# **EPICSIN EEE**

# STUDENTS ENGINEERING A BRIGHTER FUTURE

Samarth Deo - Chair EPICS in IEEE





# What is EPICS in IEEE?

EPICS- Engineering Projects in Community Service



An IEEE Foundation Signature program that supports projects and programs that advance technology and benefit humanity.



# Vision to change the world



- Empowering Students. Improving Communities.
- The heart of EPICS in IEEE is service learning



157 EPICS in IEEE supported & deployed projects globally that provide challenging and unique educational experience to over 11,000+ Pre-University and University students who have used knowledge gained in classrooms to engineer real solutions for their communities.

#### VISION TO CHANGE THE WORLD

EPICS in IEEE's vision is a world where Engineering Education is Intimately Connected to Community Service.

The program strives to assist educators and students alike to apply their knowledge in engineering disciplines to build not just products, but to build and improve community!



### IMPACTING STUDENT EDUCATION THROUGH SERVICE LEARNING

Today, the world faces significant challenges. Communities suffer from inadequate education systems, environmental issues, vulnerable infrastructure, and lack of access to essential services. These issues aren't concentrated in any one area. They can be found anywhere around the globe, from the heart of the United States to sub-Saharan Africa; from remote villages in Asia to bustling cities in Latin America.

Engineers are uniquely equipped to develop solutions to today's challenges, which ultimately allows them to change communities. EPICS in IEEE (Engineering Projects In Community Service) facilitates that change now and for future generations by creating a world where **Engineering education is intimately connected to community service.** 



#### SUPPORTING ADVANCEMENT IN THE EDUCATION OF STUDENTS

Solving community challenges through the power of technology and education, EPICS gives students a platform to work with engineering professionals to develop solutions that transform communities across the globe. We are committed to fulfilling the IEEE core purpose of fostering technological innovation and excellence for the benefit of humanity.

We champion a unique, service-learning approach to Engineering Education that focuses on hands-on experience and holistic skill development. Technology can change the world, but it takes people working together, using skills such as communication, collaboration, and creativity to apply technical solutions to community challenges.





#### **A QUICK GLANCE OF EPICS IN IEEE** IMPACT

157 **Projects Approved since 2009** 

8,000+ **Pre-Univ. Students Impacted** 

## 900+ **IEEE Volunteers Impacted**

291,000+ **People Impacted Globally** 

3,000+ University Students Impacted

\$700k+ Invested in project support

Student participants that are women



Of donations go to direct project support



Academic papers citing **EPICS** in **IEEE**  \$2.25 Average cost per person and student impacted by **EPICS** in **IEE** 

## 100%

Of students who took part in an EPICS in IEEE project showed improvements in leadership and communication skills

#### Global Reach Local Impact



EPICS in IEEE operates on a global partnership model where students actively collaborate with local service organizations and community leaders to address localized challenges. Around the globe, members of local IEEE sections, knowledgeable and experienced engineers, volunteer their time to deliver the program in partnership with Non-Profits, K-12 schools and Universities.

157 Projects		<b>34</b> Countries			<b>3 New</b> Projects in 2020	
18 % AFRICA	ibution 5 % EURO	of Pi	rojects 25 % NORTH AMERICA	23 % SOUTH AMERICA		
Project Categories 32 % 34 % 14 % 20 % ACCESS & EDUCATION ENVIRONMENT HUMAN ABILITIES SERVICES						



# **CORE INITIATIVE**

" EPICS helps fulfill the IEEE core purpose of fostering technological innovation and excellence for humanity. EPICS provides funding, support, mentorship and visibility for engineering projects."

## CELEBRATING Succesful Collaboration

In early 2020, EPICS held its 3<sup>rd</sup> EPICS Expo in the heart of California's Silicon Valley on the beautiful campus of Santa Clara University. The Expo brought together students from San Jose State University and Santa Clara University to showcase their service learning projects that provided solutions to environmental and social problems in Silicon Valley and beyond.

The event featured presentations of student led projects as well as talks from the Master of Ceremony for the evening **Dr. Tom Coughlin** (IEEE-USA Past President), **Dr. S.K. Ramesh** (IEEE Fellow and Past IEEE VP of Educational Activities), **Hon. Karen Hardy** (Santa Clara City Vice Mayor), **Erna Grasz** (CEO Asante Africa Foundation), **Jim Fruchterman** (CEO of BeneTech and TechMatters),

**Dr. Jinny Rhee** (Associate Dean San Jose State University College of Engineering), and **Dr. Ruth Davis** ( Associate Dean Santa Clara University School of Engineering).

The Expo was also recognized by United States Congressional members Anna Eshoo and Ro Khanna, through a Special United States Congressional Recognition.

