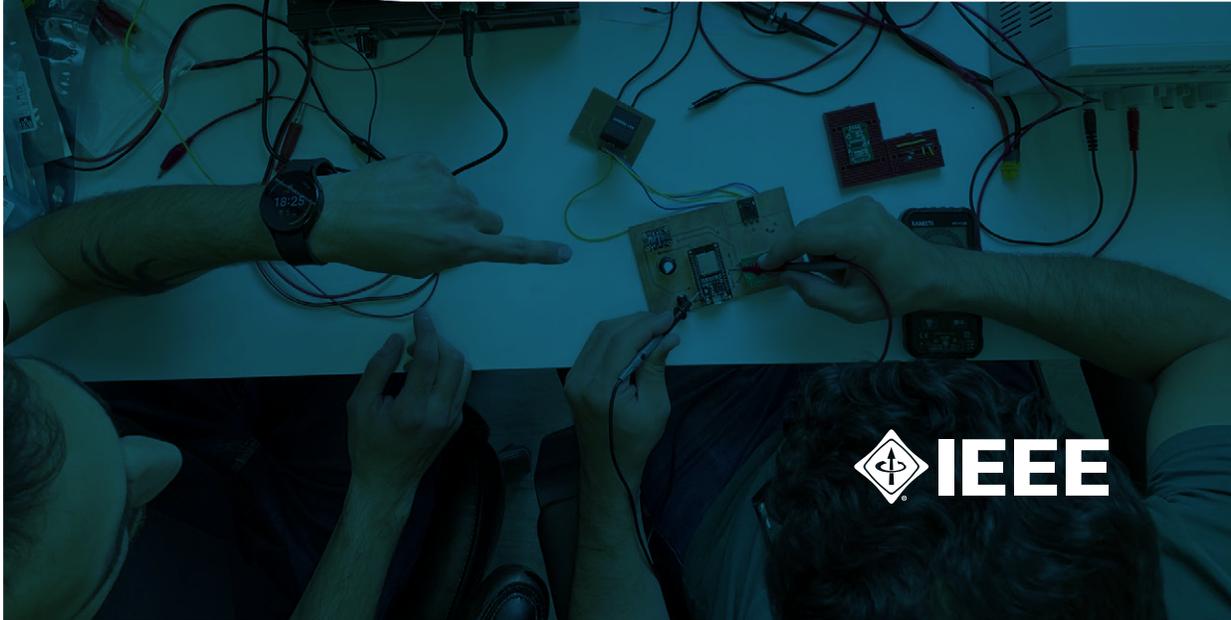**2023**

EPICS IN IEEE

Engineering Projects In Community Service

YEAR IN REVIEW

IEEE

Rowan University's Department of Experiential Engineering Education, in partnership with Rowan Environmental Action League (REAL), maintain and upgrade the on-campus community garden that grows food for the Rowan University food pantry.

Hello Friends of EPICS in IEEE!

Students in Panama testing technology for the "Closing the Gap in Engineering Education for People with Disabilities" project.

Building on the positive momentum of 2022, the EPICS in IEEE program approved an impressive 39 projects in 2023, all of which support EPICS in IEEE's four foundational pillars (access & abilities, education & outreach, environment, and human services), and **surpassed a milestone of $1 million USD in project funding.** This positive growth and activity all contributed to the program's most successful year-to-date!

This year was also successful thanks to the strong partnerships we've maintained as well as the exciting new partnerships we've developed throughout the year.

In addition to providing essential project support in 2023, our committee made several enhancements to our operating processes and also increased our public engagements across IEEE to build awareness of EPICS in IEEE. Highlights of our 2023 activities include:

- **Creation and distribution of micro-training sessions** to help better prepare students to submit proposals
- **Presentations on EPICS in IEEE to multiple audiences** in webinars and conferences around the world
- **Development and launch of a new review procedure** including additional IEEE members as reviewers for the Fall Call for Proposals

As we look ahead to 2024, the EPICS in IEEE Committee is thrilled to be celebrating the past, present, and future of our program through our **15th Anniversary Celebration.** We hope that you enjoy the following review of our past year's activities, and we encourage you to take part in our landmark anniversary celebration in 2024!

