



Engineering World Health 2021 Virtual Winter Institute Final Report

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Executive Summary

Due to the COVID-19 pandemic, Engineering World Health was unable to run our traditional January Institute programs. Following the success of EWH's virtual summer programs, we launched the Virtual Winter Institute. The VWI hosted **42 total participants**, including, for the first time, high school students. The university cohort included 35 students from 13 different universities. 16 participants were from universities in the United States and 19 were from universities in Uganda. The high school cohort included 4 American students and 3 Ugandans. Participants were divided into 7 university teams and 1 high school team. Program facilitators served as mentors for each team to guide them through the design process.

During the 3-week program, the university participants worked in teams of 5, and the high school students all worked together in one team of 7. Each team included American and Ugandan students. The technical training comprised online lectures, virtual team assignments, and live sessions with team mentors. Each university team developed a design which addressed a health need in a low-resource setting, while the high school team explored several possible solutions.

The university participants **collectively produced 7 complete design projects**. Since the program was shorter than our summer programs, teams were given 3 topics they could choose from: oxygen concentration, sterilization, or medical equipment supply lines.

Our participant feedback was positive. Participants reported they could work collaboratively with teammates from different cultures, and felt they could successfully apply what they learned. Students also reported gaining both general skills, such as learning how to work in a group and communicating effectively, and specific knowledge, such as sterilization in low-resource hospital settings. Participants appreciated the guidance of their mentors.

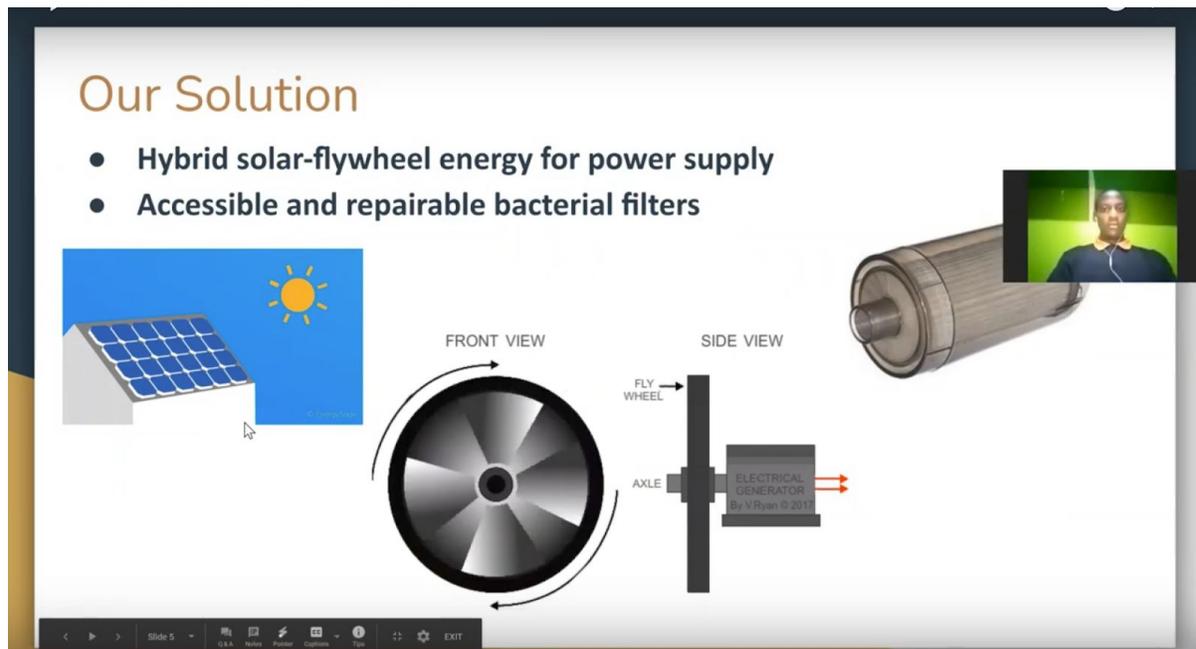
In summary, the Virtual Winter Institute was highly productive and an overall success. We are grateful to all who helped make this program possible.

Design Projects

EWH asked participants to choose one of three biomedical equipment issues and design a solution appropriate to low-resource areas. Through lectures, teamwork, and research, the participants identified needs and developed designs to address those needs. The university teams completed a total of 7 projects. Here we will summarize each design. To see more about each project, watch the presentations [here](#).

