

SATORI: OPEN-SOURCE COURSE MANAGEMENT SYSTEM
THE IMPACTS OF ONLINE LEARNING IN HIGHER EDUCATION

A Thesis Prospectus
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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Currently, we are in the midst of the global COVID-19 pandemic that has changed the way that everyone across the world is living their lives. An entity that went through a large change from the way that things have always been done are universities. Professors now have all their assignments, activities, exams, etc. online and are teaching students using pre-recorded lectures or video conferencing services like Zoom or Microsoft Teams. Despite these drastic changes, this gives our society and schools/universities the chance to experiment with and benefit from the qualities of online learning that in-person learning does not have.

The COVID-19 pandemic and the transition to online learning has made my research even more significant as course management systems will be influential in creating a successful online learning environment. Course management systems are commonplace in most university classes and they have been instrumental in operating courses as it “allows teachers to manage their classes, assignments, activities, quizzes and tests, resources, and more in an accessible online environment” (Simonson, 2007, p. 1). Over time, other functionalities have been added such as having a discussion board to increase collaboration, extend interaction outside of the classroom, and increase social connectedness to improve overall learning (Costen, 2009). Being able to host online office hours to help students, create an interactive learning environment, contact professors, give feedback to students, and other important features of the classroom will benefit both students and professors in making a learning environment where students can excel.

For the technical project, my team and I will be building onto a course management system that was created last year. While our course management tool was already useful before the pandemic, this year has increased its benefits in providing the necessary resources to aid student’s online learning. As online learning will be discussed thoroughly throughout this report, the working definition that will be used for online learning is “learning that uses internet

technology that allows teachers and students to carry out learning wherever and whenever outside the classroom” (Verawadina et al., 2020, p. 2). The STS topic that I will focus on is the impact of online learning on higher education as it has become more important than ever due to the global pandemic that our world is in. The technical and STS topics are closely related as they are co-dependent in an online course setting.

SATORI

For the technical project, my team and I will be building onto an open-source online course management system called “Satori” that was started last year. My team consists of three other students in the School of Engineering and Applied Sciences whose names are Jelena Liu, Megan Marshall, and Daniel Mizrahi. This will be a year-long project directed by Professor Aaron Bloomfield in the Department of Computer Science. Our project is mainly focused on maintaining and improving the office hours queue for students to add themselves to when they need help on assignments and creating a ticketing system for student requests if they need an extension on an assignment or need to reach out to the course staff directly. These features are adaptations of similar existing tools used in CS 2150: Program and Data Representation. This will help large courses, like CS 2150, manage students and allow the course staff to interact with and help as many students as possible, as studies have shown that going to office hours increases students’ overall learnings and scores in the course (Guerrero & Rod, 2013).

This new system was created to replace the pre-existing system called “Course Tools” which was made in the early 2000s. Class sizes have continued to grow since then from around 200 to 500 students, but the initial queue was not created to handle the sheer volume of students during busy office hour times. The system becomes glitchy, with problems such as students being kicked off the queue randomly, the queue freezing at inconsistent times, and having a slow

response time during busy office hour times. The support request tool has a slow response time when there is a large amount of student request tickets in the system as well. The tool is also not compatible with the new system the course started using this semester called Gradescope that we use for automatic assignment grading and feedback.

The existing “Satori” platform was created on Django, a Python web framework, uses MySQL to create and manage the database, and is hosted in a Docker container. The project is divided into three apps -- core, queue, and tickets -- with a user-friendly interface. Core handles creating and editing courses and upholding role and user permissions. The queue app consists of the office hours queue system and tickets will be used for the support request system. Figure 1 portrays the interplay of the different roles with the apps in our project below.

