year was enrolling ostomates in the project's first set of clinical trials and using their feedback to solve some of our years-long design challenges to create the first leak-proof bag prototypes."

Abby will be finishing up her fellowship later this year, and for the remainder of her time here, she will be focusing on another clinical trial with further design improvements and leaving concrete next steps for the next fellow to take on this project.

[RICE360.RICE.EDU/FELLOWSHIP](https://rice360.rice.edu/fellowship)

Rice360 Global Health Fellows

Abby Chapin | Colostomates

Josh Coyle | BreathAlert

David Kimmey | Celsi Warmer

Shababa Matin | LUCIA & Usability Studies

Natalie Mitchell | Validation Studies with Celsi Monitor & Celsi Warmer

Invention Education Design Studios at African Partner Universities

Along with several African universities, Rice360 is part of an ecosystem of innovators who work to invent the next generation of technologies that support newborn care and other global health needs. Universities in Africa have established six partner design studios in Ethiopia, Malawi, Nigeria, and Tanzania.



Nigeria Spotlight | To aid the growth of women in Science, Technology, Engineering and Mathematics (STEM), the Ignite Tech in Girls (ITiG 1.0) Bootcamp was held December 2022 at the University of Ibadan (UI) Design Studio & Innovation Hub. Through a strong partnership between the UI and University of Lagos (UNILAG) Design Studios, the participants were given training on Embedded Systems Design, 3D Printing, Computer-Aided Design, Public Speaking and Presentation Skills.



The UNILAG Design Studio hosted a **Sanitation Technology Hackathon** in 2022 in partnership with UI where 38 brilliant young minds in eight teams, in a healthy competition, designed devices to address the problem of open defecation, which is prevalent in Nigeria. The team who designed a Disability Inclusive Latrine (DIL)-PAN tackled the problem of transmission of diseases by insects and other vectors while also running on relatively low amounts of water compared to contemporary systems and created a solution that could be used for people with disabilities.



Kenya Spotlight | Kenyatta University in collaboration with Rice360 hosted the first annual Kenyatta University-Rice360 Design Competition on August 11, 2023, at Kenyatta University. Twenty-seven student teams applied from Kenyatta University and Jomo Kenyatta University of Agriculture and Technology and 16 were accepted to participate in the competition. The competition theme was "Designing for One Health." First place was awarded to students Juma Theophilus and Alexander Kinyanjui of Kenyatta University for their project titled, Comprehensive, Friendly and Tailored Access to Mental Health Services by PsychX.

The Innovation Technology Landscape Launches!

The [Innovation Technology Landscape](#) serves as a resource to feature the impressive work of innovators working to design solutions to address real-world challenges. The ideas featured are designed for resource-limited settings by innovators who are on the ground and working in these settings.

The material in the landscape report was gathered from African Invention Education Partners at Addis Ababa University, the Dar es Salaam Institute of Technology, the Malawi University of Business and Applied Sciences, the Malawi University of Science and Technology, the University of Ibadan, and the University of Lagos.



Partner & Student Awards



Rice360 Innovation & Leadership Award, 2023

Renuka Gadde & Dr. Theresa Mkandawire were presented with the Rice360 Innovation & Leadership award for their work supporting global health technology innovations. Theresa Mkandawire leads invention education efforts as an associate professor and former dean of engineering at Malawi University of Business and Applied Sciences. Renuka Gadde is a senior advisor to the Clinton Health Access Initiative (CHAI).

Rice360 Global Champion Award, 2023

Jan Duncan was awarded the Rice360 Global Champion Award for her commitment to global health and advocacy for treating and rehabilitating women with fistulas in Malawi and Ethiopia.

Rice360 Alumni Leadership Award, 2023

Dr. Elizabeth Spiegel '11 received the Rice360 Alumni Leadership Award for her research focused on the perceptions of disability in low- and middle-income countries. Her research team has established the first culture-specific scores that measure perceptions of disability in low-resource settings.

Rice360 Impact Award, 2023

Members of Team PEP (formerly named Team PIPER), Elise Erickson, Michelle Gachelin, Shivani Kulkarni, Alison Maniace, Shannon McGill, Summer Shabana, and Aasha Zinke, & Team BellyTubbies, Pavithr Goli, Ajay Kumar, Ana Saucedo, Summer Shabana, and Anna Tutuianu, were presented with the Rice360 Impact Award which is given to students whose contributions leave a lasting impact

on global health. The project PEP is a training model for clinical providers to learn to perform pediatric pelvic examinations and care for pediatric survivors of sexual assault. Team BellyTubbies worked to develop a gastric suction device for newborns in the Dominican Republic.

Rice360 Service and Advocacy Award, 2023

Shrutika Gupta, Pranav Mandyam, Vedha Penmetcha, and Zoe Wang, founders of the Rice360 Student Club, were awarded the Rice360 Service & Advocacy Award for their demonstrated advocacy in service for equity in global health. This group has sparked interest in global health on campus.

Rice360 Innovation Award, 2023

Members of Team TSH, Alex David, Abby Dowse, Elise Erickson, Vanshika Jhonsa, Margaret Li, and Alison Maniace, received the Rice360 Innovation Award for their design of a low-cost, point-of-care thyroid test for infants in low-resource settings, which can help with early detection and treatment of low TSH. Abby Dowse also received the Rice360 Innovation award for her continued work on Steridrum, a low-cost, UV-light sterilization chamber made from an oil drum.

Rice360 Student Leadership Award, 2023

Vanessa Garlepp, Vanshika Jhonsa, and Fadeel Khan were recognized for their notable contributions to Rice360 as teaching assistants. The Rice360 Student Leadership Award recognizes students who demonstrate a passionate commitment to leadership in global health.

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Mamadou Beye
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Ways to Give

Thank you to our community of generous supporters that make the work at Rice360 possible.

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