

Optimization of Schedule and Health Using AI

Promoting Student Health and Engagement Through Better Learning Environments

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By
Caleb Rose

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Technical Team Members:

Rebecca June & Chloe Hutchinson

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.

ADVISOR

Caitlin D. Wylie, Department of Engineering and Society

Afsaneh Doryab, Department of Computer Science

Introduction

In the last few years, life expectancy in the United States has been going down for the first time in its history (Simmons-Duffin, 2023). Many attribute this to the global coronavirus epidemic. However, while most countries experienced a rebound in life expectancy following the arrival of vaccines, the United States did not, leading many to believe there may be deeper underlying issues. An overwhelming number of Americans are not healthy, using the most recent metabolic health guidelines, the percentage of metabolically healthy Americans is around 12.2% (Araujo et al., 2019). Many factors contribute to metabolic and overall health, but the most important is lifestyle. Both my technical and STS research papers explore different ways to help college students adopt healthier lifestyle choices. Setting healthy habits in college is extremely important. College is a transition period to adulthood where students can establish routines and lifestyle choices that can positively impact their long-term health and well-being. Establishing healthy habits now can set a foundation for the rest of their lives.

My technical research paper will analyze the feasibility of AI scheduling built into an app to optimize one's schedule for both time management and healthy lifestyle choices. Our focus is designing this for college students but can also be used by anyone wanting to better their scheduling. We will test the feasibility of this app on three levels of automation.

My STS research focuses on how universities can prioritize student health in the classroom while also enhancing their learning. Students in almost all colleges must sit during lectures, which ends up being long periods each day. I will begin by investigating

through the Social Construct of Technology framework why modern college classrooms are designed to require students to sit for long periods uninterrupted. With the aid of this information, I then plan on identifying and analyzing potential solutions to this unhealthy way of learning through the theory of utilitarianism. The best solutions will maximize the well-being of students and staff while minimizing costs for each college.

Technical Topic

Time management is extremely important in college. Not having proper time management can lead to poor academic performance (Britten & Tesser, 1991) and neglecting exercise. The most common reasons that students do not exercise regularly are not having enough time or having too many commitments (Ebben & Brudzynski, 2008) which are both time management issues. Optimizing one's schedule to better their academic and overall health is a very challenging task for college students. They are extremely busy; they must balance classes, clubs, work, exercise, and social activities. They also have not had much experience in creating their schedules before college. Our team's research hopes to use AI, particularly an LLM (large language model) as a tool to optimize student's schedules through an app to better their overall health and productivity. LLMs are the most common type of chatbot, allowing for the most comprehensive range of interactive features, such as personalized goal setting, real-time feedback, and adaptive conversation flows that would give our user's the highest engagement and satisfaction. The LLM would build an optimized schedule integrating the user's input tasks with the user's uploaded health data from a wearable device. To determine the feasibility of this app, investigating if LLMs can make complex scheduling planning decisions and health predictions is crucial.

LLMs such as ChatGPT-4 and Gemini Pro have had their scheduling capabilities researched very recently. In general planning and scheduling it was found that LLMs have promise, but they still have a while to go to combat the complexities of this exercise (Pallagani et al., 2024). However, Pallagani et al., (2024) argue that with proper training paradigms, LLMs can soon become very proficient in optimized scheduling. According to Kim et al., (2024), LLMs have also made huge advancements in health predictions such as optimal readiness, when to fall asleep, and predicting sleep disorders. However, language models still have more development to be made to combat misinterpretation of health data (Kim et al., 2024). Although at this current moment, an LLM would not be able to accurately incorporate optimizing scheduling with health data, the research above illustrates that this would be feasible soon in the future. Because of this, our team is more concerned about the feasibility of this application in terms of student willingness and user experience and not about the feasibility of the AI being able to optimize their schedule.