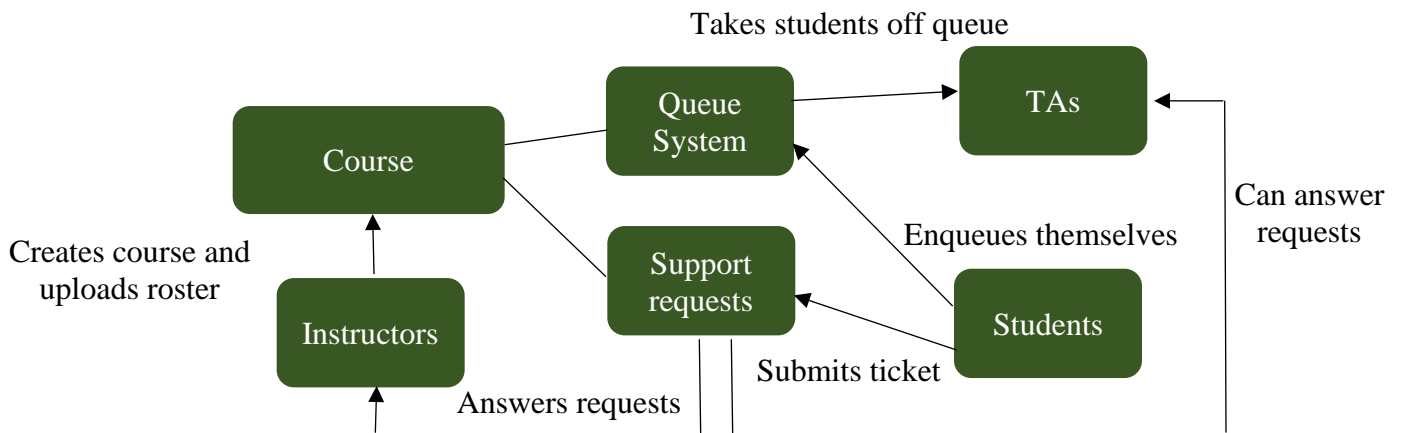


Figure 1: Satori Operational Flow: The depiction above shows the roles that each user plays and how they interact with the apps in Satori (Flynn, 2020).

We plan to test our web application once each feature is done, starting with the 50 CS 2150 TAs, and when that is successful, it will be made available to over 530 students who are currently taking this course. Once our web application and research are completed at the end of next semester, we will write the technical report. We hope that by using this system, instructors and students will be able to have an easier-to-use and more cohesive course management system,

especially with the course being completely online due to the COVID-19 pandemic. We also hope that these enhancements will improve students' overall online learning experiences.

IMPACT OF ONLINE LEARNING ON LEARNERS

There has been a large shift to online learning due to the global pandemic and there are examples of where it works as well as features that are lacking. This is becoming a bigger issue as most students and professors are both new to online courses and professors are currently struggling to figure out how to integrate all aspects of their courses into an online setting without a lot of time to prepare. For my research, I am examining the most influential aspects of online learning for professors and universities to focus on when developing online courses. I will also use Pinch and Bijker's framework of the Social Construction of Technology (SCOT) to explain the different relevant social groups that influence online learning and what they can do to improve students' learning in online courses (1984).

INFLUENTIAL FACTORS IN AN ONLINE LEARNING SETTING

When seeing how online courses impact learners, it is important to consider students' diverse backgrounds, learning preferences, and how they interact with professors and/or other students, especially as most students are taking their courses online at this time. A study that was conducted between students taking classes online and in-person showed that students were able to master both courses, but in-person students attributed their success to the organization of the class structure, their teacher, and personal interaction. Online students attributed their success to the website structure, feedback from and access to their instructor, and self-regulation. They also noted that there was a lack of personal interaction, but it allowed them to be more productive (Reisetter et al., 2007). This study highlights the differences between in-person and online learning and demonstrates where more of the focus should be for online course development.

Being online allows students to regulate their schedule more than in-person classes, especially if courses are asynchronous. It could also potentially put a strain on teacher-student and student-student interactions as more scheduling needs to be involved to meet up or ask questions instead of just being able to walk up to someone and start a conversation during an in-person class. Furthermore, online courses emphasize the significance of thorough feedback from instructors on students' work to know that they are on the right track in the course, as the personal component is lacking. Lastly, if the online tool for a course is not intuitive for students or is extremely slow, the frustration that students experience negatively impacts their learning. However, if the tool is user-friendly, it can positively impact their learning.