At the event, both Universities received a \$10,000 grant from EPICS to support student solutions. Projects such as Disaster Relief Communication Box, MilkGuard, and Automated Water Testing System for Aquaponics, that, through technology, will directly impact people within the community.







## INVESTING IN FUTURE TECHNOLOGISTS

At the beginning of 2020, EPICS in IEEE along with volunteers, teachers, and administrators were looking forward to the launch of another EPICS pilot initiatives' second phase, an initiative that focused on enhancing the educational experience of thousands of pre-university students in underserved public schools in the U.S. cities of Baltimore and Chicago.

In collaboration with our partners at Purdue University's EPICS program, school administrators from Chicago and Baltimore, local IEEE sections and volunteers; the initiative was prepared to begin its work in providing a unique learning experience for students.

Due to the global pandemic, efforts towards this initiative have been paused, but the EPICS committee has developed other ways to impact preuniversity students and will continue developing creative ways to advance service learning for preuniversity students until this initiative can be relaunched.

#### 2020 Stats Prior to Covid-19

12 Public School Partners 34 STEM Teachers 27 IEEE Volunteers 1,000+ estimated students directly impacted



### SHARING OUR STORY AND HONORING ACCOMPLISHMENTS

Though many EPICS volunteers were unable to advance their programs due to lockdowns and quarantines, volunteers remained active in the virtual space, academic papers and articles around the globe. Some notable events and articles during 2020:

- Samarth Deo, the EPICS Chair, was a featured speaker at the <u>2020 Global Humanitarian Technology Conference</u> and <u>2021 Rising Stars Conference</u>.
- Dr. Stephanie Gillespie, EPICS committee member was a featured speaker at the <u>2020 Rising Stars Conference</u>.
- Kai Goodall a former EPICS project leader received the 1<sup>st</sup> place in the annual <u>SAIEE (South African Institute of</u> <u>Electrical Engineers) National Student Project Competition.</u>
- EPICS in IEEE was cited in 7 Academic Papers and 1 published book.
- Dr. Victoria Serrano, an EPICS committee member, was featured in <u>The Institute</u> discussing her work in STEM outreach and the EPICS in IEEE project she developed in 2016 while pursuing her PhD at Arizona State University.











## EPICS in IEEE funding

Funding usage: project supplies, \$1k-10k Multi-year projects are approved and reviewed annually Any IEEE member or section can apply (professional or collegiate)

No deadlines: proposals accepted year-round! Must have students involved (K-12 or college)



## Partnerships

To ensure you are helping and not hurting, all EPICS in IEEE projects collaborate with NGOs or nonprofits

- Relationships with local community and understanding of the needs
- Provide maintenance and support for solution after deployment





# WORKING WITH PARTNERS TO ADVANCE OUR MISSION

In 2018, The EPICS committee developed a two-year pilot initiative, that completed in 2020. The initiative was a success in accomplishing its goals of:

Support university educators teaching service learning.

Foster stronger ties between universities, communities and local IEEE sections.

Provide technological solutions to community needs.

Support the education of students.

EPICS is working with faculty at these universities to consider an **extension** of partnerships in 2021.

#### OUR UNIVERSITY PARTNERSHIP INITIATIVE BY THE NUMBERS

- 33 Student lead projects supported
- 200+ University students impacted
- 350+ Pre-university students engaged
- 33 Non-profits directly impacted
  - 20,000+ Community members directly impacted
  - 27 University faculty members engaged





## PROJECT SPOTLIGHTS: BRINGING CLEAN DRINKING WATER TO 700 FAMILIES

#### Purdue University Students Continue Collaboration During A Year At Home

In 2020 work began on a collaboration between EPICS in IEEE, Purdue University, local IEEE volunteers in Colombia, and IEEE's SIGHT program. The purpose of the collaboration is to address the need for clean and filtered water in Carpinelo Colombia.

Like many other student led projects, the Covid-19 Pandemic made the project harder to complete. That did not stop the students from using this time to engineer something better. Students were able to work collaboratively online with their professors, IEEE volunteers, and each other to improve on their initial solution.

Students improved their initial design and were also able to create a 'user manual' and easy to follow design plans so that this project, once deployed, can be easily replicated, and sustained by local citizens. In 2021 the students plan to deploy their prototype and deliver clean drinking water through technology to a community in need.



## PROJECT SPOTLIGHTS: PLANTING SEEDS OF CARROTS, CUCUMBERS, AND COMMUNITY

#### Ohio State EPICS in IEEE Project Finds A Way to Work Through Quarantine

The EPICS in IEEE project from Ohio State University titled "farmbot" was a huge success in 2019, with OSU students developing a functioning farm robot for a local Ohio community.

