

Emma Luke

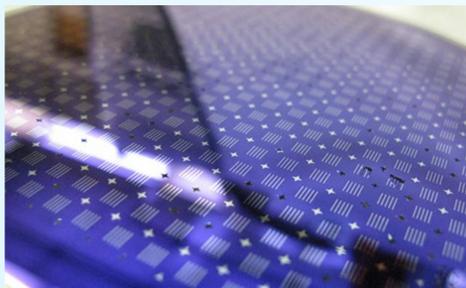
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Introduction

Worldwide there is a lack of access to clean water, with over 783 million people lacking access to safe water. The issues related to lack of access to clean water stretches far beyond the scope of drinking water. With this lack of clean water comes diseases. People eat contaminated crops, drink water riddled with fecal matter, and shower in unsanitary water. Diarrhea is a leading cause of death in countries that lack access to clean water. About 60% of deaths due to diarrhea can be linked to unsafe drinking water, along with poor personal hygiene and sanitation.

Research Competency

In April of 2017 I began working in the McGrath Lab at the University of Rochester. This lab works with nanomembrane devices that are also being used by a group in the United Kingdom at Cranfield University to clean water by filtering microbes and contaminants from water. This group is working with the same nanomembrane devices to provide sanitary conditions for a widespread group of people. As mentioned before, the lack of access to clean water does not just affect drinking water, but also basic sanitation and hygiene needs.



Poor sanitation, such as waste water infecting local agriculture fields or drinking sources, can lead to many harmful diseases. By using nanomembranes to develop waterless toilets, the group at Cranfield University is assisting many individuals by preventing the spread of diseases.

Entrepreneurship Competency

During the Fall 2018 semester I was invited to a presentation by the founders of the Ugandan Water Project out of Rochester, NY. The Ugandan Water Project is a humanitarian, non-profit organization with the goal of advocating for clean water in Ugandan communities.

This business utilized several aspects of my training as an engineer, especially from senior design seminar. They designed their product with the customer needs in mind –access to clean water – while also considering



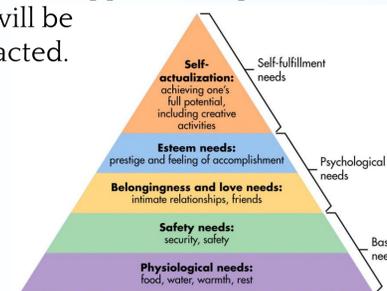
the engineering and impact of the system on a greater level, such as long-term sustainability by the community. The team took into account the climate of the region, the current training of the community members, and the regulations for clean water. In engineering, this is a practice known as Designing for X.

In the future, I plan to use similar techniques to those utilized by the Ugandan Water Project. With a passion for helping people through designing medical devices, I will often need to Design for X -- whether that be economic concerns, anatomical constraints, or some other challenge.

Interdisciplinary Competency

Through the action of the United Nations, 2.6 billion people gained access to clean water, but some is contaminated. There are psychological effects that stem from contamination including reducing household labor supply and productivity, negative impacts on children's test scores, brain disfunction, and social exclusion.

Through academic coursework for my minor in psychology, I have learned about several aspects of mental health through a variety of theories. I wanted to further explore the impact of a lack of access to clean water and the fulfillment of needs. Maslow's hierarchy of needs describes the importance of fulfilling needs. First, physiological or basic needs must be met -- this includes food, water, warmth, and rest. Without access to clean water, this fulfillment may not happen and a person's mental health will be negatively impacted.



Service Competency

I have participated in several Girl Scout Workshops in collaboration with the Society of Women in Engineering. Through a series of workshops, the girls are introduced to several different engineering disciplines where each engineering group hosts a different workshop that allows for hands-on involvement.

I proposed a workshop on providing access to clean water. This could be a biomedical engineering workshop where the nanomembrane chips could be displayed and short clips could be shown on how materials are filtered out. As a hands-on component, there could be different sized balls in a setup where only smaller holes were present. This would show the girls how larger particles, such as contaminants, are filtering out of the water to clean it.



Global Competency

I traveled to Honduras for a 10-day volunteer trip with Global Water Brigades. I worked with fellow students, as well as community members, to establish a clean water system in a remote Honduran community, El Censo. The trip involved learning about the previously established water system, assisting in building a new clean water system, and visiting surrounding communities that had previously had the Global Water Brigades assistance to install clean water systems. This allowed us to experience the "before, during, and after" of the system sequence.

Working closely with the community members on the project digging trenches and installing pipes was an eye opening experience. I was able to communicate with, and learn from, the community members everyday. They were proud of what they had and were very thankful for our help.



References

- Chowdhury, Shyamal, 2016, "Arsenic contamination of drinking water and mental health".
- Compassion, 2019, "Water Facts".
- McLeod, Saul, 2018, "Maslow's Hierarchy of Needs".
- National Academy of Engineering, 2019, "NAE Grand Challenges Scholars Program".
- Soutter, Will, 2013, "Nanomembranes in Water Treatment".
- The Water Project, 2016, "Facts about water: statistics of the water crisis".
- Ugandan Water Project, 2019, "Helping you provide clean water and save lives in Uganda".