Another study of online learning represented Western and Eastern cultures and demonstrated that a student's cultural background could impact their work, how they learn, and how they communicate in online collaboration/participation (Yang et al., 2010). This study shows that the way that one online student learns from and participates in class discussions can be very different from another student which is important as many students are taking online classes all over the world. These two studies show that there are multiple factors that impact a student's online learning experience and research is being done in multiple different areas. These areas are shown in Figure 2 below while also emphasizing the ones I will primarily focus on for my research in green.

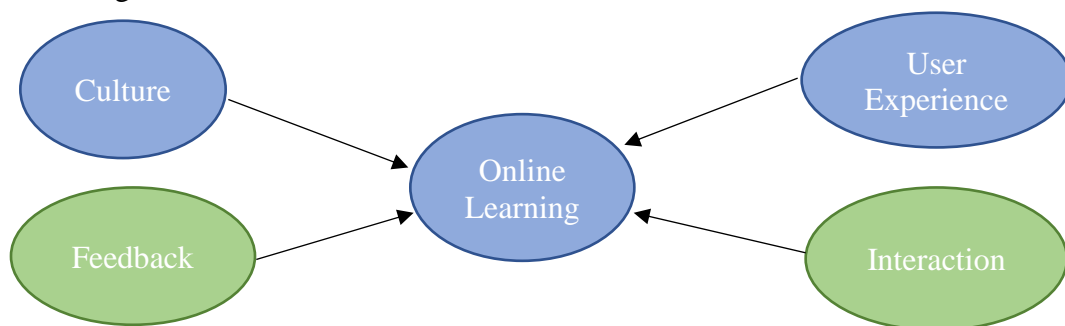


Figure 2: Prominent Aspects for Online Learning: After examining multiple studies on online learning, the depiction above demonstrates important factors that were found for professors and universities to consider and highlights the areas I will focus on in my research. (Flynn, 2020).

ANALYSIS OF NECESSARY IMPROVEMENTS – SCOT

A SCOT model is used to understand the needs of students in an online course, how the relevant social groups for online learning can work together, and paves a way in providing an online learning environment where students can succeed. The relevant social groups for online learning are students, professors, and universities. As shown in the studies discussed in a previous section, students’ quality of learning is better when they are more engaged in courses/lectures and when they receive timely and thorough feedback from instructors. Additionally, as the global pandemic forced universities to transition their courses to an online setting, both students and instructors were given just a few weeks to prepare which has caused many issues. Universities also were not prepared to account for low-income students who rely on their universities for access to school necessities. Figure 3 shows the problems of relevant social groups when implementing online learning.

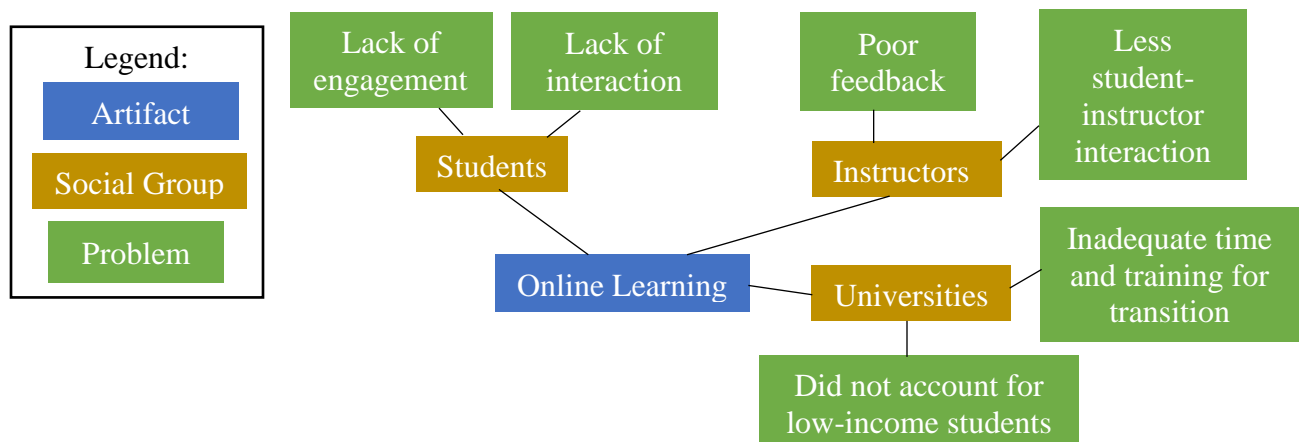


Figure 3: SCOT Model for Online Learning: The depiction shows the bigger problems that relevant social groups need to address to implement online learning successfully in universities. (Adapted by Flynn (2020) from Bijker, Bonig, & Oost 1984).

