

**EPICS
IN
IEEE**



In partnership with



Environmental Competition

A photograph of several hands of different skin tones cupping a small, textured green ball, symbolizing environmental care and global unity.

2022 REPORT TO THE UNITED ENGINEERING FOUNDATION

SUPPORTING ORGANIZATIONS

IEEE Foundation





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EXECUTIVE SUMMARY

The EPICS in IEEE Environmental Competition successfully selected, launched, and supported ten environmental-focused projects from eight different US-based institutions. Launching this competition in the winter of 2022 was critical as students were eager to get back to hands-on learning outside their classroom after the COVID-19 pandemic-mandated hiatus. The students involved in this competition are incredibly passionate about using their technical skills to mitigate and address the impact of climate change.

From a litter-collecting robot for a local lake to nitrogen-sensing drones for understanding air quality, these projects have provided hands-on learning and community engagement experiences crucial for university students' development of professional skills. Over a dozen IEEE volunteers are working with the eight universities and 132 university students to complete these environmentally focused projects. Once the projects are complete and deployed in the community, the estimated number of people impacted by all ten projects will be over 500,000.

EPICS in IEEE was thrilled to take on the competition in partnership with the United Engineering Foundation. Although the projects are not fully complete and deployed at this time, there has been significant learning and engagement from the student teams. The community partners are pleased with the progress being made as they collaborate with the students to deploy their prototypes.



Some teams are working through an engineering class curriculum or a senior design project while others are utilizing their IEEE clubs on campus to implement these projects. With a shared mission of combating climate change and making a local impact, these students have shown their passion and perseverance through these projects. Additionally, the students have come away with critical knowledge to help them succeed in their future engineering careers. Perhaps the most valuable learning experience was the opportunity to work across multidisciplinary teams and engage in practical activities to apply what is being taught inside the classroom. According to the student survey, 93.6% of the respondents felt that their EPICS in IEEE project contributed to their development of teamwork skills among other professional skills. The students partnered with non-profit organizations and learned how to develop technology that is making real-world, tangible impacts.

The EPICS in IEEE committee has been supporting these teams throughout the year through quarterly checks as well as mentor assignments. This has ensured that the project teams felt supported and given the tools to successfully launch their projects.

In our original call for proposals, the total amount awarded in project grants was **\$57,761.20**. Three of the ten projects received phase two funding for a total of **\$4,705.00**, resulting in a total of **\$62,466.20** given out in funding.

The EPICS in IEEE Environmental Competition has been notably fulfilling—serving as one way to work towards the IEEE mission of fostering technological innovation and excellence for the benefit of humanity. Without the support of both the United Engineering Foundation and the IEEE Foundation, the committee would not have been able to support so many impactful projects. The EPICS in IEEE committee is excited to share the below stories and updates of the projects that have been supported.





PHASE 1

CALL FOR PROPOSALS & VOLUNTEER MENTORS

RAISE AWARENESS WITH ENGINEERING STUDENTS

The EPICS in IEEE committee raised awareness for the Environmental Competition through global IEEE media channels and partner organization AIChE and ASME channels. The committee communicated to faculty members through The Purdue EPICS University Consortium and the Electrical and Computer Engineering Department Heads Association (ECEDHA). The competition was included in the IEEE Student Branch newsletter, the IEEE Young Professionals eNewsletter, Educational Activities Newsletter, IEEE Foundation Newsletter, and others. Furthermore, it was shared on the EPICS in IEEE social media sites.

The committee promoted a second call for proposals in April 2022, soliciting three additional projects that were then approved and funded. To help students with preparing proposals for the competition, the committee hosted a [webinar](#) in April for students who wanted assistance with submitting a proposal. See Exhibit A for examples of the promotion mentioned above.

RECRUIT FACULTY AND COMMUNITY MENTORS

EPICS in IEEE recruited IEEE members to become mentors to support the interdisciplinary student teams. This was done through IEEE communication channels such as the Young Professionals eNewsletter, the [IEEE Life Members website](#), and the IEEE Member Benefits Bulletin. The [Mentoring EPICS in IEEE projects](#) blog post was shared through the EPICS in IEEE social channels and EPICS in IEEE eNewsletter. Due to this promotion, over 130 IEEE members volunteered to serve as mentors.

INTERDISCIPLINARY STUDENT TEAMS

As a part of the proposal process, student teams had to describe how both the project and team were interdisciplinary. This competition was promoted to our partnering organizations' student members to help encourage participation from multidisciplinary groups. All the teams selected were interdisciplinary student teams, representing two or more engineering

disciplines. As students reflected on the interdisciplinary nature of their teams, they overwhelmingly thought it helped their learning experience to interact with students in other disciplines. See the below quotes from the student teams:

“

Being in a team with such a diverse collection of engineering disciplines really provides a well-rounded engineering experience. I've learned so many things,"
added Mitsu Walkifucazaki, a junior studying computer science, and part of
the Project Hydration Station

”

“

Having a "team with a lot of different majors and expertise is important due to the broad nature of the problems tackled,"
said Ethan McConnell, an electrical engineering major, and
team lead, Project Aeration

”

“

I am interested in engineering but don't really want to go towards that as a career. However, seeing my fellow teammates in their specialties, i.e., mechanical and electrical engineering, gave me an increased appreciation of the structures I see every day."

Closeout Student Survey response

”

“

Working with our stakeholders from the Civil, Construction, and Environmental Engineering department at NC State allowed us to understand the importance of working in an interdisciplinary team. Various complex problems affect communities, and it is necessary to have an interdisciplinary approach to solve them."

Closeout Student Survey response

”

EXHIBIT A

ENVIRONMENTAL COMPETITION PROMOTION

EPICS in IEEE
Published by Johanna Perez · April 27 ·

Extended Deadline: Submit your proposals for the EPICS in IEEE Environmental Competition by May 7. Students, faculty, and professionals are invited to be inspired to change their local community! [https://epics.ieee.org/uef-competition/...](https://epics.ieee.org/uef-competition/)



EPICS in IEEE
Environmental Competition

EPICS.ORG
UEF Competition - EPICS in IEEE
EPICS in IEEE in Partnership with The United Engineering Foundation Environmental Competition Submit a Proposal You Can Change the World
Climate change has increased the frequency of natural disasters and negatively impacting millions of people from coast to coast throughout the United States. Th...

See how the average temperature in your area is changing.
[Explore Climate Science Info](#)

1 Like Comment Share

Comment as EPICS in IEEE
Press Enter to post.

Mon, 25 April 2022
7-8 pm ET

FREE Live Virtual Event

EPICS in IEEE Proposal Drafting
Student teams can win US \$5,000-10,000

Presented by Stephanie Gillespie, Ph.D.,
Associate Dean at Tagliatela College of Engineering

REGISTER NOW



EPICS in IEEE
Published by SocialPilot · September 7 at 12:00 PM ·

Calling all IEEE professionals! Do you want to help a student group successfully launch a community-based project by lending them your professional and technical knowledge? Sign up to be an #EPICSinIEEE mentor today! Click here to learn more: <https://bit.ly/3xZW0KK>



EPICS.ORG
Mentoring EPICS in IEEE projects - EPICS in IEEE
By Stephanie Gillespie Industry professionals can play a critical role in the success of a service l...



Mentoring EPICS in IEEE projects
May 19, 2022

By Stephanie Gillespie Industry professionals can play a critical role in the success of a service learning project. By sharing your experience in technical design, professionalism, client/stakeholder relations, and/or project management, you can mentor a...

