Improving Indoor Air Quality for Vulnerable Populations Nationally and Globally

Purdue EPICS Global Air Quality Trekkers, Purdue University, West Lafayette, IN, USA

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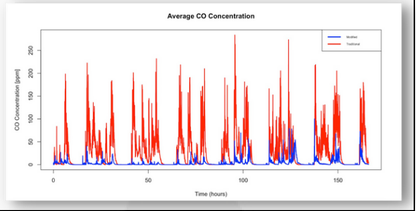
Nandi Clean Kitchens

Our Kenya Team is working on creating an efficient fan system to ventilate harmful CO within the indoor atmosphere. We are aiming to increase means of health improvement with our ideas! The overall system needs to be safe, easy, and budget feasible for our users. We are hoping to expand on these ideas with an accessible stove design and easy-to-use fan system. The team is working on adding new extensions to the existing stove since it is getting weathered due to the harsh seasons. Our project partner, Dr. Rose Aykukwei, has mentioned that an addition of solar panels would help increase the usage and sustainability of the system. We have been also researching ways to provide extra incentives with solar.

Study Abroad 2019

The team went to the Nandi Community to conduct tests withing the traditional kitchen (no windows) and modified kitchens (included windows and roof vents). Based on the figure, the levels of CO concentration was dangerously high in the traditional kitchens while the modified kitchens provided more ventilation, thus the lower values on CO. Those findings were still relatively close to OSHA permissible CO levels.

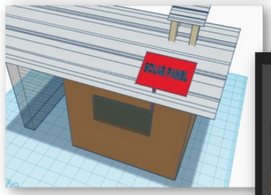


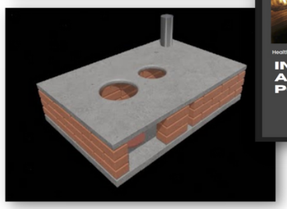
Current Work

Currently, our Kenya Team is working on reducing air pollutants in kitchens in Kenya by designing a new stove and fan compartment.

For the new stove design, we are working to make the smoke and air pollutants travel through the stove and out through the chimney more efficiently. While brainstorming new ideas on how to improve the stove, the Kenya Team is also making sure that the cultural and traditional normalities that the Nandi Community has, specifically with their stove designs, are maintained. We are also making sure we come up with incentives on why they should trust our stove design and why they should use it.

Our team introduced the idea of using a fan in the kitchen to help draw air pollutants out a couple years ago. Originally the fans were placed in the side of the kitchens, but little to no change was made in the number of air pollutants in the kitchen. Therefore, we started testing the fan inside of the chimney to see if more air pollutants and smoke were to be pulled out of the kitchen and stove this way. We noticed there was a decrease in CO in the kitchen when the fan, located in the chimney, was on. So, we knew the fan in the chimney idea worked, but we didn't have a safe, accessible, and efficient place to out the fan in the chimney. This is what the Kenya Team is currently working on - a compartment that holds the fan in the chimney.

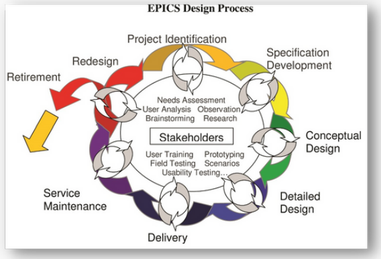




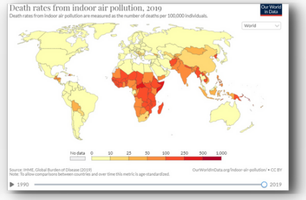
Project Background

Founded by **EPICS** (Engineering Projects in Community Service) within the College of Engineering. **GAQT** (Global Air Quality Trekkers) is an engineering service project group dedicated to developing a design using natural ventilation to the people of Nandi, Kenya in reducing indoor pollution within their community kitchens. The women of Nandi become ill from a variety of respiratory diseases due to burning biomass from lacking ventilation. Our project partners include AMPATH Population Health and Moi University School of Engineering. This issue of indoor air pollution is prevalent in areas of the US that encounter the most natural disasters.

Both the Kenya and Miller Team are within the design/prototype phase of the project, after conducting multiple tests/ brainstorming in particular research areas. We make sure to keep communication with our project partners a main priority since they are our important stakeholders. It is important to consider all the criteria and constraints of the project since it will help further develop the extra resources that are needed.



Since the group's creation in 2016, GAQT has been working to create a final design that increases airflow and reduces pollutants within the kitchen. Our overall goal of the project includes designing a chimney and fan system with easily accessible, budget flexible, sustainable, and renewable means of materials. The team built a functional test kitchen to continue testing with fire simulations and stove efficiency model. We have also expanded our work with the local Miller Elementary School to test our filtration box projects!

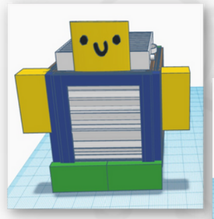


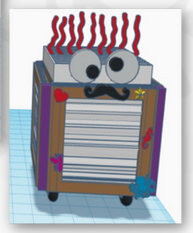
Miller Elementary School

Our newly established team works with the local Thomas Miller Elementary School in Lafayette, IN. This team hopes to help in educating the younger generation about the harmful effects of indoor air pollution and how many health risks it can pose to young children! We would also like to incorporate STEM activities for the students so that they can learn interactively and build things that can promote healthy academic environments. Later on, we can work further to expand our final deliverables to other schools around the nation!

Visits To The School!

Since Fall 2022, we have visited the school to place PurpleAir Sensors to measure the PM2.5 (Particulate Matter) within the classroom to determine if filter boxes would help in creating a low PM2.5 atmosphere. This semester we have decided to place the sensors for the entire semester to get a clear periodic trend on the levels to make a better comparison.





Current Work

We have an initial project including an acrylic box that will serve as a small HVAC system and allow "polluted" air with a smoke pen to pass through multiple air filters. Our prototype will also include an artistic portion to allow the students to express their creativity when building the box. We will then move onto creating our artistic filter boxes which will serve as a fun, easy-to-build filtration device that is not only budget feasible but also proven to provide great results indoors! The students can also decorate and add their little touches as they like!

Acknowledgments

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Moi University Foundation of knowledge

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