Stephanie Gillespie, Ph.D.
EPICS in IEEE Committee Chair, 2023
Associate Dean, Tagliatela College of Engineering, University of New Haven

"This year was successful thanks to the strong partnerships we've maintained as well as the exciting new partnerships we've developed throughout the year."

EPICS IN **IEEE**

Global Participation in 34 COUNTRIES

37% NORTH AMERICA

32% ASIA

15% AFRICA

13% SOUTH AMERICA

3% EUROPE

EPICS IN IEEE

39 PROJECTS

PROJECT PILLARS

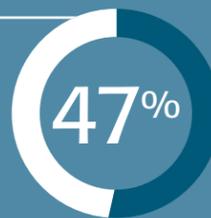| 4	26	5	4
Environmental	Access & Abilities	Human Services	Education & Outreach

$167,000 USD

given out in funding this year

811 STUDENTS

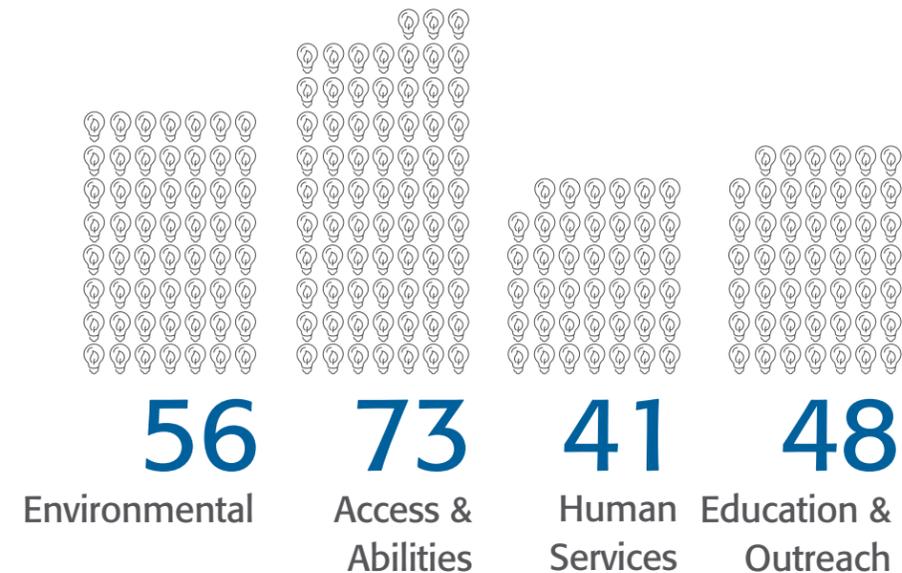**579** University Students **232** Pre-University Students

47% Female Students

256 IEEE VOLUNTEERS Engaged

219 PROJECTS

PROJECT PILLARS

56	73	41	48
Environmental	Access & Abilities	Human Services	Education & Outreach

$1,099,000 USD

given out in funding since 2009

11,201 STUDENTS

4,579 University Students **6,622** Pre-University Students

1,036 IEEE VOLUNTEERS Engaged

Total Estimated People Impacted

1,585,816*

EPICS in IEEE Access and Abilities Competition

Members of the Adaptive Mouse EPICS in IEEE team at the University of Florida in Gainesville collaborate on product design for a mouse and keyboard all in the same device that can be used with one hand.

"Combining what I've been learning in the classroom with funding from IEEE and my own personal passion for gaming, I'm hoping to make a difference and help others enjoy a hobby that I love."

In Fall 2022, EPICS in IEEE initiated a call for proposals for service learning projects that solve accessibility issues within communities, enable adaptive services, redesign technology for equity, and develop assistive technologies. Given that more than 15 percent of the global population (about 1 billion people) lives with disabilities, such as hearing, vision, mental health, or mobility impairments, EPICS in IEEE was responding to the need for innovative and cost-effective solutions in local communities around the world.

Administered in partnership with the **IEEE Foundation,** the 2023 Access and Abilities Competition was designed to challenge university students from all over the world to use their engineering skills to help solve accessibility issues within their communities. Through this innovative competition, students, faculty, and IEEE professionals were inspired to come together with community organizations to address the technological needs of communities through service learning.