[read more](#)

EPICS in IEEE
Published by Ashley Moran · April 22 ·

The EPICS in IEEE Environmental Competition extended its deadline to May 7th! Don't miss the opportunity to address the impact of climate change through service learning. Join us for a Q&A webinar on 25 April from 7-8 PM ET to learn more. Register here: <http://bit.ly/3JRDWPS> #epicsinieee #servicelearning



See how the average temperature in your area is changing.
[Explore Climate Science Info](#)

2 Like Comment Share

1 Share

Like Comment Share

EPICS IN IEEE In partnership with 

Environmental Competition

PHASE TWO OF FUNDING

Do you want to put your engineering skills to good use by creating a positive impact for your local community? EPICS in IEEE, in partnership with the United Engineering Foundation, wants to empower students to use engineering and technology to solve humanity's environmental problems. Students, faculty, and professionals are invited to be inspired to change their local community. Proposals should identify a problem in the local community, and detail how the student team will attempt to solve the problem using engineering and technology skills. **Student teams can win \$5,000-10,000 USD to build their prototype or solution!**

Important Dates

Proposal Drafting Webinar (optional)
25 April 2022
7-8pm ET

Proposal Submission
7 May 2022

Project Selection By
June 2022

Project Completion
14 November 2022

Selected Recipients from Phase One of Funding Include Projects Such As:

- Aquaponics for a local community garden
- Litter-collecting robot for a local lake
- Nitrogen-sensing drones for understanding air quality

Competition Rules

Each university student-led team must:

- Be multidisciplinary: involve students from different engineering disciplines and have faculty support in using service learning.
- Projects should be led by students in the United States, and impact a community within the United States.
- Deploy and complete their projects within the community by 14 November 2022.
- Submit bi-monthly progress reports and meet with their assigned mentor.
- Use dedicated competition funding for materials related to the project. (i.e. salaries, honorariums, personal computers, significant capital equipment or machinery, etc. are not eligible for funding.)
- Teams must submit their proposal through the [EPICS in IEEE proposal platform](https://epics.ieee.org).

Supporting Societies




Learn more about the EPICS in IEEE Environmental Competition by visiting epics.ieee.org. Questions? Email epicsinieee@ieee.org.



PHASE 2

PROPOSAL REVIEW & SELECTION OF AWARDEES

PROPOSAL REVIEW

Every project proposal was reviewed and approved by the EPICS in IEEE committee based on our evaluation form. The EPICS in IEEE Project Management Working Group reviewed the proposals and submitted the top projects to the full committee for review and approval. The proposal form asked for the problem statement, project implementation plan, intended impact, community partner letter, and a detailed budget. After the review, the project leads were provided feedback on their application, including the funding decision if they had been awarded a grant for the competition.

10 APPROVED PROJECTS

The EPICS in IEEE committee approved and funded ten projects from eight different US-based Institutions. All the approved projects provide hands-on learning and community engagement experiences crucial for professional skills development for university students. Over a dozen volunteers are working with eight universities and 132 university students on the below projects.

Project Title	Institution	# of Students
Hydration Station	Arizona State University, Tempe, AZ	6
Henry County Aquaponics in the Park	Morehouse College, Atlanta GA	6
Spatial Extent Monitoring of Coast Sunny-day Flooding	North Carolina State, Raleigh, NC	6
Lake Litter Solutions	Arizona State University, Tempe, AZ	6
Urban Gardens	Ohio State University, Columbus, OH	35
AZGFD - Aeration	Arizona State University, Tempe, AZ	6
Project DIANA	Ohlone Community College, Fremont, CA	7
Reducing Chicagoland Ecological Footprints via Outdoor Recreation Centers and Personal Gardening	Oakton Community College, Des Plaines, IL	6
Measuring Nitrogen Level in Carmans River by using a Conductive Polymer-Based Sensor	New York Institute of Technology, Old Westbury, NY	4
Sustainable Localized Food and Educational Systems	Rowan University, Glassboro, NJ	50



PHASE 3

ANNOUNCEMENT AND ORIENTATION

ANNOUNCEMENT FOR FUNDED PROJECTS

Through our grant management system, Foundant, all the teams were notified that they had been selected as grant recipients and asked to fill out an acceptance package. If the project had not been selected, the rejection reason was sent to the project team. Others were given the opportunity to revise and resubmit their proposal based on feedback from the committee review process.

Of the 20 proposals that were submitted ten were selected. Five of the applications were international projects that did not qualify due to grant restrictions. Five were given the opportunity to revise and resubmit based on feedback from the committee but were ultimately not selected for funding. Even a few of the funded projects were originally asked to revise and submit or provide clarifying information to ensure their proposals met the requirements of the competition.

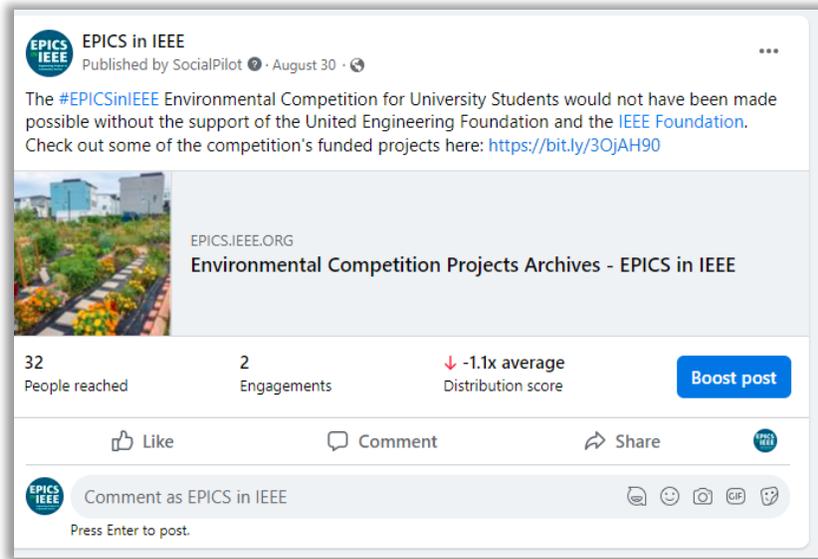
The EPICS in IEEE Program Manager worked with the teams to ensure that they completed the required paperwork in their acceptance package including Grant Acceptance Conditions, Waiver and Release of Liability Forms, Publicity Release Form, Intellectual Property Policy Form, and the Grant Legal Agreement. The program manager then worked with the local IEEE sections and the teams to coordinate the distribution of the funding.

PROMOTIONAL CAMPAIGN FOR FUNDED PROJECTS

Once the first seven projects were approved, there was a [blog](#) article shared on our website. A project page for each of the approved [Environment Projects](#) was added to the EPICS in IEEE website. These project pages will be updated to include photos and videos of the projects as they are received in the coming months. An article about the Environmental Competition was included in both the IEEE Foundation printed Newsletter and was featured in their eNewsletter. An article was also included on the [Life members' website](#) that highlights the competition. See Exhibit B for examples of funded project promotion.

