



PEEPS – Personalized Environmental Purification System

EPICS – Global Air Quality Trekkers (GAQT)



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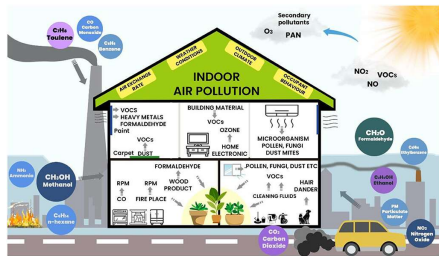
GAQT

Who we are and what we do

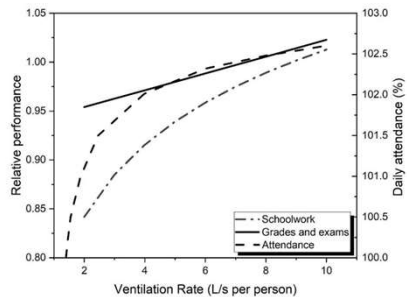
The mission of GAQT is to develop natural ventilation solutions and efficient filtration methods to mitigate the amount of air pollution presented in schools. Indoor Air Pollutants, or IAP, is caused by sources that release gases or particles into the air. Such things as inadequate ventilation, high humidity, and high temperatures can all increase concentrations of IAP. Common IAP particles include CO, VOC, and NOx. When breathing in IAP, immediate effects, which are short-living and treatable, usually involve irritation of the eyes, nose, and throat, along with headaches, dizziness, and fatigue. However long-term effects, can show up years after exposure or after long, repeated periods of exposure. Long-term effects can include respiratory diseases, heart diseases, and cancer.

As mentioned earlier, GAQT is focusing on reducing IAP in schools, specifically K-12 schools. We are focusing on IAP in K-12 schools because children are more sensitive, since their airways are small and still developing. Children also breathe in more air, which means they have a greater risk of exposure, especially since their immune system is still developing. Growing up breathing high levels of pollution can impact how children's lungs develop which puts them at a greater risk of lung disease.

When children are exposed to IAP in schools, it can impact their performance in school. IAP can cause cognitive learning and verbal abilities in children to decrease. Along with this IAP can impact such things as reasoning, planning, problem solving, and decision making (Wang, 2021). However, studies show that an increase in ventilation results in better cognitive functionality for children and can improve student's schoolwork, grades and exams, and attendance (Sadrizadeh, 2022).



Ravindra, 2022



Sadrizadeh, 2022

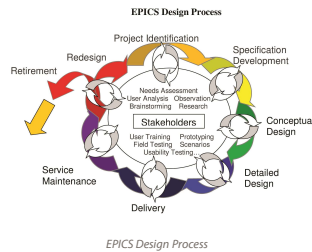


References:

Methodology

Our team partnered with the Miller Elementary School in Fall of 2022. We were able to begin researching indoor air pollutants (IAP) and testing sensors at the school. The following semester, Spring 2023, we conducted hands on activities with the students at the elementary school so they could learn the effects of IAP and how important good ventilation is. During this semester, we were also able to collect PM data from two (2) classrooms. Over the summer of 2023, we were able to get funding from the EPA P3 grant, where we are now working to create a personalized device that helps to remove IAP in classrooms. In the future, when we have a working prototype that has gone through initial testing, we will reach out to the Miller School and other Tippecanoe Schools to work on testing PEEPS and teaching students the importance of good ventilation.

Since our team is associated with EPICS, we use the EPICS design process. Where we initially started in the project identification stage, then moved to the specification development phase. We are current rotating between the conceptual design and detailed design phase, improving our prototype from feedback from design reviews. To make sure GAQT can complete the needed work in the semester, we have two teams the Electronics Team and the Prototype Team.



EPICS Design Process

Team Objectives

Our team is split into two sub-teams to make sure work is completely efficiently and effectively. Even though both sub teams are working on two distinct parts of the project, they work together to make sure PEEPS works as one unit.

- Prototype Team
 - PEEPS outer structure,
 - Aesthetics
 - Fusion360 and 3D modeling
 - Mounting, lighting, fan and light bulb placement
 - Nanofiber filter – electrospinning machine
- Electronics Team
 - Sensors
 - Circuitry
 - Arduino / microcontroller
 - Control logic

Impact

When GAQT was going to the Miller Elementary School to conduct hands-on activity with children. This helped us teach the students in simple terms the importance of ventilation. These demonstrations also helped spread the word to other students, teachers, and community members on why adequate ventilation is important.

When PEEPS is completed and we have a working-prototype, we will be able to test in classrooms and begin testing to make sure PEEPS not only works adequately in schools, but also provides a better learning environment for students. When testing in schools, we will receive feedback to better learn how to make PEEPS better for students. Whether this be adding more incentives, like a charging port, or different levels of light, the feedback we receive will be beneficial. We will also begin educating new students with hands-on activities and fun presentations to teach them how important good ventilation is.



GAQT Prototype Team – Final Design Review F23

Summary

GAQT is working to not only reduce indoor air pollutants (or IAP) in local schools, but we also hope that doing this will teach students, administrators, and the local community of how important it is to maintain proper ventilation. Our team is honored to be a part of the EPA P3 (People, Prosperity, and the Planet) Student Design Competition. GAQT will advance the US EPA P3 goals on development of scalable community-based solutions to prevent and reduce IAP in classrooms. This will provide a healthier environments for students to learn, think, and create. To meet the P3 project objectives, EPICS students on our team will be preparing mid- and final-semester design reviews to document and demonstrate progress throughout the project. This is a great way for undergraduate students to accomplish their hands-on learning and professional development skills.

GAQT has successfully earned a spot in Phase I of the competition with a funding of \$24,000 to development the design and functionality of PEEPS. Our Phase II efforts will be presented at the Student Design Expo in Summer 2024. In the future, we hope to collaborate with more local schools to gain feedback on PEEPS and provide accessibility for all school environments.

You can use the QR code to the right to learn more about our project.



Acknowledgements

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