

Innovating Environmental Health: Building Peace through Collaborative Engineering and Education for Clean Air

Kathmandu Nepal

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Our project strived to narrow the inequalities in health and education posed by pollution by providing clean air to Nepali classrooms – an inequality that undermines the principles of human rights and is a basis for conflict. We designed low-cost air filtration devices, implemented IoT air quality sensors, and taught a curriculum on sustainability to push for climate justice. Our goal was to tackle air pollution and its potential to result in large-scale deaths. Growing up in Shanghai and Kathmandu, we experienced the impacts of air pollution firsthand. There were days we were not allowed to exercise outside or play on the field because the air was toxic. The ability to attend school in the greater Boston area taught us that poor air should not be the norm. We learned about environmental health and climate engineering in the classroom, and we were inspired to use of our knowledge to make a difference. Reading about parents fighting for air filtration devices in Beijing inspired us to create low-cost air filtration for the classrooms. We saw a feasible platform for us to promote peace. From there, we learned the importance of data and education in creating sustainable change, leading to the sensor and education aspect of our project.

Indoor air pollution is an overlooked health emergency because of its immensely interdisciplinary causes and effects. It is not only about particulate matter or carbon dioxide, but also about pulmonary health, geographical inequalities, environmental poverty, and more. The issue we are responding to requires the galvanization of people across multiple sectors and cooperation amongst them. As a result, it distills into the roots of peacefulness. It necessitates cooperation in a time of division. Furthermore, air pollution continues to be viewed as a long-term challenge that will “impact future generations”. Current responses evolve around long-term plans such as reaching net zero carbon emission. In reality, its immediate effects can already be witnessed. As such, there needs to be stopgap measures to mitigate the consequences pollution currently has on our day-to-day lives and the threat that it poses to peace. By building low-cost devices, we aim to tackle the immediate impact of pollution on children.

We chose to conduct our project in Kathmandu, Nepal because its economy in tandem with its geography makes it especially prone to amassing air pollution. On March 26th of 2021, Kathmandu witnessed the world's most polluted air. These constant and worsening spikes of air pollution is degrading the health conditions of all the citizens, especially young children. The need to create a healthy learning environment for children is becoming an increasingly dire issue. The opportunity to implement air filtration devices and air quality sensors through our project directly tackles the rampant levels of pollutants in the city. Furthermore, education at our host site has been severely disrupted due to the pandemic. Being able to take our Eco-Ed program to Kathmandu has allowed us to give these students an opportunity to learn new ideas and concepts, which they can use to create a positive impact in their communities.

Due to the COVID-19 Pandemic, we executed our project remotely. Within the team, communicating remotely across three time zones was especially challenging. It was difficult to replicate the connectedness and unity of an in-person project. To overcome the unique work setting, we checked-in with each other every morning and night to discuss our progress and next steps. Furthermore, we used a remote organization platform Notion to keep track of our tasks. There were often delays when one of our tasks was dependent on the completion of another. As such, we strived to each oversee a slightly different portion of the project to allow for steady progress. For future PfP grantees, we would recommend participants to find ways to spend bonding time with their teammates and project partners. In the virtual environment, feeling a sense of belonging can help them stay motivated towards achieving their project goals.

Connecting with partners and local communities was also much more challenging in a remote setting as we had to communicate via email. The delays caused by the format of communication often meant that we had to plan a few steps ahead of time. Furthermore, due to the spread of COVID in Nepal, many of our existing contacts diverted their attention to tackling the epidemic. We used this opportunity to reach out to more stakeholders and audiences in Nepal that we would have not connected with otherwise. We gained insightful feedback from local leaders and students who have helped us grow our

project. The opportunity to work on a virtual medium allowed us to involve participants from different parts of the world and to collaboratively work towards a common goal.