EXHIBIT B

PROJECT PROMOTION



Environmental Competition Inspires University Students to Address Climate Change
5/25/2022



Dr. Stephanie Gillespie, EPICS in IEEE Chair



EPICS in IEEE, thanks to the grant from the United Engineering Foundation (UEF), successfully launched the EPICS in IEEE Environmental Competition for University Students. This competition has inspired teams of students to collaborate and engineer solutions to address local environmental concerns throughout the US. In addition, the competition allows engineering faculty to encourage students to address local challenges through community service learning.

Since the competition launch, the committee has approved and funded seven projects from five different US based institutions. From a litter-collecting robot for a local lake to nitrogen-sensing drones for understanding air quality, these projects provide hands-on learning and community engagement experiences crucial for professional skills development for secondary and university students. A dozen volunteers worked with 10 secondary school students and 72 university students on the projects.

Phase 1 Funded Projects

- > "Hydration Station" by students of Arizona State University EPICS
- > "Henry County Aquaponics in the Park" by students of Morehouse College
- > "Spatial Extent Monitoring of Coast Sunny-Day Flooding" by students of North Carolina State University
- > "Lake Litter Solutions" by students of Arizona State University EPICS
- > "Urban Gardens for Sustainable Education and Agriculture" by students of Ohio State University EPICS
- > "AZGFD-- Aeration" by students of Arizona State University EPICS
- > "Project DIANA" by students of Ohlone Community College

The EPICS in IEEE committee opened a Phase 2 call for project submission seeking 3-5 more worthy projects. Proposals were due by 7 May; watch the [EPICS in IEEE website](#) for news about Phase 2 project funding.

The Environmental competition isn't the only thing new to EPICS in IEEE in 2022, the committee also welcomed two new additions—a new committee Chair and Program Manager.

Dr. Stephanie Gillespie is the new chair and is the Associate Dean at the Tagliatela College of Engineering at the University of New Haven. She said, "After serving on the committee for three years, I am excited to have the opportunity to lead the committee as the chair." She has been a service-learning practitioner for 5 years, including development of community partners and supporting student teams with real-world, client-based engineering. "I know the projects supported by EPICS in IEEE have a positive experience on both our students and our communities. I'm excited to continue the positive momentum our committee has established under our prior chair Samarth Deo, and expand the impacts of service learning across the

Environmental Competition Projects

EPICS in IEEE



Urban Gardens for Sustainable Education and Agriculture



Project DIANA



Sustainable Localized Food and Educational Systems



Hydration Station



Reducing Chicagoland Ecological Footprints via Outdoor Recreation Centers and Personal Gardening



Measuring Nitrogen Level in Carmans River by using a Conductive Polymer-Based Sensor



Lake Litter Solutions



Aeration Project with AZGFD



Spatial Extent Monitoring of Coastal Sunny-day Flooding



Henry County Aquaponics in the Park

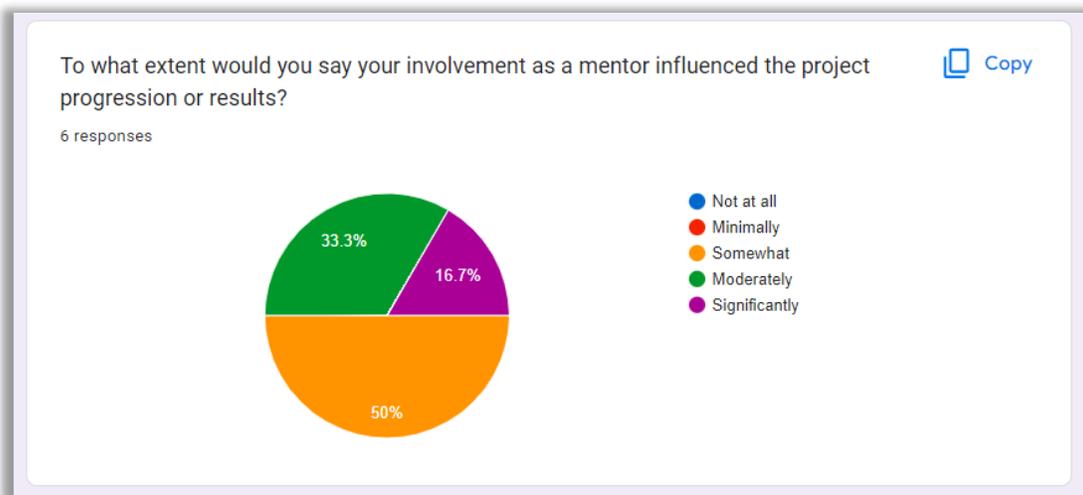


PHASE 4

STUDENT TEAMS WORK ON THEIR PROJECTS

SUPPORTING ENVIRONMENTAL COMPETITION STUDENTS

In addition to funding, the EPICS in IEEE committee supported the Environmental competition student teams by matching them with a mentor for their project. Each project was assigned an IEEE industry mentor based on the mentor's expertise and what support the team needed. These mentors met with the teams and helped the team through the design and deployment process. The EPICS in IEEE committee surveyed both the mentors and the students about their experience. 50% of the responding mentors reported that their involvement moderately or significantly influenced the project progression or results, as shown in the below chart.



EPICS in IEEE asked the mentors what topics the teams asked for versus what topics they provided advice on. Not surprisingly, differences in the responses suggest that the mentors are able to provide feedback and advice on areas that the teams did not realize they needed help with. For example, only 43% of the teams asked for help on *Technical Details related to specific project goals* but over 71% of the mentors ended up providing insight in that area. Some other key areas of discussion were *Details of the Engineering Design Process (broad)*, *Project management or budget questions*, *Assessment of the project impact*, and *Team dynamics or leadership*.

Examples of the IEEE Mentor's Impact:

“

Our IEEE mentor, Jeffrey Katz, has been very helpful in helping the team move forward with the wireless communication network. Appreciate the support from EPICS for IEEE for this project.

Jeremy Edmondson (NC State Project Lead)

”

“

They had a specific question on using LoRa communications, and I arranged for an IBM expert to talk to them. It showed them the depth of technical ability in a large company.

Jeff Katz, Sunny Day Flooding Mentor

”

“

Luis Chocho (our team mentor) helped with the project management aspect of our EPICS design in getting deliverables done as well as accelerating our rate to getting in the prototyping phase. Now we are officially a Stage 3 team, so his advice was valuable in getting us there. He created a spreadsheet and made me think about other project management applications I can also use (like Trello).

Seth Storino, Program Lead for Hydration Station Project

”

“

The most valuable experience for me was mentoring a team with each member having a completely different background. Communicating, let alone mentoring, such a diverse team was definitely outside of my comfort zone. I needed to adapt and learn how to effectively bring the team onto the same page to work towards a common goal. Developing this soft skill of collaborating with a team from diverse backgrounds through mentoring was an invaluable first-hand experience that will help me grow as a researcher.

Yusuf S Yaras, PhD (Mentor for the Henry County Aquaponics Project)

”

“

We are glad to have our mentor Muhammad providing his expertise. With his input and the funding from EPICS in IEEE, we believe we will be able to create something viable within the school year.

Lake Litter team

”

“

Always is good to share the experience with the new generation.
Luis Chocho, ASU Hydration Station Project mentor

”

ASSESSING THE PROJECTS

The student teams were asked to submit quarterly reports to track the progress of their projects. Through the check-in forms, the committee was able to see the progress made by the teams. The check-ins also allowed the committee to assist the teams that were having challenges with their projects.