We plan on conducting a user study to evaluate our proposed application. The study will incorporate pre-existing sleep data to tailor task recommendations. Each user will be assigned a specific sleep pattern based on general circadian cycles, allowing us to create prompts that align with their hypothetical energy levels throughout the day. Specifically, we will track whether users follow or change the app's scheduling recommendations. These changes reveal preferred times for key activities and provide insights into user habits and preferences for timing adjustments. Feedback on prompts will also be collected to assess the clarity, usefulness, and relevance of the app's recommendations. We will also gather qualitative feedback from participants to ensure that the prompts are both engaging and supportive in addressing users' needs. Even though not using an actual AI will be a

limitation in our research, we believe that collecting the above data will ensure a detailed feasibility analysis of an AI scheduling app in terms of user experience and interest.

STS Topic

Sitting has become the silent epidemic ruining the health of Americans. It was found through observational research that Americans spend an average of nine and a half hours per day sitting (Matthews et al., 2021). This is just an average, many Americans who have office jobs and sit during leisure hours have much more sedentary time. This increase in sedentary behavior is associated with a greater risk of all-cause mortality (Chau et al., 2013), even with adults who meet the physical activity guidelines (Owen et al., 2010). This is a particularly relevant issue for college students. Students are expected to sit during long lectures and often sit down while working on schoolwork at the library. One study found significant increases in self-reported discomfort and sleepiness when students had to sit for seventy-five minutes or more during a lecture (Hosteng et al., 2019). Not only is this prolonged uninterrupted sitting bad for student's health, it also takes away from their learning by causing drowsiness which reduces class engagement and focus. Yet the modern classroom design perpetuates these issues by facilitating and reinforcing such sedentary behaviors with the instructor standing while the students are expected to sit and listen without interruption. Finding potential solutions to this problem requires a better understanding of why the modern classroom is designed in this way.

Scholars already know that changing the spatial layout of classrooms affects students learning (Byers et al., 2018). So why have we not tried to change the rudimentary design of classrooms; that students must sit quietly and listen while instructors stand and teach? To better understand why the classroom is expected to be run in this manner I will

utilize the Social Construct of Technology framework. This framework will help analyze how societal, cultural, and historical factors have shaped the design and function of modern classrooms. It will help uncover why efforts to change our learning environments have been limited, whether due to one of these factors or a combination of them.

Although these efforts have been limited, there has been more awareness of these issues recently. Over the last ten years, researchers have been testing potential solutions to our flawed learning environments. One potential solution that has already had a lot of research backing it is utilizing standing desks. Both students and instructors have already supported this solution. A large survey of around a thousand students and one hundred and fifty instructors found that most students want the option to stand (95.5%) (Benzo et al., 2016). Benzo et al. (2016) also found that most students and instructors were in favor of standing desks in college with the percentages being 76.6% and 86.6% respectively. Standing desks also allow students to be more alert while learning. Finch et al., (2017) found that standing while completing reading comprehension tasks did not impair the individual's ability to complete the task but standing made them more enthusiastic and engaged while completing it. Another researcher found that standing desks helped students be more interactive during class and were better for students who suffer from learning disorders such as ADHD (Usman et al., 2018, p.32). The research clearly shows that students and instructors support and are willing to utilize standing desks and their benefits. However, there are many reasons to look toward other solutions. Installing standing desks across campus is a huge project for many colleges. Mounting expenses such as equipment costs, labor costs, and the lost opportunity costs stemming from lecture halls being closed during renovations are just some of the reasons why standing desks have not

become widespread on college campuses. There must be solutions that are more cost-effective.

Through the lens of Utilitarianism, I will identify and analyze these solutions that minimize costs while also benefiting the well-being of students and instructors. In conjunction with the insights gained through the SCOT framework and the Utilitarianism theory, I will then draft a final comprehensive list of potential solutions that colleges can utilize to promote student health and improve their learning experience.

Conclusion

With these two research papers, I intend to investigate and deliver a prototype to help optimize health and schedule based on an LLM AI and user health data as well as a deeper understanding of our learning environments and a comprehensive list on how we can change them to promote student health and learning. Both metabolic health and sleep quality will be improved with the methods displayed in the papers, with my technical paper focusing on both and my STS paper focusing mainly on metabolic health. These two deliverables from their respective projects will assist college students in understanding how they can better their health and their learning in ways that are often ignored.

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