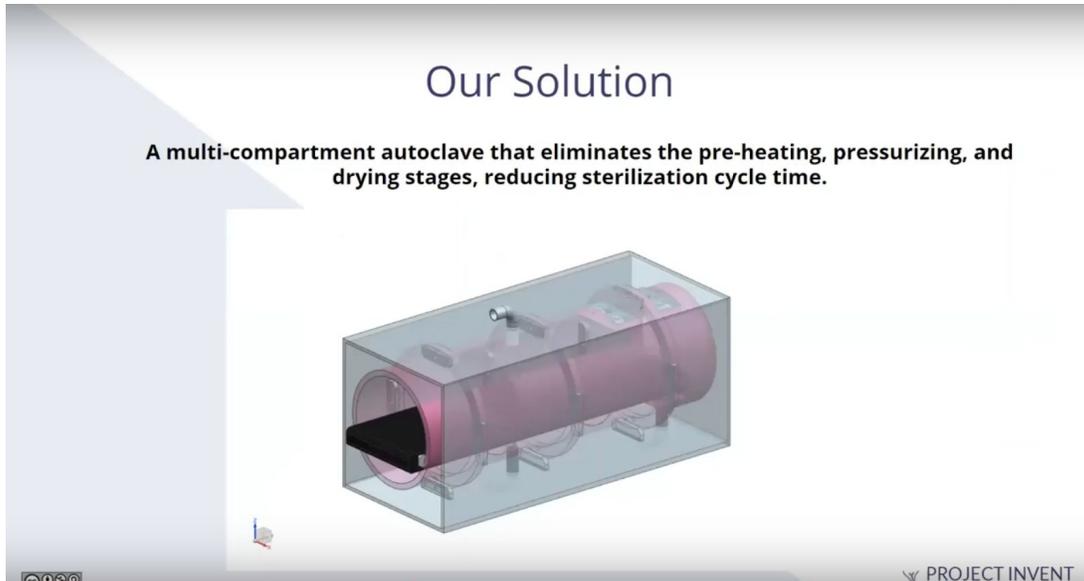
Team 1 - Modified O2 Concentrator Design

Team 1 outlined the existing issues with hospital oxygen delivery very well and developed a solar power solution to make oxygen concentrators less dependent on unreliable sources of electricity. They also proposed a universal filter to reduce the difficulty of finding replacements.



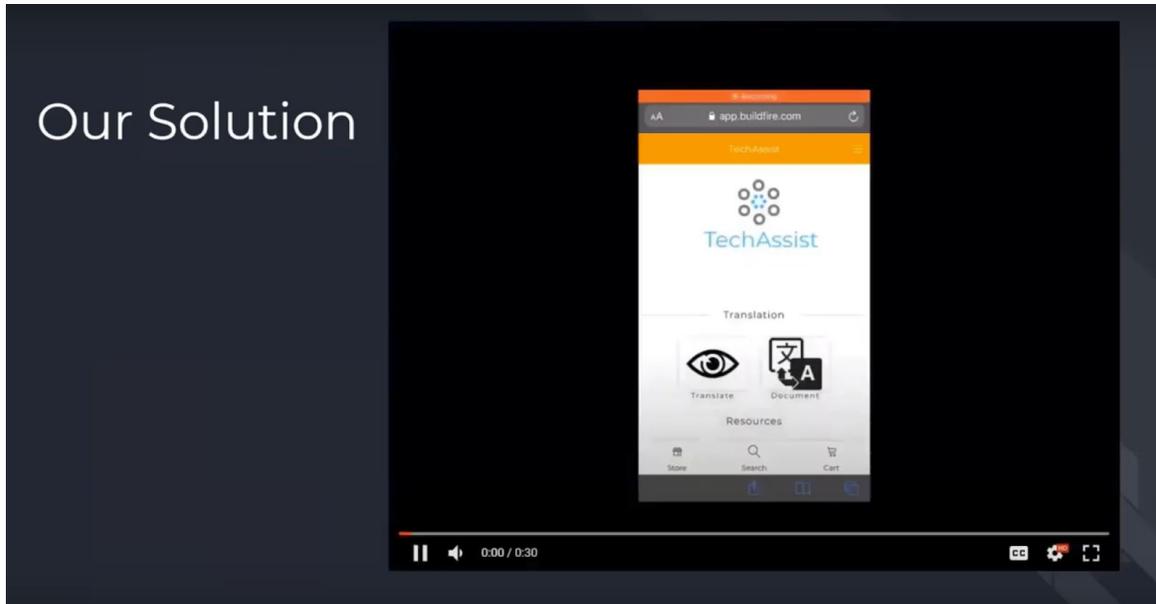
Team 2 - Multi-Compartment Autoclave

Team 2 worked to speed up sterilization for hospitals with their design for a multi-compartment autoclave. They aimed to provide a lower-cost, portable autoclave option which would still be able to handle a large amount of sterilization.



