# Engineering Wellness: Curriculum for Engineering Students to Change the Narrative of Surviving to Thriving

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Robin Fowler is a Technical Communication lecturer and a Engineering Education researcher at the University of Michigan. Her teaching is primarily in team-based engineering courses, and her research focuses on equity in communication and collaboration as well as in group design decision making (judgment) under uncertainty. She is especially interested in how power relationships and rhetorical strategies affect group judgment in engineering design; one goal of this work is to to understand factors that inhibit full participation of students who identify with historically marginalized groups and investigate evidence-based strategies for mitigating these inequities. In addition, she is interested in technology and how specific affordances can change the ways we collaborate, learn, read, and write. Teaching engineering communication allows her to apply this work as she coaches students through collaboration, design thinking, and design communication. She is part of a team of faculty innovators who originated Tandem (tandem.ai.umich.edu), a tool designed to help facilitate equitable and inclusive teamwork environments.

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# IUSE: Engineering Wellness: Curriculum for Engineering Students to Change the Narrative of Surviving to Thriving

## Introduction

This Improving Undergraduate STEM Education (IUSE) Level 1 Engaged Student Learning project explores how wellness education can be effectively integrated into the first-year engineering curriculum by examining students' and instructors' perspectives on its integration. National data suggest high rates of mental health challenges for undergraduate students. In engineering, a culture of normalized high stress at the expense of wellness may affect students' help-seeking and their decisions to remain in engineering programs. We propose that there is a critical need for proactive interventions to support student wellness, equipping students with the necessary tools to thrive during their undergraduate years and beyond. The team has developed a first-year design course, *Engineering Wellness*, which has been offered at the University of Michigan for three years. The curriculum purposefully integrates physiology, sensor technology, the relationship between data and physiology, ethical considerations for inclusivity, and research-based strategies to support student wellness. The project poses the overall research question: *How can proactive, wellness-based curricular interventions support undergraduate engineering students in thriving?*

The project includes (1) qualitative research that engages students and instructors and (2) curriculum development informed by research findings with a robust translational plan to share resources for maximal impact widely. The project design, with its integrated research and curriculum, is synergistic, ultimately changing the narrative from one of survival to one of thriving for engineering students. Social Cognitive Theory guides the research to inform not only what curriculum supports student wellness, but also how to deliver it in a student-centered way. Findings from instructor and student interviews are being leveraged to adapt the Engineering Wellness curriculum for broader reach, targeting more students through various modalities. In this poster, we will describe the *Engineering Wellness* curriculum and share our preliminary results from interviews with instructors and students.

## Course Overview

*Engineering Wellness* delivers a research-based curriculum that supports students' wellness through a hands-on design course, while also teaching about the rapidly evolving field of wearable health sensors and associated at-home wellness technologies. *Engineering Wellness* is motivated by rapidly advancing sensor and data-processing capabilities, such as artificial intelligence, that can be leveraged to analyze increasing volumes of health data. This rapid acceleration of technology has led to proposals that personalized and preventative medicine will be realized in the near future [1]. Of course, while these technologies hold incredible promise, there are significant concerns of equity, data privacy, bias, and accessibility. *Engineering Wellness* addresses both these opportunities and challenges through discussions and case studies that engage students in examining the social implications of these technologies and how their role as engineers can address issues of equity throughout the design process. An explicit goal in designing *Engineering Wellness* is to make wellness content integral to the course, with practical wellness strategies incorporated into lessons on sensor technology and physiology. For example, one lesson focused on sleep, including learning about ECG sensors for heart rate detection, how

heart rate is used by sleep-tracking devices, and studies on how we achieve our most restful sleep (Figure 1). Additional topics include time management, mindfulness, self-advocacy, and rest.