Examples of updates that were received from the teams:

SUNNY DAY FLOODING
Spatial Extent Camera + Sensor Array

PATRICK COVIL SEAN GRAY
JOE BOLEWITZ SAM GASKINS

Problem Statement

- Tidal flooding is a problem in coastal Carolina communities.
- These flooding events are not well documented or researched.
- There is a need to gather data on when and where these flooding events occur, the spatial extent, and the quality of the flooding water.

Scope / Requirements

- Product is intended for coastal researchers studying flood patterns and water quality.
- Product must be easy to use and reproduce.
- Product must have a battery life of over 3 months.
- Product must provide accurate salinity data and spatial extent of flooding.
- Each sensor and camera node must cost less than \$200 to reproduce.

Innovative Tech

- IoT LoRa
- Edge Machine Learning

Solar Powered ESP32-CAM

MakePython LoRa Hub Node

LoRa

Technical Problems

- Edge Machine Learning
- LoRa
- TDS Sensor

Future

- Designing web/node infrastructure to allow sensors to collate data together.
- Improve image processing modeling. (Field Prototype April 30th)
- Improve bracket/mounting for sensors and enclosures.

Inundated Area

FLOODED/ Pre-FLOODED

Sponsors: Dr. Katherine Anarde, Dr. Natalie Nelson, Megan Carr, EPICS in IEEE NC STATE UNIVERSITY

Progress Report Poster of the Sunny Day Flooding project at NC State

“ We are now in the assembly phase of the project, our drone parts and gas sensors are shipping in and we are currently in the process of assembling the drone. We have added some new recruits to the team who have been a great help in this building process. The team is continuing to work on this project over the course of summer break, our next step is to calibrate and test our industrial gas sensors, once we have those setup, we will begin installing them into the drone and develop an early-stage prototype. Project DIANA update ”

“ We are planning to bring out a prototype to our client within the next month. The prototype would be a rather simple one where it would fulfill the basic requirements of the fishery and we will work on optimizations from there onwards. Project AZGFD Aeration ”

COLLECTING STORIES

The EPICS in IEEE Committee collected information and photos through the check-in forms which has led to storytelling for the projects. There are five videos and six articles that have been created so far to share the story and impact of several of the approved projects. In addition to phone interviews with students, the EPICS in IEEE Program Manager and Committee chair visited both Arizona State University and NC State University to interview students to learn more about their experiences.

A detailed overview of each EPICS in IEEE Environmental Competition project, including links to any media articles, follows:



HYDRATION STATION

BY STUDENTS OF ARIZONA STATE UNIVERSITY EPICS



Every day approximately one thousand plastic water bottles are distributed to individuals without housing in Phoenix on behalf of the Human Services Campus. Clean water is a necessity. Due to the COVID-19 pandemic, all drinking fountains have been shut off resulting in a water shortage for many residents. A diverse team of six students studying different STEM fields is participating in the Environmental Competition to design a solution to this community problem. The result is Project Hydration Station



EPICS in IEEE has funded Project Hydration with an initial grant of **US\$2,000** to help them solve this community issue. The team worked closely with the Phoenix Human Services Campus, distributing reusable water bottles resulting in a cleaner environment. To ensure that people continue using these bottles, they will install a 24/7 water supply with a built-in sanitary station designed to clean the bottles. The prototype also will comply with the Americans with Disabilities Act Standards for Accessible Design (ADA), so it will be accessible to people with disabilities. The team will take special care of those with disabilities by factoring in their daily challenges in



order to accommodate their access to the hydration station. This project focuses on making Downtown Phoenix a cleaner neighborhood and providing a service for the clients of the Human Services Campus.

Community Partner: Human Services Campus

Project Page: <https://epics.ieee.org/project/adu-epics-hydration-station/>

Article: [University Students To Design “Hydration Station” for Phoenix’s Homeless](#)

Video: [EPICS in IEEE Project: Hydration Station](#)

HENRY COUNTY AQUAPONICS IN THE PARK

BY STUDENTS OF MOREHOUSE COLLEGE



Henry County, GA is at the center of America's food desert crisis, which limits the community's access to nutritional foods. The lack of nutritional food has many negative impacts on this underserved community, and many people are not even aware of this food crisis. To address this community issue, six students, along with three volunteers, created Project Henry County Aquaponics in the Park.

EPICS in IEEE granted **US\$10,000** to the team to begin the process of implementing this solution. As part of the solution, the team will plan and build a smart community garden to distribute fresh produce to the local neighborhoods and elementary schools, while also offering new opportunities. The project's three phases include Research &



Collaboration, Engineering Design & Employment, and Program Design & Implementation. The community garden will utilize environmentally friendly materials which will allow students and local members to get hands-on opportunities to work in STEM outreach fields. This will be the first step in a larger outreach program in Henry County that will further transform this community. The team will work alongside Bridge Solutions and Henry County Parks & Recreation to develop and maintain the garden, as well as help to further expand the program.

Community Partner: Bridge Solutions and Henry County Parks & Recreation

Project Page: <https://epics.ieee.org/project/henry-county-aquaponics-in-the-park//>

SPATIAL EXTENT MONITORING OF COAST

SUNNY-DAY FLOODING

BY STUDENTS OF NORTH CAROLINA STATE UNIVERSITY



Tidal flooding is a steadily increasing problem that affects thousands of people. Many times, the extent of the flood is unknown leaving community members with little to no direction on what to expect and creating dangerous situations. Six students from North Carolina State University, along with two volunteers, are tackling this problem. The team's solution focuses on providing the public with needed information, such as the spatial and potential impacts of tidal flooding, through further research and a self-powered camera.



EPICS in IEEE has given a grant of **US\$7,705** to support this project and further help with needed materials and research. In the team's desired invention, the entire spatial extent of the waves will be disclosed, making sure the community is aware of where not to go. Their proposed system utilizes a self-powered camera and a wireless system to make the data readily available to all areas.

Contamination data is needed, and all analyses will be covered through an external project in Beaufort, NC. This project will be working with the Department of Civil, Construction, and Environmental Engineering and the Department of Biological and Agricultural Engineering at NCSU to implement this solution.

Community Partner: Department of Civil, Construction, and Environmental Engineering and the Department of Biological and Agricultural Engineering at NCSU

Project Page: <https://epics.ieee.org/project/spatial-extent-monitoring-of-coastal-sunny-day-flooding/>

Article: [NC State EPICS in IEEE Team Field Trip](#)

Video: [EPICS in IEEE: Sunny-Day Project](#)



LAKE LITTER SOLUTIONS

BY STUDENTS OF ARIZONA STATE UNIVERSITY EPICS

Trash is oftentimes found in, and nearby, bodies of water threatening the wildlife, marine life, community members, and the overall environment. All bodies of water are important because they sustain surrounding ecosystems, which is why it's crucial there becomes a solution to combat this issue. Six students from Arizona State University established Project Lake Litter Solutions, which focuses on building a robot with the ability to skim a body of water and collect trash before it sinks to the bottom.



EPICS in IEEE provided the team with **US\$7,456** to create multiple iterations of their prototype. Project Lake Litter Solutions is divided into multiple phases, focusing on building multiple different types of prototypes and reviewing each design to assess which unique features to include in the final design. The student team will use rapid prototyping equipment from their university and will test in a local body of water. The team is partnering with the City of Tempe with the hope of expanding this solution to other communities in Phoenix, AZ.