ENGAGEMENT

Keeping students engaged during online lectures and in course content has been one of the bigger challenges in online learning. Data collected through subjective experiences and interpretations of online learning found that students are bored in online courses and desire a more engaging experience. It was also seen that it is not as easy to ask questions and get answers when courses are not face to face. However, the data also mentions that it gives flexibility to students to learn at any place and if a course is asynchronous, students could learn at any time, which gives flexibility to instructors as well (Goralski & Falk, 2017). These student experiences represent the pros and cons of online learning. It also demonstrates the difficulty of keeping students engaged as it is easier to get distracted and is a completely different experience now for a student to raise their hand and ask questions during class. For students to be successful in their online courses, they need to be engaged and all relevant groups need to do their part.

Furthermore, an instructor at Grand Canyon University offers ideas that could potentially help instructors increase student engagement. These ideas include providing opportunities for additional student-instructor interaction, anticipating questions from students and making a FAQ list, putting effort into answering students' questions completely as that enhances students' experiences and an instructor's social presence, and making the course as personal as it can be in a virtual environment as it will keep students involved (Jackson, 2019). These ideas express the importance of the interaction between students and instructors which sets the foundation of courses in general, whether they are online or not, and shows ways that they can be implemented into online classes to improve students' learning experiences.

FEEDBACK

With online learning, there is not a direct interaction between students and their instructors. This makes receiving instructor feedback significant, so students can see if they are on the right track in the course or not. Two studies, one on 120 online graduate nursing students and one in a survey given to 304 online undergraduate and graduate students, found that the timeliness and quality of instructor feedback is an important predictor of overall course satisfaction. There was also another survey of 186 online graduate students that found a significant relationship between instructor feedback on assignments and learning results by measuring student satisfaction and final grades (Croxtton, 2014). These studies bolster the idea that in an online setting it is more important for students to have easy access to instructors and detailed feedback to see ideas on their work, so they can improve and increase their satisfaction in online courses. Conversely, if instructors lack timely and quality feedback, it could negatively impact students' learning. This was a significant pet peeve in the survey of 304 undergraduate and graduate students (Croxtton, 2014). Overall, the way that an instructor interacts with their students could have a positive or negative impact on their learning.

UNIVERSITY RESPONSE TO COVID-19

In March 2020, universities across the U.S. shut down their campuses and transitioned faculty and students to online learning in response to the COVID-19 pandemic. There have been many issues as faculty with no experience with virtual courses were now expected to lead online lectures or post pre-recorded videos online, and classes have been experiencing zoom bombings and interruptions. Additionally, low-income students are not able to have easy access to a stable Internet connection and laptops to be able to participate in online courses (Carey, 2020). Instructors were given such a short amount of time to adapt their fully in-person classes to an

online setting and the issues that occurred could be prevented in the future if universities spent more time on training instructors and giving more guidelines to students on this new online university environment. Additionally, to get their classes done, low-income students would depend on having university Wi-Fi and access to laptops which is missing as they are not on university campus. In the future, universities could do a better job of making sure that they provide aid to low-income students and give them access to laptops. Finally, an online institute in Michigan found that if students were given mentor support, it helped them stay on track in their online courses and this can be an initiative that universities could start to help their students (Carey, 2020).

FURTHER IMPACTS

Course management systems have been around for a while and have become even more important during the COVID-19 global pandemic. Putting students at the center of online course designs and utilizing course management systems to provide necessary features for students to succeed such as interaction, feedback, user experience, learning preferences, etc. will be essential for students to succeed in online learning environments. My STS research will focus on figuring out how relevant social groups can work together to further the influence of online education on students and how these relationships could be incorporated into online course design.

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