The team, in 2019, held a successful summer camp to introduce students to robotics and engineering. Due to Covid-19 they were unable to hold a similar camp in 2020. That did not stop the students from sharing their love of engineering with a younger generation.

In 2020, they held, in collaboration with the local community, a virtual town hall to share their knowledge with local students. The virtual town hall was well received, and in a time when building community is especially difficult due to the Covid-19 pandemic, this project continues to plant seeds of community as well as carrots and cucumbers.



**EPICS**IN**IEEE** 2020 Annual Report

## PROJECT SPOTLIGHTS: INSPIRING THE NEXT GENERATION OF INNOVATORS

#### Training High School Students To Develop Inclusive Software In Colombia

In 2020, a team from the Univ. Del Norte in Colombia, set out to create components for those with disabilities to be able to play video games on existing consoles. The team realized they can do much more.

They realized that there were not many curriculums available for teachers who teach students with disabilities. The EPICS team set out to develop a STEM curriculum for high school students in Colombia with disabilities.

The result is a 75-page curriculum for teachers to use during a school year that engages students to learn how to code and make video games.

During 2021, using the prototype game console controls the team engineered for those with disabilities, the EPICS team plans to test this curriculum. In collaboration with the Apanedxa Institute, the team is looking forward to introducing their curriculum across a dozen schools in Colombia, should the schools return to in person learning.



Para poder ver el código python con mBlock, primero se deben instalar un complemento y después crear un usuario en la plataforma virtual.

Ingresa a la página <u>https://ide.mblock.cc/#/</u>y te saldrá este mensaje para instalar mLink:



El proceso de instalación es simple, sin embargo si tienes dudas puedes consultar las instrucciones en esta página:

https://mblock.makeblock.com/en-us/d ownload/mlink/

2 Una vez instalado el complemento, te aparecerá una ventana como esta:



Selecciona la primera opción de Create Now y te llevará a la interfaz online de mBlock, que es el mismo link del comienzo:

https://ide.mblock.cc/#/

Ahora podrás ver la interfaz de mBlock y descubrir las herramientas que te ayudarán a desarrollar tu propio juego:



#### **STEM FOR ALL**

Oregon State Univ. students developed new and exciting courses and activities that enable people with disabilities to experience and learn STEM related concepts





#### **BUDDY THE DOG**

Students from Stevens Institute of Tech. developed the first transtibial canine robotic leg for buddy the dog.







#### **FLOOD SENSORS**

Santa Clara University Students deployed a system of sensors that will give early warning should the local creeks flood.

#### **Future Engineers**

University students in Ecuador introduced students from underserved communities how to code and how renewable energy sources work.









#### **Disaster Relief**

**EPICS**INI EEE

In the aftermath of Hurricane Maria, EPICS in IEEE supported a project to build charging stations in communities throughout Puerto Rico. In 2019, the success of the project helped lead communities in Puerto Rico to consider "Micro grids" as a long-term solution to future natural disasters.





# EPICS in IEEE – SIGHT Collaboration Project



#### Natural Disaster Preparedness – Filtration Project

OBJECTIVE: Explore/evaluate available filter technologies, chose most cost-effective method based on resources available to the community, and educate the families on how to build and maintain household filters using the low-cost, chosen technology.

OUTPUT: an instructional manual and video demonstrating construction (by Purdue) to be used by partners in Colombia (Universidad de Antioquia, a.k.a. U de A) to help residents build their own filters.

PURPOSE IEEE FUND: subsidize raw materials needed in filter construction, while residents supply labor.





# Where CAN my project be?



To apply for funding for a project or to support/donate to the program, please visit us at <u>www.EpicsInleee.org</u>



#### **MEET THE 2021 EPICS in IEEE COMMITTEE**





Samarth Deo Chair

Dr. Stephanie

Gina Carrillo Gillespie



Dineshkumar Singh



Dr. David

Oyedokun



Penny Wirsing



Dr. Y. Vijayalata



Dr. Victoria Sorrano



Dr. Leah Jamieson









**Daniel Dilebrato** Development Officer

Message

# To the students..

- If you have an idea, don't be afraid to submit it as a proposal
- If you are already doing a project and need help, don't hesitate to ask for help
- All ideas, proposals get constructive feedback
- You are free to collaborate with students from other schools and other student branches

# To YP's, faculties..

- If you are open to mentoring someone, we are happy to connect you to those who need help
- If your student branch or affinity group would like to partner with EPICS in IEEE, reach out to us
- Be a facilitator in student led projects locally in your section/community



# Thank You!

For more information or to learn how you can get involved with EPICS in IEEE please visit us at:

www.EpicsInleee.org

Or email us at Epics-info@ieee.org