Community Partner: City of Tempe

Project Page: <https://epics.ieee.org/project/lake-litter-solutions/>

Article: [ASU Students Address Climate Change with the EPICS in IEEE Environmental Competition](#)

Video: [EPICS in IEEE Project: Lake Litter](#)

URBAN GARDENS FOR SUSTAINABLE

EDUCATION AND AGRICULTURE

BY STUDENTS OF OHIO STATE UNIVERSITY EPICS



Access to fresh produce is difficult in many low-income neighborhoods, who do not have affordable access to supermarkets, making food insecurity prevalent. 35 students from the Ohio State University College of Engineering, along with several faculty members, worked together to address this issue while designing an environmentally friendly solution. Project Urban Gardens for Sustainable Education and Agriculture is a climate-resilient community garden that offers fresh produce to the community, as well as STEM outreach opportunities for neighboring schools.



EPICS in IEEE has granted the project team **US\$10,000** to start designing and building this environmentally friendly and substantial garden. The project has three components that revolve around the design and implementation of the garden, and the creation of education modules to help educate students in this low-income community. Working with partner organizations, The Charles Madison Nabrit

Memorial Garden and South Side Family Farms, the team plans to utilize solar electricity generation, as well as rainwater, to minimize money and time spent. The team, as well as their partner organizations, hope to establish this site as an efficient, cost-effective, sustainable growing place to improve food scarcity.

Community Partner: Charles Madison Nabrit Memorial Garden and South Side Family Farms

Project Page: <https://epics.ieee.org/project/urban-gardens-for-sustainable-education-and-agriculture/>

Article: [Meet the Robot Solving Hunger While Teaching STEM in Urban Ohio](#)

Video: [EPICS in IEEE Urban Gardens](#)

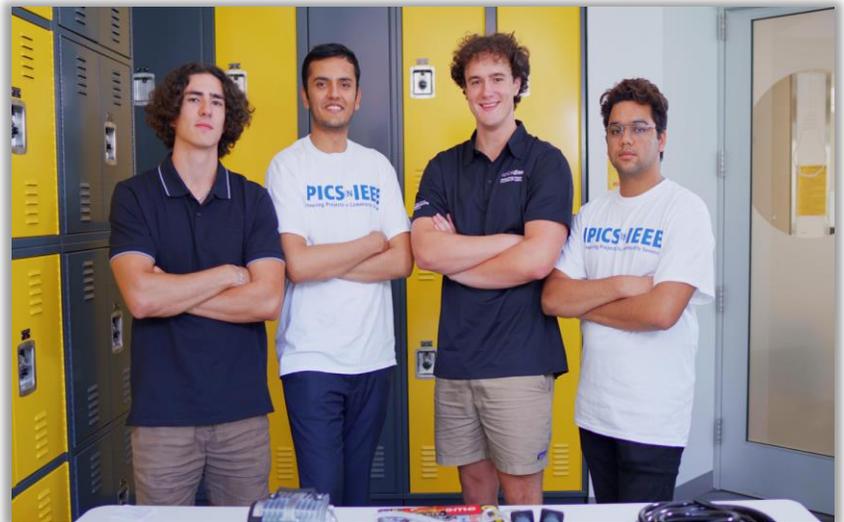
AZGFD – AERATION



BY STUDENTS OF ARIZONA STATE UNIVERSITY EPICS

Seafood is widely consumed, but the process of sustainably obtaining fish is often overlooked. The team of six students from Arizona State University came up with Project Aeration, a balanced but innovative solution that will still support the pre-existing system more safely and efficiently. Project Aeration's goal is to design better aeration methods to be used at AZGFD hatchery. Currently, the Arizona Game and Fish Department uses liquid oxygen as their chosen aeration method, which is poured into the water at their hatchery. This method poses multiple risks, including its far too low temperature, making it dangerous to both the fish and humans in direct contact.

EPICS in IEEE funded this project with **US\$5,500** to help them solve this community issue. The team's method will utilize an oxygen diffuser to slowly infiltrate the liquid oxygen in the water, creating a sustained oxygen gas aeration technique. The team is currently developing a prototype to run different tests focusing on one variable at a time, such as oxygen bubble size



and the amount of pressure needed. If proven efficient, the team will deploy it in a small section of the hatchery. Project Aeration's mission is to help sustain the environment inside and outside the hatchery while providing the best possible fish to its consumers.

Community Partner: Arizona Game and Fish Department (AZGFD) Hatchery

Project Page: <https://epics.ieee.org/project/aeration-project-with-azgfd/>

Article: [ASU Students Address Climate Change with the EPICS in IEEE Environmental Competition](#)

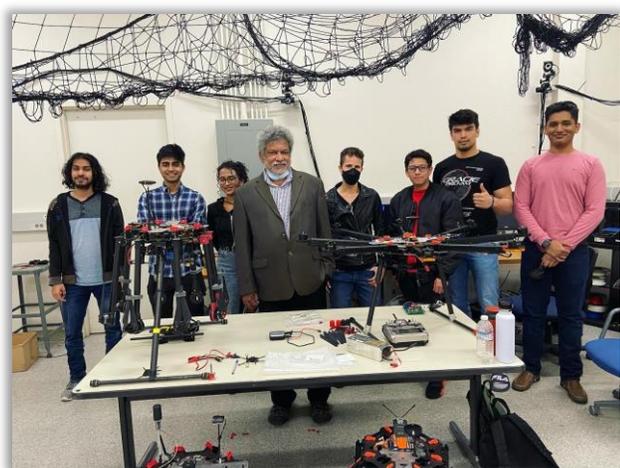
Video: [EPICS in IEEE Project Aeration](#)



PROJECT DIANA

BY STUDENTS OF OHLONE COMMUNITY COLLEGE

The high concentration of gasses, such as nitrogen, has led to a reduction in native plant species and the overall biodiversity in surrounding areas of Fremont, California. This issue affects our environment in many harmful ways. Seven students from Ohlone College, and two volunteers, are designing an effective solution to combat this problem. Project DIANA is focused on utilizing a drone to detect different gas concentrations and then stabilize them within the air.



EPICS in IEEE has granted them **US\$3,815** to purchase needed materials so they can start up this solution. The project is divided into three different phases. The research phase will educate them on the different sensors, gasses, calibration methods, and more, through professional databases and connections. After their research concludes, they will gather all their data and utilize it in the following two phases: Development and Deployment. The team is composed of students

from their IEEE Steam Club, and they will be utilizing data from the World Wildlife Fund with hopes of getting the Environmental Protection Agency involved at the end.

Community Partner: World Wildlife Fund

Project Page: <https://epics.ieee.org/project/diana/>

Article: [On a Mission to Save Biodiversity](#)



REDUCING CHICAGOLAND ECOLOGICAL FOOTPRINTS VIA OUTDOOR RECREATION CENTER & PERSONAL GARDENING BY STUDENTS OF OAKTON COMMUNITY COLLEGE



Recreational facilities, such as community gardens, are either inaccessible to the under-resourced community or not readily available to the public. In Chicago, there is a lack of sustainable resources which not only contributes to climate change but also negatively affects a large part of the community. To combat this problem, six student members of Oakton Community College's IEEE Student Branch, along with two volunteers, introduced sustainable and accessible resources to their community.