The point at which we thought the project was not going to work was when we were simultaneously struggling with a technical issue in connecting a sensor chip for our air quality sensor project as well as hearing back much higher prices for 3D printing pieces for our prototype than expected. Given that this sensor chip was key to our users being able to use their phones to connect to the sensor and detect air quality meant that unsuccessful connection would hinder the accessibility of our project, or we'd have to drastically alter it, which would require time we did not have. Based on the quotes for our 3D printing pieces, our air-filter device would also have to be priced exorbitantly higher than the accessible low cost we were aiming for. The result was an overwhelming feeling of dejection; even if we solved the connection issue, we still had the high prices to grapple with. After putting our heads together looking at the problems at hand, we came upon a potential fix for our connection issue and were able to devise a strategy for how to modify our designs to bring pieces down as well as negotiate to our advantage.

The process of implementing the project showed us that peace means free and respectful collaboration. Fundamentally, conflict is a result of the inability of two factions to work together towards a common goal. Peace is when we are able to put differences aside to conclude that no matter other trivialities, we all at the basic level have the same goal of a just world. Through our education program, we've instilled in a cohort of close to 20 students the value of cross-cultural teamwork and the importance of empathizing with people unlike yourself in the path towards innovating. Working side by side with Karkhana and the Association of Mechanical Engineers, we've also emulated this same collaborative relationship. We had meaningful discussions about the air filtration devices to simplify the design and lower its cost. Most of all, we strived to create designs that are suited for the local communities, specifically incorporating local materials in the device itself. We aim to encourage and strengthen the potential for future collaborative relationships to come.

Meeting students from the education program has also shown us an increased sense of optimism for the future. As part of this education program, students create and present on an innovation developed by following the principles of design thinking that they believe will solve a community issue. Watching the culmination of their work in the form of a final presentation on the last day forever changed our perspective on what young students are capable of and the power harnessing this potential can have. Students tackled issues from menstruation waste management to river pollution, interviewing people in their communities most influenced by these issues and the rigor and passion with which they confronted these issues made me realize that even my previous high esteem was an underestimation. We have come out with a renewed sense of hope that young people, with their drive and brilliance will in due time carve out an effective and just resolution to the issue of climate change.

The project has helped us affirm the need to take strong steps towards tackling indoor air pollution in the learning spaces around the world. Not only because of air pollution but due to this project, we have grown more sensitive towards other climate emergencies that are emerging as it has started to impact people everywhere on a day-to-day basis. Climate crisis, however, isn't a simple problem. Being able to solve it requires an active collaboration across various disciplines and groups. Our education project was based on that idea, bringing young people from different walks of life to tackle the problems that are impacting their societies. As we executed this project and mentored innovative ideas that students came up with, we were left with a realization that working to create social change is challenging but if looked at properly we can find support. This project has inspired us to look for networks and communities that have similar motivations like we do to amplify the impact.

Our Davis project has shown us the interconnectedness of the world and thus our responsibility to be a part of making it a better place. Pollution is an entity that is not constrained by national borders. It is carried by the wind into communities that are unequipped to tackle it and thus unproportionately impacting those that are low-resourced. Our Davis experience has also very much been impacted by the COVID epidemic. We completed our project in a remote format via the internet. We were able to find the necessary information, communicate with local partners, and implement our project while being physically located in a different space. The ability to do so shows us how connected we are with the rest of the world. We truly are able to do something significant because of the tools and information we have access to. It has engendered us to think more about our role in this global world and building peace.

“By allowing us to design and execute a project on our own, Projects for Peace has given us the opportunity to build a wide range of skills that will help us to take our idea to the next level.” — Bidhi Mandal

“This project has been about the power of young people, demonstrated not only in the work we were doing in leveraging our skills to create a more just and peaceful world in the sector of respiratory health but also in the talent and grit we saw in the students in our Eco-Ed program. This has made me realize that if more resources were available to harness the potential of students like us around the world, we would be making much greater strides in addressing issues in health and climate change and the conflict it brings.” — Sabhyata Sedhain

“The opportunity to participate in a Davis project taught me to become an efficient leader — adapting to the needs of the host community as well as my teammates. I was enlivened to see that the small action I take can propagate into larger changes” — Vanessa YiRan Li

Thank you to the team at Projects for Peace and Wellesley Career Education for supporting our project. Through PfP funding as well as our social media campaigns, we have gained tremendous insights on being a changemaker. We hope to have begun narrowing the inequalities induced by climate change and the threat that it poses to world peace. We look forward to continuing our initiative in the fall to share our mission of providing clean air to children.

