

**Thesis Project Portfolio**

**Engineers in Action: Eswatini Suspended Bridge**

(Technical Report)

**The Failings of Online Learning for Elementary Education during the Covid-19 Pandemic**

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

**Kathryn Wagner**

Spring, 2022

Department of Engineering Systems and Environment

## **Table of Contents**

Sociotechnical Synthesis

Engineers in Action: Eswatini Suspended Bridge

The Failings of Online Learning for Elementary Education during the Covid-19 Pandemic

Prospectus

## **Sociotechnical Synthesis**

Access to a good education is essential for children around the world. A successful early education allows children to gain both the knowledge and skills that they will need to contribute to society later in life. However, a good education is something that is not always readily available for every child. The two projects found in this portfolio build off of the idea that every child needs to be able to receive a quality education. The Capstone project focuses on the construction of a suspended footbridge that will impact two underserved communities. While the suspended footbridge will allow community members to safely access markets, cities, churches, and health care, one of the bridges main uses will be allowing school age children to safely travel to both primary and secondary school. Then, the STS research paper focuses on the quality of education that elementary students received in the United States during the Covid-19 global pandemic. The paper focuses on how the United States reliance on computer learning resulted in elementary students not being exposed to the same level of education as previous years. The outcome of both projects helps ensure that a quality education is received by the students impacted. Once constructed the suspended footbridge will allow children to safely travel to their schools, while the research paper helps determine the problems with online education so that they can be avoided in the future.

Engineers in Action (EIA), a non-profit organization whose goal is to help underprivileged communities around the world, tasked the University of Virginia's capstone team with designing a suspended footbridge for the communities of Zombodze and Boyane in Eswatini. These two communities rely on being able to cross the Mtilane River, a river that runs between the two communities. Extended periods of annual flooding during the rainy seasons result in the river becoming incredibly dangerous for the community members to cross. A suspended cable

footbridge, when constructed, will provide safe passage over the Mtilane River. The team was instructed to develop a comprehensive report on the scope of designing and constructing a suspended footbridge for the assigned site. The full comprehensive report consists of site data, necessary background information, design summaries, a construction plan, a safety plan, a bill of materials, a list of responsibilities, and a standalone drawing set for bridge construction.

The Spring of 2020 brought about an unprecedented time for the United States educational system. As the Covid-19 pandemic swept across the nation, schools were forced to shut down in order to ensure that students and teachers remained safe. To make sure that children continued to receive their education “93% of households with school-age children” began to use some type of distance learning (McElrath, 2020). However, the shift to online school presented many challenges that appear to have diminished the effectiveness of online education of elementary age students. Once it was deemed safe enough to resume in-person education, schools were quick to reopen their doors and revert back to the way school was taught before the pandemic. The STS research paper answers the question: how was the United States reliance on computers during the Covid-19 global pandemic a failure for elementary education rather than a success story. The paradigm shift theory is used to analyze what failures in online school caused the Kuhn cycle to not be completed resulting in the return to in-person education. In looking at the failings in elementary education during the Covid-19 pandemic, that were a result of the United States reliance on computers to continue students’ learning experience, the United States education system can learn how to better transition to a new type of learning if another crisis would arise in the future. The lack of control and preparation for the switch to online education at the beginning of the pandemic, now recognized, can hopefully be avoided if the United States would ever have to resort to computer learning again.

While the two projects within this portfolio are interrelated, due to their main goal of ensuring that children receive the quality of education that they deserve to be successful in life, the work that went into both projects could not be more different. The Capstone project allowed the team to participate in a real-world job. Working with the EIA allowed the team to experience how a true engineering firm would handle an assigned project. The team experienced the positives that came with relying on a team and the pitfalls that can present themselves during the varying stages of the project. While the Capstone project solely focused on the technical and team building skills, the STS research paper allowed for a focus on developing research skills, a skill that is often not taught in many engineering classes. Together, the two projects helped develop research skills, technical skills, and team building skills. Skills that when combined allowed for a true experience in what a career within engineering can be like.

## Works Cited

McElrath, K. (2020). Nearly 93% of Households With School-Age Children Report Some Form of Distance Learning During Covid-19. *United States Census Bureau*. Retrieved from <https://www.census.gov/library/stories/2020/08/schooling-during-the-covid-19-pandemic.html>