After carefully reviewing the impressive 58 proposals submitted, the EPICS in IEEE Committee selected 23 projects for funding in early 2023. Student teams were awarded between $1,000 and $10,000 USD to build their prototype or solution in collaboration with their community partners within 12 months. The resulting projects, which range from a sound detection device in Canada to a wheelchair electric assist device in the US, a self-navigating robotic walking aid in Malaysia, and many more, involved over 350 students and 149 IEEE volunteers and are estimated to impact an estimated 8,000 individuals worldwide in the first year of deployment.

"Combining what I've been learning in the classroom with funding from IEEE and my own personal passion for gaming, I'm hoping to make a difference and help others enjoy a hobby that I love," shared John McCauley, a biomedical engineering student at the University of Florida at Gainesville, US, of his team's Adaptive Mouse, an innovation designed to help individuals with hand or arm deficiencies to enjoy the exciting and rapidly-growing world of gaming.

In another project, a team from Mehran University of Electronics and Technology in Sindh, Pakistan, developed a Low-Cost Stairlift designed to help remove financial barriers and usher in a new degree of hope, independence, and inclusivity for individuals with mobility issues in their region.

The EPICS in IEEE Access and Abilities Competition was funded by the **Jon C. Taenzer Memorial Fund,** which was established by the IEEE Foundation in 2019 thanks to a generous bequest from the estate of Mr. Taenzer, an IEEE Life Senior Member. Together, EPICS in IEEE and the Taenzer Fund provided **$90,000 USD** to the Access and Abilities Competition to support the development of innovative solutions for those with disabilities and promote IEEE's mission of advancing technology for the benefit of humanity.

Students Create a Recycling Device to Combat Plastic Waste in Their Community

IEEE Student Branch at the University of Peradeniya in Sri Lanka created "iSort," a sorting process for recyclable materials that also included an education component and reward system for young students.

With many citizens in Sri Lanka either burning their plastic waste or otherwise improperly disposing of it, members of the IEEE Student Branch at the University of Peradeniya in Sri Lanka, along with students at the university's Rotary Club, could no longer stand by and watch the quality of their air decline and area landfills overflow with plastic. They promptly responded by creating iSort, a process for identifying, sorting, and condensing plastic waste to help ensure its proper recycling, improve the quality of life for residents, and promote a cleaner environment.

Driven by a team of 50 students and five IEEE volunteers, "our main focus was to develop a machine using different engineering practices gained during our undergraduate years that would be capable of sorting out the plastic waste into different categories," shared team member Saumya Abeyrathne, who noted that the project's other primary goal was to educate people on the importance of recycling, which the team encouraged with rewards of mobile data packages for using the machine.

The development of a deep learning model using Google images in conjunction with a sorting device created with a Raspberry Pi enabled the iSort apparatus to identify, categorize, and then shred the plastic waste to increase recycling capacity. And while the team recognizes that the collection of all soft plastics is impossible, "we hope to encourage youngsters to recycle by using a token system, which can be helpful for them in their studies," said recent Electrical & Electronic Engineering graduate and team member Primash Morapitiya.

Team iSort confirmed that the invaluable support they received from EPICS in IEEE enabled them to help address a global problem by making a measurable difference in their local community.

"If it weren't for [initiatives] like EPICS in IEEE, our project might still be in the concept or design stage," Abeyrathne said. "We're really grateful for EPICS in IEEE because it offered a great opportunity for us to make our project a reality."

"We're really grateful for EPICS in IEEE because it offered a great opportunity for us to make our project a reality."

EPICS IN IEEE

Team's Development of Robotics Kits Help Teach Younger Students about Agriculture, the Environment, and Physics

Students Create a Solar-Powered Air-Filtration System That's Improving Air Quality Halfway Around the World

Young students viewing and testing the agricultural robotic kits..

Information is power, and a team of students at Universidad del Cauca in Colombia, along with IEEE volunteers and IEEE Senior Members recently took that to heart when they launched their *Space and Agriculture Robotics (Rokit)* project. Working in conjunction with community organizations and local school boards, the project worked to strengthen STEM education while also improving the agricultural systems in rural areas by introducing the concepts and application of sustainable technologies and power sources within the local school system.