EPICS in IEEE has granted them **US\$2,000** to start working on their community-driven project. The project will increase awareness about sustainable practices while making them accessible to all socio-demographic areas. Their goal is for the community to use a community garden, which will reduce the carbon footprint, and introduce new healthy practices. As part of an endorsement project, the



team will start up an accessible community garden, to ensure recreational and gardening usage is available to the entire community. The second phase of the project focuses on obtaining community members' opinions on the new garden through interviews, field studies, outreach events, and more. The third phase requires the team to put together all their acquired information into a sustainability/engineering report about the effect this had on both climate change and their community. The team, as well as their partner organizations, hopes to introduce meaningful recreational and gardening resources to better their lives, while also reducing climate change.

Community Partner: Oakton Community Garden run by Oakton Community College Students

Project Page: <https://epics.ieee.org/project/reducing-chicagoland-ecological-footprints-via-outdoor-recreation-centers-and-personal-gardening/>

MEASURING NITROGEN LEVEL IN CARMENS RIVER BY USING A CONDUCTIVE POLYMER-BASED SENSOR BY STUDENTS OF NEW YORK INSTITUTE OF TECHNOLOGY



The Carmans River in the Pine Barrens is one of the largest rivers in New York and many community members depend on it for various activities, but excess nitrogen continues to leak into the water. High levels of nitrogen create deterioration in the water and can lead to hypoxia, fish deaths, and degraded wetlands or marine habitats. Current methods for measuring nitrogen levels require lots of time, money, and chemicals. Four students from the New York Institute of Technology will design an autonomous sensing system to help monitor nitrogen levels.

EPICS in IEEE has granted the team **US \$9,996.20** to design and implement this autonomous system to better the environment. The team's system is composed of two parts: a conductive polymer-based sensor, for measuring nitrate in water; and a custom-modified drone for plunging the sensor into water and collecting water samples. The team will first develop the needed polymer-based sensor, which will be intergraded with an antenna and ground-penetrating radar to ensure the lowest maintenance possible. After the sensor is developed, it will be tested in water to test sensitivity levels, repeatability, and the relationship between the sensors and nitrate concentrations. The project will utilize a drone to collect both data and water samples, which is convenient, low-cost, and fast. The system will first be tested at their university campus and then in the Carmans River. The team, as well as their partner non-profit organization, Long Island Pine Barrens Society, hopes to spread environmental awareness and benefit the entire surrounding community.



Community Partner: Long Island Pine Barrens Society

Project Page: <https://epics.ieee.org/project/measuring-nitrogen-level-in-carmans-river-by-using-a-conductive-polymer-based-sensor/>

SUSTAINABLE LOCALIZED FOOD AND EDUCATIONAL SYSTEMS

BY STUDENTS OF ROWAN UNIVERSITY



A large subset of the world's population finds themselves in a crucial state of food insecurity because affordable, healthy resources are often scarce. As global warming continues to increase, access to sufficient nourishment decreases, heavily affecting vulnerable populations such as communities in Philadelphia and South Jersey. Although there have been community gardens installed in many food-insecure communities, there is still work to be done, such as developing a year-round maintenance plan. 50 students from the Rowan Environmental Action League (REAL), faculty members, and five volunteers will work alongside The Bullock Garden Project to further develop community gardens, including a garden at their university.

EPICS in IEEE has granted them **US\$8,800** to start upgrading these community gardens and creating new educational lessons. This project will develop micro-green hydroponic units, aerial drones for seeding, monitoring, and harvesting; a simple system to preserve food; educational outreach opportunities; and a modular water system, designed for gardens not close to a water source. Each of these



units can be applied to different community projects in the region. Rowan REAL, together with The Bullock Garden Project, hopes to minimize food insecurity through low-maintenance community gardens while increasing educational outreach opportunities.

Community Partner: The Bullock Garden Project and Rowan REAL. SHPE: Leading Hispanics in STEM and the National Society of Black Engineers.

Project Page link: <https://epics.ieee.org/project/sustainable-localized-food-and-educational-systems>

IMPACT

PROJECT COMMUNITY IMPACT

Over a dozen IEEE volunteers are working with eight universities and 132 university students to complete their environmentally focused projects. Out of the 132 university students, 44 identify as female. The estimated number of people that will be impacted by all ten projects is over 500,000 when completed, as reported in the initial project proposal. The teams shared our community-partner assessment survey with their community partners to get their feedback on the progress and impact of the projects. Additional project surveys will be sent to both the teams and the community partners at the one-year and two-year mark, to assess long-term community impact.

Due to the timing of the projects and their deployment into the community, there has not yet been a survey of community beneficiaries as outlined in the proposal to examine the final delivered solution by the students. EPICS in IEEE will look to do this in May of 2023 once most of the projects have been completed and deployed to evaluate the following:

- The possible change in perception of the community to engineering
- How the community believes the delivered solution will impact their lives/situations for the upcoming year
- Were the initial community expectations met or exceeded

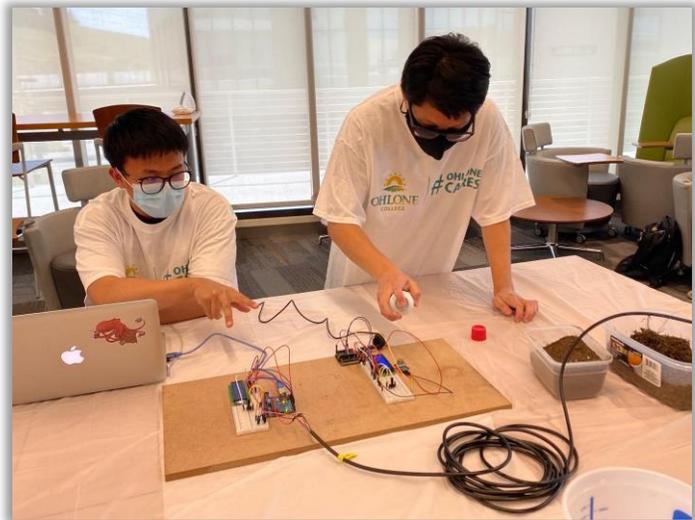
While the student teams are continuing to test and complete their solutions for full implementation, EPICS in IEEE can already see positive impacts:

For the **Sunny Day Flooding project**, they estimate 6,000 people will be impacted. The team reflected that while deploying their prototypes during the summer they were able to witness the impact of tidal flooding on the coastal North Carolina communities. With this project, they believe researchers will be empowered to investigate tidal flooding further in order to develop solutions for these communities. Dr. Anarde Assistant Professor, Dept. of Civil, Construction, and Environmental Engineering, NC State, one of the project sponsors will incorporate the real-time data stream into [her project web app](#) for real-time communication of flood extent to communities and researchers.

The impact of the **Hydration Station** project is estimated to be 12,000 based on the Human Services Campus Fiscal Year 2022 report. However, the population of the homeless in

Maricopa County growing, so the team can expect to be serving more than 12,000 people in future years. The team believes that this project, once deployed, will be active for at least three years.

As **Project DIANA** is still in progress, the main community impact has been within the school by increasing the interest of students in STEM fields. The team received a very positive response from students during a showcase where the team raised awareness regarding nitrogen pollution within the community. Once the team is able to deploy the drone in serpentine grasslands near Santa Cruz and collect data within that region, the data can be shared with local environmental organizations to put measures in place for mitigating excess pollutant levels.