Team 3 - Tech Assist

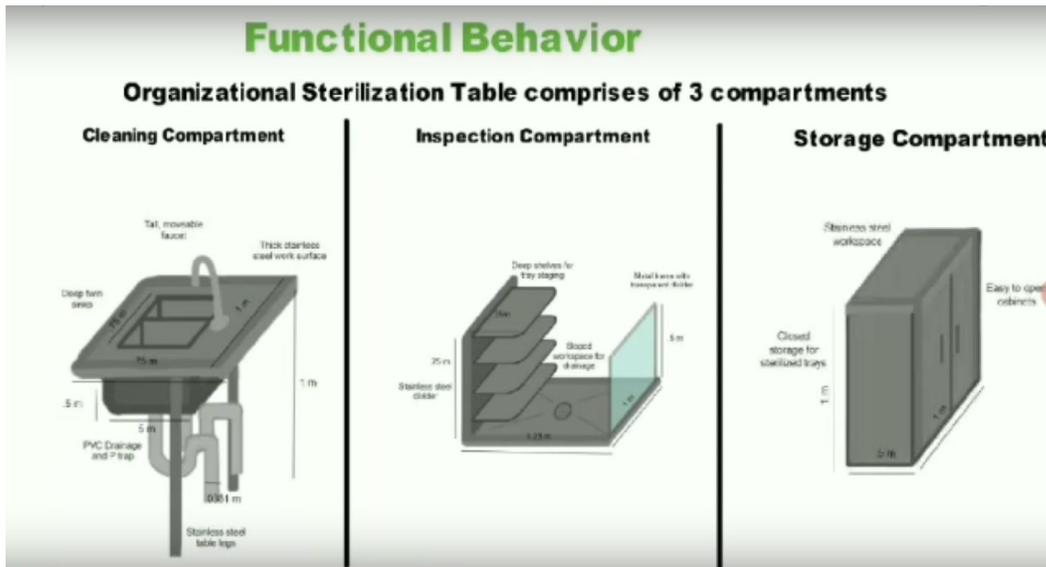
Team 3 addressed a need relevant to Ugandan biomedical technicians. Their project designed an app to improve access to online resources and overcome language barriers when trying to repair second-hand medical equipment.



Team 4 - Organization Sterilization Table

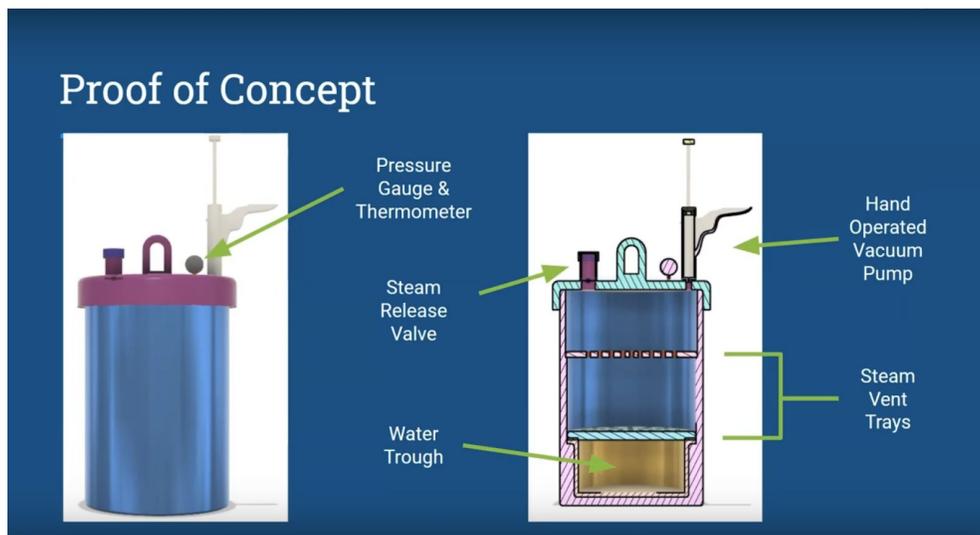
Team 4 identified an issue in hospital workflow in which medical staff may lose track of which tools are sterilized and which are not. They carefully considered the context

of Ugandan hospitals in their design, and worked to ensure table parts would be easily replaceable and low-cost.