Through the *Rokit* project, the team created 10 modular robotics kits specialized in agriculture to help educate Colombian students on the topics of agriculture, the environment, and physics. The kits have the capacity to move independently, cultivate crops, measure physical, chemical, and environmental variables, become aware of their surroundings, and accept programming from various devices. Members of the IEEE Aerospace and Electronic Systems Society (AESS) Unicauca partnered with organizations Happlab Seedbed (R&D Group in Computational Intelligence) and Natues STEAM to help ensure that the robots' capabilities were tailored to the needs of the community.

According to project mentor Ernesto Vega Janica, former Senior Manager of Opportunities Development within the IEEE Standards Association, use of the kits will help Colombian students gain soft skills in problem-solving, creativity, and leadership as well as hard skills in programming, data analytics, basic physics, electronics, and ecology. "I think this particular project will help younger generations learn about STEM careers and how these technologies can improve the quality of life for many underserved communities," Vega Janica said.

Team members are thrilled that the *Rokit* project is planting positive seeds by educating the next generation on sustainable technologies that will help address food sovereignty issues in their country.

"Having these hands-on experiences will show students that these projects are achievable," Vega Janica confirmed, "even in remote and often neglected communities."

> "I think this particular project will help younger generations learn about STEM careers and how these technologies can improve the quality of life for many underserved communities."

The Rokit project team created 10 modular robotics kits specialized in agriculture to educate Colombian students.

Though they're located over 6,000 miles away from their intended targets, a team of students from the the Fulton Schools of Engineering at Arizona State University in Tempe, Arizona, US, proved that we're all part of an interconnected world with their launch of *Project Koyash*, through which they created a solar-powered air-filtration system designed to improve air quality for nomadic communities in Mongolia.

A drought and subsequent food shortages recently led nomads to migrate to the Mongolian capital of Ulaanbaatar, a highly polluted city where UNICEF sources report that children have 40 percent less lung function than children living in rural areas. Working with the nonprofit Taiwan Fund for Children and Families (TFCF) and supported by a grant from EPICS in IEEE, the *Project Koyash* team's solar-powered air-filtration system autonomously cleans polluted air in less than an hour and is being used in the mobile homes (such as yurts) of those living in nomadic communities.

With Ulaanbaatar logging an average of 290 days of sunlight each year, the team's solar-powered air-filtration system includes a solar panel, battery, Arduino microcontroller, inverter, and filter, and components are housed

Representatives from the Taiwan Fund for Children and Families, help install the filtration systems in the community.

in a 3D-printed weatherproof box to protect the system from harsh weather.

According to team leader Bryan Yavari, a neuroscience student at ASU's Barrett Honors College, "the seamless *Koyash* system is designed to run autonomously so that the residents don't have to turn it off and on or move anything." Within the air it filtered, recent tests found that the system reduced pollution by an impressive 75% within 90 minutes.

Driven by a multidisciplinary group of students majoring in aerospace engineering, computer science, industrial design, and mechanical engineering, the team has deployed 13 units so far and hopes to eventually provide filtration systems to the more than 800,000 residents of Ulaanbaatar's Ger district.

Among the many support organizations involved in the project, the team is grateful to EPICS in IEEE for helping them bring their vision to reality.

Yavari acknowledged that many people think they can't do anything about the effects of climate change, "but when you really put yourself out there and do the work, you can accomplish so much," he confirmed. "It's important to keep trying, no matter what obstacles are faced."

> "...recent tests found that the system reduced pollution by an impressive 75% within 90 minutes."

EPICS IN IEEE

EPICS in IEEE Celebrates its 15th Anniversary

In 2024, EPICS in IEEE will proudly celebrate its milestone 15th anniversary and commemorate an outstanding decade and a half of impacting and inspiring students and local communities around the globe.