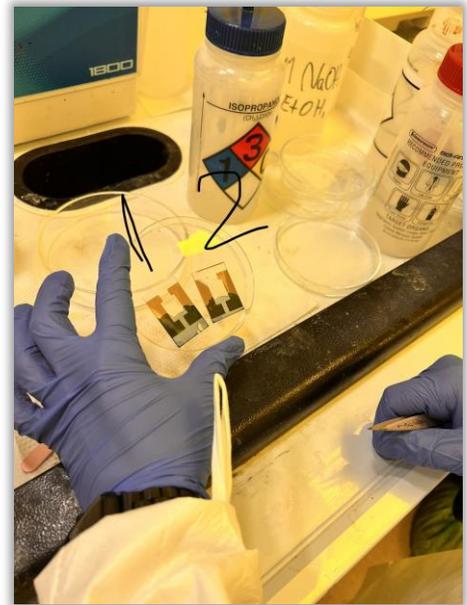


This would help protect the overall plant and animal species within that region, increase biodiversity and prevent the effects of direct toxicity toward the general population (approximately 62,000 as of 2021). The drone that the team is designing is a multipurpose tool that is capable of detecting nitrogen, ammonia, carbon monoxide, sulfur, and ozone—enabling the scope to be expanded for various uses.

The **Lake Litter Solution** team is in the process of working with their community partner to test their current prototype in the large lake. Beyond these tests, the team needs to work with smaller lake communities in Arizona to deploy the prototypes for long-term observation. The team estimates that they can impact 1,000 people in the next year, and 10,000 over the next three years.

The **Measuring Nitrogen Level in Carmans River by using a Conductive Polymer-Based Sensor** project will benefit the Carmans River which plays an important role in

coastal ecosystems. The project proposed to fabricate and integrate a conductive polymer-based sensor for direct nitrogen measurement in water and use a drone for automatic sampling and data collection. Completion of the proposed Phase 2 project will allow the team to measure nitrogen levels in Carmans River more efficiently. Continuous and long-term measuring and monitoring of nitrogen in Carmans River will be as invaluable evidence that protection and preservation of the surrounding watershed will lead to reduced nitrogen levels in the river. Working together with the Long Island Pine Barren Society, the team will raise the environmental awareness of the community.



For the **Reducing Chicagoland Ecological Footprints project**, the community partner feels that if the students complete a prototype or product, it will solve the problem in their community. The local garden is looking to extend the community garden growing season and the student's hoop house helps solve the problem. The community garden mentioned in their survey that, “the students asked permission to use the space, toured the space, respectfully used the space, and conducted some student engagement.” One of the students on the project noted, “going out to the garden and talking with the community partners we have for this project I think is one of the ways I learned the most. It was beneficial to work closely with a community partner.”

The Henry County Aquaponic team held a meeting with Henry Parks and Recreation on May 18, 2022. Following this meeting, the park's manager and county commissioner agreed to support a proposal to build a greenhouse to further develop this project and spur future growth. They were advised that the appropriations process through the county government would mean that the greenhouse will be completed in November 2022. This extended the timeline for the project.

The **AZGFD Aeration project** team has been working on making the prototype to calculate the oxygen levels of our aeration system. The overall efficiency of the system needs to be calculated with respect to the power of the motor. They are planning to bring out a prototype to our client by December. The prototype would be a rather simple one where it

would fulfill the basic requirements of the fishery. The students have plans to work on specific optimizations based on feedback from the initial prototype.

The **Sustainable Localized Food and Educational Systems** project's proposed solution would include drones that could communicate with sensors that could monitor the water content, pH, and temperature in the soil to identify when the garden should be watered and amended. This group is interested in expanding the capacity for composting as well as providing a location to store the goods that are harvested to provide food sources to those in the apartment complex adjacent to the gardens. While the main beneficiary of the project is Bullock Garden, there is also the opportunity to educate k-12 students. The Rowan Environmental Action League (REAL) group members met with Sonya Harris of the [Bullock Garden](#). She provided a lot of avenues for outreach to the students in the Glassboro school district. Three groups at Rowan could provide the outreach, REAL, SHPE-Leading Hispanics in STEM, and the National Society of Black Engineers (NSBE). This would lead to at least three outreach events in the spring semester which would reach 60-90 students. Students would use LEGO® Education SPIKE™ Essentials to learn about sustainability.

The team for **Urban Gardens for Sustainable Education and Agriculture** continues to pursue excellence in academic-community partnerships within our work. They meet almost every week with students (undergrad and grad), faculty, community leaders, and community members present. With the help of this project, the team has more directly added the Academy of Urban Scholars. This will allow direct involvement of high school students, a demographic currently only minimally involved in our partnership. The K-12 students will partner with OSU undergrads to create curricula around robots.

The community garden has benefitted and has had a great experience with this partnership. "Yes, the students met and exceeded our expectations; the nature of our project goals is somewhat open-ended, so 'completion' is a priority, but not the highest or only priority. The students are fully capable of completing/meeting/exceeding project goals in the future," responded Damon Nabrit, from The Charles Madison Nabrit Memorial Garden in the Community Partner Close-Out Survey. The partner views the project as a long-term project that will continue to evolve in the future and mentioned that they have been revising their 2 and 5-year plans to retain student involvement and maintain viable student-created/led solutions.

STUDENT LEARNING IMPACT

While community impact is important, the service-learning model facilitated by EPICS in IEEE also significantly impacts the students involved. The EPICS in IEEE committee surveyed the students that participated in this Environmental Competition to see what learning outcomes resulted from this experience. 31 students responded (response rate of 23%) and there were responses for seven of the ten projects. The chart indicates the self-reported outcomes of specific skills gained due to the Environmental Competition project:

Skills Gained	Significantly/ Moderately Impacted	Somewhat Impacted	Minimal/ No Impact
Project Management	70.9%	22.6%	6.4%
Problem Solving	83.8%	9.7%	6.5%
Engineering Design Process	90.4%	3.2%	6.5%
Increased understanding of your technical discipline	58.1%	19.4%	22.6%
Increased understanding of other technical disciplines	77.4%	12.9%	9.7%
Incorporating stakeholder and/or community feedback into the design process	74.2%	19.4%	6.5%
Leadership	54.8%	22.6%	22.6%
Teamwork	93.6%	3.2%	3.2%
Written Communication	54.9%	29%	16.2%
Verbal or Oral Communication	77.4%	19.4%	3.2%
Understanding the needs of the end-user	77.4%	19.4%	3.2%
Social Impact	83.8%	6.5%	9.7%
Empathy	67.8%	16.1%	16.1%

Students also provided additional comments on skill development in their close-out forms, and mentors and community partners were also invited to comment on the growth they observed in the student teams or individual members. Selected quotes that showcase details about student development are shown:

“ Speaking about the project at events in public helped me develop better social/communication skills. Learning how to wire and test out the sensors taught me some engineering skills. ”
Student Survey response

“ During our EPICS design reviews, my team and I presented to a group of engineers and industry representatives to receive feedback about our project. This was a super helpful experience for my personal development because it helped me improve my presentation skills. Furthermore, there were things that the industry representatives brought up that our team had not thought of or focused on enough. This was very helpful for me because it showed me how valuable constructive criticism can be in improving the design. ”
Student Survey Response

“ It was rewarding to interact with the students and see their thought process and growth as they discovered what worked and didn't work with regard to sensor design and function.”
NC State Community Survey Response

“ Going out to the garden and talking with the community partners we have for this project I think is one of the ways I learned the most. It was really beneficial to work closely with a community partner like we are in this project. ”
Student Survey Response



“

This grant through EPICS in IEEE made it possible for a small team of engineering students to work together and submit a proposal for funding. We believed it was a shot in the dark but we all learned that great things can happen if you just try. We grew close together through the proposal efforts and many "founding" members chose to stay on the project because it felt possible. I think the primary outcome is that teamwork is crucial in all success stories.