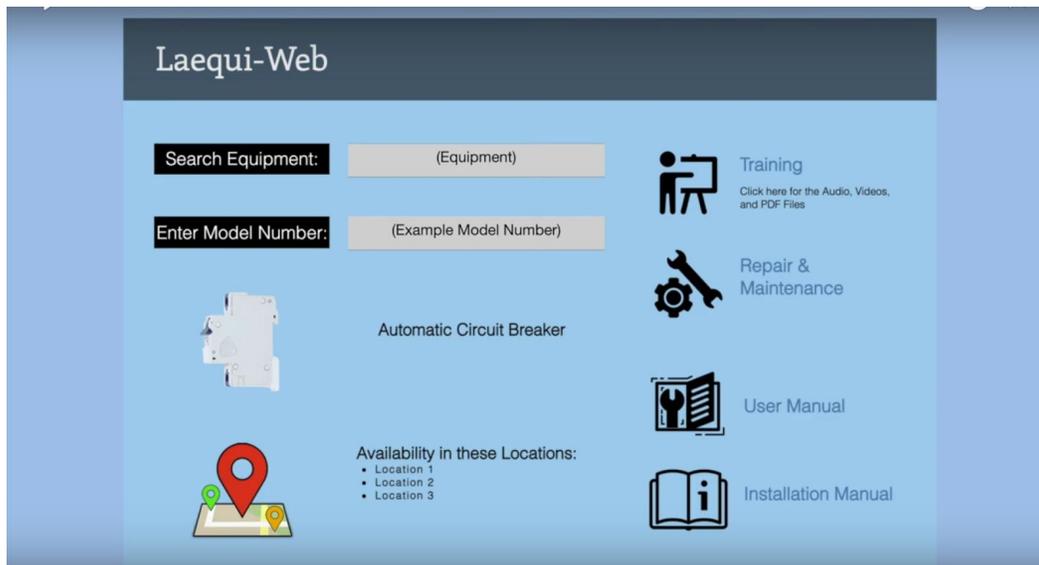
Team 5 - Sterilipot

Team 5 designed a small autoclave which could be manually pressurized and would not rely on electricity. With the addition of steam vent trays, they intended to make the sterilization chamber customizable and maximize the use of the small space.



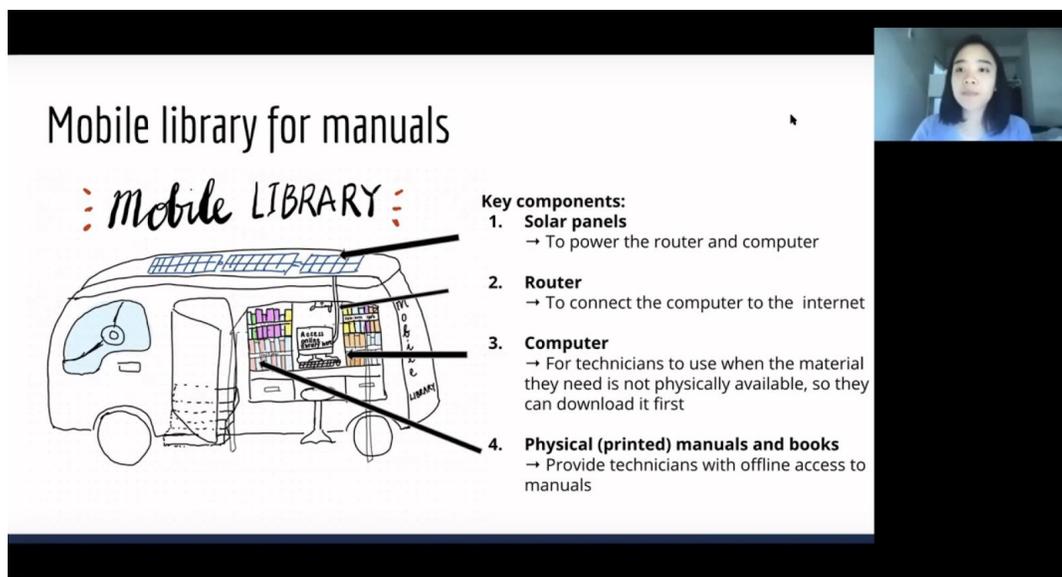
Team 6 - App-Based Medical Equipment User Training

Team 6 outlined the difficulties hospital staff face in learning to use new equipment. They designed a streamlined service to provide users with easier access to training materials, as well as information on where spare parts may be found.



Team 7 - Improving Offline Access to Equipment Manuals

Team 7 sought to address the barrier of limited internet access in finding equipment manuals. They carefully considered the stakeholders and designed a mobile library for manuals.



Participant Debriefs and Feedback

Our participant feedback was positive. Some of the words used to describe the program were “engaging,” “interesting,” “really educational,” and “exciting.” A common challenge for participants was difficulty with unreliable internet connections, especially for Ugandan students.

Below are some comments taken directly from the participant feedback about the Virtual Winter Institute:

“I definitely learned a lot about the specifics of sterilization in low-resource hospitals, and how medical needs in different countries/areas vary greatly from what I might expect in the U.S. Also, I feel like I learned more about how to work in a group, especially virtually, and how to communicate effectively and efficiently.”

“This experience has been a great way to explore the realm of biomedicine while receiving feedback, encouragement, and suggestions from actual biomedical engineers.”

“It’s a great way to learn deeply about a really cool and important industry, in a way that you can’t through your everyday life.”

Acknowledgements

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