

Thesis Portfolio

Developing a Reliable and Economical Web Portal for Meals on Wheels

(Technical Report)

New Methods in the Teaching of Computer Science

(STS Research Paper)

An Undergraduate Thesis

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

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Sociotechnical Synthesis

This portfolio discusses two projects, a technical project, the Capstone Project, as well as an STS Research Paper, that each explore separate topics. In order to better serve the community, the Charlottesville Meals on Wheels worked with UVA computer science students in order to create a volunteer management portal to replace their previous system of manually keeping track of everything. As that application aged, the Meals on Wheels staff reached out for a new capstone team to build a new, updated application due to the old application slowing down and not allowing several important operations. In addition, the technical project explores computer science education and how it can be improved in order to expand computer science to a larger and more diverse population.

This Capstone Project, the first project, consists of an application that is designed to keep track of customers and volunteers as well as the number of meals delivered and other important information and tasks in order to help the Charlottesville Meals on Wheels staff function as efficiently as possible. Some of these administrative tasks can get rather complex due to a combination of daily, weekly, biweekly, monthly, and one-time volunteer shifts and customer needs. Also, most of the meals delivered are sourced via donation, which makes predicting supply difficult. The application developed provides this functionality among other features.

The second project, the STS Research Paper examines how introductory computer science education has grown and improved and how that trend can be continued through exploration of new methods in order to address the new, modern problems facing computer science education. Computer science is only growing in prevalence and these educational issues will only grow unless they are addressed. The following research question explores one specific facet of this growth.

How are introductory computer science classes, specifically how CS1 (CS 111x) and CS2 (CS 2110), are taught at the University of Virginia, and how can they be improved, specifically by exploring their similarity to introductory foreign language classes?

In order to explore this question, this paper utilizes both documentary research methods as well as interviews of both computer science and foreign language instructors and teaching assistants. In order to further explore this topic, two STS frameworks, Technological Momentum as well as Wicked Problem Framing were selected in order to help analyze the results. The goal of this paper is to analyze the current teaching methods of CS1 and CS2 at the University of Virginia and explore how new methods can be developed and integrated with what is currently being used. This research focuses on important issues such as how to educate a predominantly non-technical population on technical concepts that are only becoming more and more important to the majority of jobs.

The experience of working on both of these projects simultaneously was important because getting to see the interaction of the real-world examples of the Meals on Wheels staff learning more about what benefits a web application could bring to their workflow was interesting in combination with the STS project of bringing computer science to new populations. Their experience of learning how computer science could help them influenced one of the staff members to explore more about the application and ask further technical questions to understand what was happening. This natural questioning further highlighted the importance of people in the real world needing to understand what computer science can do for them before deciding to explore computer science further for themselves.