Lake Litter final report

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This was my first time leading a student team, so I learned quite a lot about leadership and project management.

Student Survey Response

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“

This project has been an amazing learning opportunity for me. It tested my ability to lead and manage, I stumbled many times throughout the course of the project but with each mistake, I learned so much more. In the early stages, I spent countless hours reading about drone operations and various gas sensor systems to develop a project plan on my own. Later on, I shared this knowledge with my team and learned how to manage teams, assign tasks, pick up any slack and improvise when needed.

Project DIANA team lead

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PROJECT EVALUATION

Overall, the Environmental competition was successful and has led to substantial learning experiences for the students and the community partners involved:

Completing a competition at this level has never been done by the EPICS in IEEE committee and there were some unforeseen challenges that the committee learned from during this competition. At the start of the calendar year, there was an unexpected staff departure, resulting in no one in the EPICS in IEEE program manager role for over three months. This staff transition led to some delays in the implementation of the competition. The projects were not selected until April, and three were not selected until June. In addition, it took longer than expected to get the funding dispersed to the student teams. In most cases, the funding was received over the summer when the students were on break and not able to work on the projects. The late start for selecting projects and onboarding a new staff person caused delays in the projects from the program side.

Two of our projects had considerable delays for other reasons. The Rowan University project lead left the university before kicking off the project, leading to a change in the project lead/faculty advisor for the project. The Morehouse project was not able to kick off when it wanted to due to delays from the community partner. Both projects have been working to refine their designs and will purchase their materials in 2022, however, the majority of the implementation work will happen in Spring 2023.

Despite the delays, most of the project teams have been successful in launching their projects. Although most projects are not completed and deployed in the community yet, the students have contributed significant work in the allotted time. The teams have taken time to reflect on the work completed so far and made plans for the completion of their prototypes and deployment into the community. The students are grateful for the funding that they have received and are enjoying the work that they have done so far. The project lead from Project DIANA said, “I would like to thank EPICS in IEEE and the United Engineering Foundation for allowing me to pursue my goals and aim higher.”

FUTURE PLANS

In the final reports, the student teams were asked to identify the next steps and when their projects will be officially completed. All teams are aiming to finish their projects and deploy in the community by May 2023 at the end of next semester. This aligns with the end of their academic year. Some teams are ready or have tested their prototypes, some will be finishing them in the early part of the semester. The EPICS in IEEE committee will continue to track the progress of the teams and offer support as needed.

There will be an end-of-project report to evaluate the final project impact. In addition, there will be a survey sent to the community partners and beneficiaries. The EPICS in IEEE committee looks forward to supporting and telling the story of these projects over the next few months.

FINAL BUDGET

The EPICS in IEEE Committee gave **\$62,466.20** money for the projects. In addition, **\$9,642.76** on promotion and administrative expenses. See Exhibit C for the full invoice for the project.

**Thank you to the United Engineering Foundation
and the IEEE Foundation for your support of the
EPICS in IEEE Environmental Competition.**



Exhibit C

UEF22-028: Advancing Engineering Through Service Learning: Inspiring Young Technologists To Address Environmental Issues Through Technology

Funding Request/Invoice

On behalf of EPICS of IEEE, the IEEE Foundation requests reimbursement for one-time grant in support of the *2022 Environmental EPICS Competition: Powered by UEF*.

Expenditure	Description	Budget Amount	Funding Request																																	
Direct Project Support	Mini-grants student team finalists to purchase materials needed to deploy their engineering solutions.	\$85,000	\$62,466.20																																	
	<table border="1"> <thead> <tr> <th>Project #</th> <th>Project Title</th> <th>Amount</th> </tr> </thead> <tbody> <tr> <td>2022-UEF01</td> <td>Hydration Station</td> <td align="right">\$ 2,000.00</td> </tr> <tr> <td>2022-UEF01-P2</td> <td>Hydration Station-Phase 2 funding</td> <td align="right">\$ 2,000.00</td> </tr> <tr> <td>2022-UEF02</td> <td>Henry County Aquaponics in the Park</td> <td align="right">\$ 10,000.00</td> </tr> <tr> <td>2022-UEF03</td> <td>Spatial extent monitoring of coast sunny-day flooding</td> <td align="right">\$ 7,750.00</td> </tr> <tr> <td>2022-UEF04</td> <td>Lake Litter Solutions</td> <td align="right">\$ 4,500.00</td> </tr> <tr> <td>2022-UEF05</td> <td>Urban Gardens</td> <td align="right">\$ 10,000.00</td> </tr> <tr> <td>2022-UEF06</td> <td>AZGFD - Aeration</td> <td align="right">\$ 5,500.00</td> </tr> <tr> <td>2022-UEF07</td> <td>Project DIANA</td> <td align="right">\$ 3,815.00</td> </tr> <tr> <td>2022-UEF07-P2</td> <td>Project DIANA-Phase 2 funding</td> <td align="right">\$ 1,080.00</td> </tr> <tr> <td>2022-UEF08</td> <td>Reducing Chicagoland Ecological Footprints via Outdoor Recreation Centers and Personal Gardening</td> <td align="right">\$ 2,000.00</td> </tr> </tbody> </table>	Project #	Project Title	Amount	2022-UEF01	Hydration Station	\$ 2,000.00	2022-UEF01-P2	Hydration Station-Phase 2 funding	\$ 2,000.00	2022-UEF02	Henry County Aquaponics in the Park	\$ 10,000.00	2022-UEF03	Spatial extent monitoring of coast sunny-day flooding	\$ 7,750.00	2022-UEF04	Lake Litter Solutions	\$ 4,500.00	2022-UEF05	Urban Gardens	\$ 10,000.00	2022-UEF06	AZGFD - Aeration	\$ 5,500.00	2022-UEF07	Project DIANA	\$ 3,815.00	2022-UEF07-P2	Project DIANA-Phase 2 funding	\$ 1,080.00	2022-UEF08	Reducing Chicagoland Ecological Footprints via Outdoor Recreation Centers and Personal Gardening	\$ 2,000.00		
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UEF22-028: Advancing Engineering Through Service Learning: Inspiring Young Technologists To Address Environmental Issues Through Technology

Funding Request/Invoice

	2022-UEF09	Measuring Nitrogen Level in Carmans River by using a Conductive Polymer-Based Sensor \$ 3,396.20		
	2022-UEF09-P2	Measuring Nitrogen Level in Carmans River by using a Conductive Polymer-Based Sensor- Phase 2 funding \$ 1,625.00		
	2022-UEF10	Sustainable Localized Food and Educational Systems \$ 8,800.00		
Promotion		Costs include professional writers to document each student project for promotional activities. Professional photographers/videographer to document key community activities for promotional activities. Upgrades to the environmental project pages on the website	\$10,000	\$8,611.49
Administrative		Costs include Staff/Committee chair travel	\$5,000	\$1,031.27
		Total for UEF	\$100,000	\$72,108.96
IEEE Investment		Funding of Phase 1 of the project, Staff cost, Online Grant Platform, and Communication Platforms such as WebEx and Zoom	\$35,000	\$33,750.00
		Total Project	\$135,000	105,858.96