

THESIS PROJECT PORTFOLIO

Satori: A Course Management System

(Technical Report)

A Student-Centered Analysis of the Design of Virtual Learning Tools

(STS Research Paper)

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Bachelor of Science, School of Engineering

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SOCIOTECHNICAL SYNTHESIS

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with Joshua Mehr, Cristian Scruggs

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STS advisor: Kent Wayland, Department of Engineering and Society

PROSPECTUS

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Remote learning tools have revolutionized modern education systems, enabling almost anyone to learn from the comfort of their own home. The last two years have seen a steep increase in the use of these tools, with over 74% of US households with children transitioning to some form of online education due to the COVID-19 pandemic (McElrath, 2021). Even as courses return to in person instruction, instructors have integrated the convenient aspects of online learning into hybrid, or blended, classroom environments. This widespread adoption has the potential to dramatically transform lives by making education accessible to those all over the globe. However, like many other quickly emerging technologies, we are not fully aware of the societal implications that e-learning tools may have; what long term impacts may they have on students, instructors, and modern education systems? This lack of certainty makes it increasingly important for developers to proactively evaluate their approaches to designing these tools and determine the best strategies for creating virtual learning tools.

With the transition to online learning, students have reported increased levels of academic stress and anxiety (Lister, et. al., 2021). This raises the larger question of how virtual learning environments specifically impact students and how they should be designed to account for these impacts. The STS thesis delves into this mutually shaping relationship between online learning platforms and student learning outcomes, specifically by analyzing literature in the areas of accessibility, motivation, and memory. My research shows that online learning, if implemented correctly, can play a significant role in making education more accessible to students with disabilities and neurodiverse students, helping foster intrinsic motivation, and boosting information retention. The findings of the literature were indicative that the primary characteristics of a well-designed virtual learning environment are configurability, diversity of presentation options, and temporal control strategies.

The conclusions of this thesis can be applied in projects focused on developing online learning tools, an example of which is detailed in the technical portion of this portfolio. The technical thesis details the continued development of Satori, an open-source application that will be used as the primary course management system for CS 2150 (Program and Data Representation). The previously used management system included two primary functionalities: a support request management system and an office hours queue. This system was functional in the initial years the course was offered, but as the course enrollment has grown to over 500 students per semester, it has failed to appropriately scale. In response, my team is developing a new course management system in Python and Django. By the end of the spring 2022 semester, my team was able to roll out a functional queue and ticketing system with extensive tests. The new system also includes features to manage course enrollment, create multiple queues, and monitor TA performance. Anecdotal feedback from teaching assistants and students show that the new system is easier to use, has lower latency, and experiences fewer crashes. We also thoroughly documented the system for future individuals that choose to work on Satori and provided many suggestions for expansions that could be made to the tool.

I personally found the work that I did on my STS thesis to be valuable because I was able to apply the knowledge I gained through research in my work on Satori. Much of my research made me more conscious that my design decisions did ultimately have implications for the end user. My hope is that since I was able to gain so much from the content of my STS thesis, other developers working on similar projects may be able to as well. I found my technical project to be very rewarding, especially because I had the opportunity to first handedly watch individuals use and benefit from the tool we developed. My team also laid a solid groundwork for students to continue to expand Satori and integrate new features, such as announcements and additional

statistics about student engagement. For other individuals interested in the topic of virtual learning, I believe that accessibility can be a fruitful area of research with many implications on user experience design. Further research into user experience design as it relates to student learning outcomes could drastically improve the educational experiences of students and instructors alike.