Thesis Project Portfolio

UVA Automated Course Advising Assistant

(Technical Report)

Smarter Calculators in the Modern Classroom

(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

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Spring, 2020

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Sociotechnical Synthesis

Technology such as personal computers and smartphones have been rapidly transitioning into educational environments over the past few decades. Students and teachers have found various uses for this technology from saving time in checking work to representing information in new ways. Overtime the knowledge and skills students should learn and teachers should provide will change because of new technologies. My theses are related by looking at two types of online innovations and how they can be used to improve the education process for students. The technical thesis addresses students planning their college education and aims to generate a personalized multiyear course plan. The STS thesis addresses the potential impact computational knowledge engines can have on teachers' and students' educational behaviors. However, these theses differ in the timeframe they respond to the problem of updating educational curricula. The technical thesis focuses on proactive students recognizing specific gaps in their education and finding immediate opportunities to fill them whereas the STS thesis focuses on factors that gradually change how content is offered and taught. The overall goal of this report is to provide both short-term and long-term understandings of how online innovations can modify curricula.

My technical explores creating a web application personal assistant to provide concrete guidance in topics such as course recommendations, degree requirements, course workload, and time management. In most college campuses across the United States, there is immense flexibility in courses one can take to achieving their degree(s); this introduces a problem in knowing what classes will be most beneficial, enjoyable, and accessible. The main objectives of this research were to: 1) determine what aspects of courses are important in planning a college education and satisfying degree requirements 2) how to represent various combinations of courses in a format that can be assessed by students on relevancy and practicality. Our research

group was successful in addressing these two objectives and creating a web-application that B.A. and B.S. Computer Science students could utilize to generate and plan a multiyear course plan at the University of Virginia.

My STS thesis analyzes how students and teachers perceive the abilities of computational knowledge engines and how, if it all, the engines affect their behavior. Computational knowledge engines have immense potential for the type of material they can assist in, however, it is not immediately clear how teachers and students can use them. The objectives of this STS research were: 1) determine what factors are important to students and teachers when adopting new technologies and 2) how these factors have presented or failed to present in the case for adoption of computational knowledge engines. These objectives were met through looking at prior research on the graphing calculator, learning management systems, and knowledge engines as well as primary sources and associated opinions on knowledge engines. It was concluded that the use cases of knowledge engines are not general enough relative to their complexity to be commonly adopted into K-12 classroom settings.