EPICS in IEEE was modeled after the EPICS program, a curricular-based program from Purdue University (Lafayette, Indiana US) that started in 1995. Since 2009, EPICS in IEEE has proudly honored its commitment to providing community organizations with the technology they need to improve and deliver services while offering undergraduate students invaluable opportunities to broaden their educational skills and benefit from personal and professional development through engagement with their communities.

"For the past 15 years, EPICS in IEEE has played a key role in expanding the global reach of projects in which engineering students bring their learning and skills to bear in addressing challenges faced by their local communities," shared Leah Jamieson, co-founder of EPICS at Purdue and 2007 IEEE President. "By tackling community needs in the areas of access & abilities, education & outreach, environment, and human services, students participating in EPICS in IEEE gain first-hand experience in marrying engineering and community, and project by project, contribute to IEEE's goal of 'advancing technology for the benefit of humanity.'"

"As the field of service learning and community-engaged learning evolves, so does EPICS in IEEE," added Stephanie Gillespie, 2022-2024 EPICS in IEEE Chair. "We're excited to celebrate how far EPICS in IEEE has come in 15 years and explore the dynamic future of our program."

The EPICS in IEEE committee invites you to participate in the organization's 15th anniversary festivities, which kicked off at the 2024 IEEE Rising Stars conference in Las Vegas and continue with virtual events throughout the year as well as stories of past and current projects and their impact on the community. Check out our website for more information about upcoming special events and other ways to get involved!

> "We're excited to celebrate how far EPICS in IEEE has come in 15 years and explore the dynamic future of our program."

Thank You to Our Donors and Supporters

EPICS in IEEE, an IEEE Educational Activities program, cannot thank its supporters and partners enough for making 2023 the best year yet. We look forward to seeing the great activity and results generated by the 39 projects that were approved this year!

The team at EPICS in IEEE would like to thank all those who participated, supported, and encouraged the program in 2023, including students, volunteers, IEEE partners, and community partners!

- Fischer Mertel Community of Projects
- Jon C. Taenzer Memorial Fund

Partnering Organizations

- IEEE Antennas and Propagation Society
- IEEE Industry Applications Society
- IEEE Instrumentation & Measurement Society
- IEEE Life Members
- IEEE Solid-State Circuits Society
- IEEE Standards Association

We would also like to extend a special thank you to the IEEE Foundation and EPICS in IEEE donors. This generosity has supported and informed the educational experience of thousands of students globally, while also enabling technological solutions that have positively impacted communities around the world.

EPICS in IEEE Project Team's visit to their community partner Trinity Eldercare in Malaysia to test their self-navigating robotic walking aid prototype.
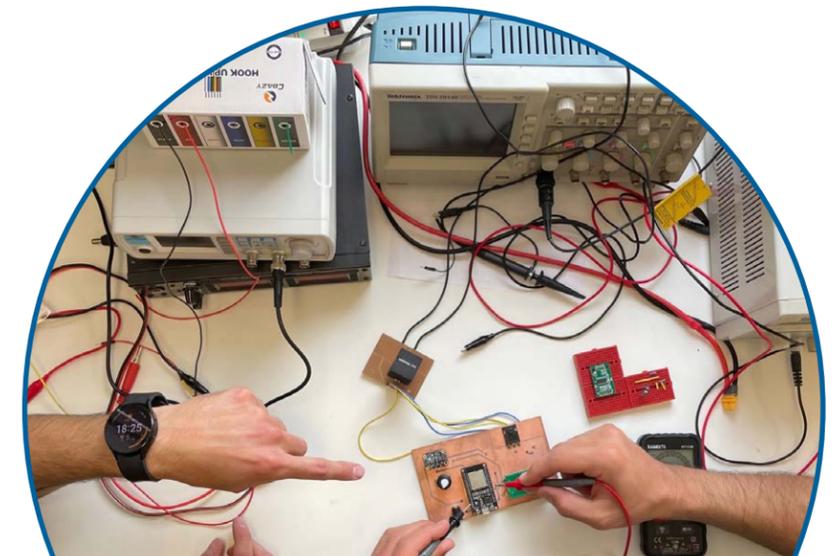
EPICS IN IEEE

Engineering Projects In Community Service

To learn more, visit **epics.ieee.org**

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◆ **IEEE**