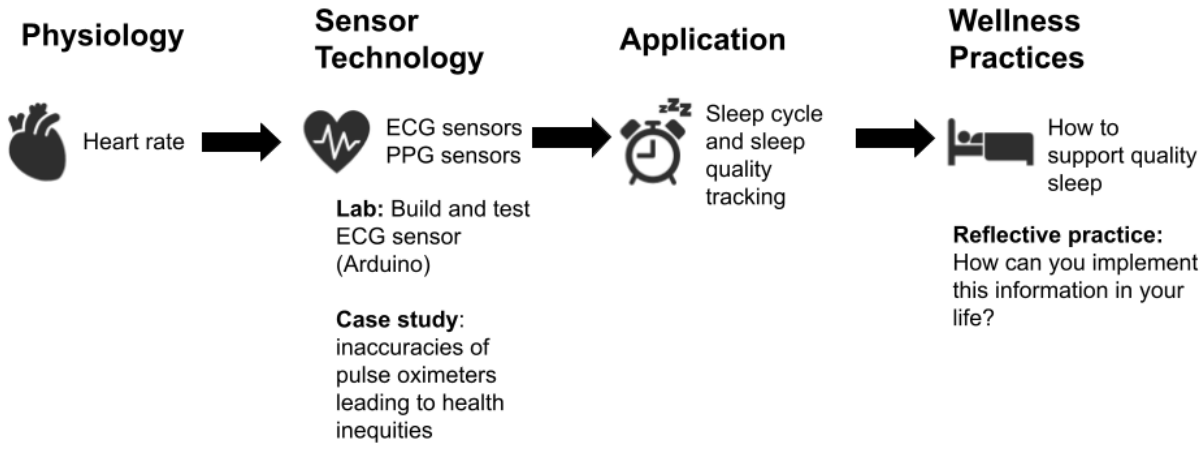


**Figure 1. Overview of the Sleep Module.**

**Preliminary Course Feedback**

Overall, student feedback for the Engineering Wellness course is positive. While framed as a biomedical engineering-themed section, the course enrolls students pursuing a variety of engineering majors. Feedback indicates that students appreciate the emphasis on wellness and highlight that the course topics and structure emphasize instructor care.

**Research Overview**

To achieve our research goal of identifying factors that contribute to a successful wellness curriculum for undergraduate students, we are conducting a qualitative study that involves interviewing first-year engineering students and instructors of these courses.

*Theoretical Framework*

Our project leverages Social Cognitive Theory (SCT), a comprehensive psychological framework widely applied in health education and behavior [2]. SCT posits that individual learning and behavior change are largely driven by a dynamic, reciprocal interaction among cognitive, behavioral, and environmental factors [3], [4].

*Instructor and Student Interviews*

SCT informs the interview protocols for both students and instructors. The instructor protocol includes questions that address how instructors describe wellness and thriving, as well as their perceptions of their relationship to student success. The instructor protocol examines instructor decisions regarding student wellness in the classroom by exploring various dimensions of SCT, including self-efficacy, observational learning, outcome expectations, goals, reinforcements, environment, and reciprocal determinism. Example questions include “How confident do you feel about your ability to implement wellness policies, practices, or curriculum effectively into your engineering courses?” (Self-efficacy) and “Can you describe a time that you observed or learned about other faculty implementing curriculum changes (content, policies, etc.) related to student wellness? What lessons have you learned from their experiences?” (Observational

Learning). The student protocol similarly examines student perceptions through the SCT. Interview questions focused on understanding the students' interpretation of what wellness means to them and how being a college student has affected their ability to practice and maintain wellness practices. Example questions include "How confident are you in your ability to maintain wellness practices consistently? Why?" (Self-Efficacy) and "Are there any rewards or positive reinforcements (like better health, sense of accomplishment, or positive feedback from others) that you've received from practicing wellness habits?" (Reinforcements).

Instructor participants were recruited through institutional and national listservs, and student participants were recruited from first-year engineering courses at the focal institution. All participants were offered a $50 gift card for their participation. Members of the research team, who are current first-year engineering instructors, conducted interviews with instructor participants. Additionally, a research team member, who is a current undergraduate engineering student at the focal institution, conducted interviews with the student participants. At this stage of the project, the team has conducted interviews with 21 first-year instructors and 9 undergraduate students.

**Preliminary Findings**

*Instructor Interviews*

We identified four main themes of barriers described by instructor participants when describing barriers to implement wellness content and policies in their first-year engineering courses: (1) lack of time, (2) lack of value for promotion, (3) large class sizes, and (4) lack of training. Participants shared that they find it challenging to add content to already packed courses and that they have limited time to research, learn about, and participate in existing on-campus resources (e.g., workshops). Some participants noted that the number of resources on campus is a positive aspect, but they find it overwhelming to navigate. Furthermore, participants described time constraints on offering extra support to students, not only because of their workload, but also because the times when students may need support can be unpredictable and difficult to schedule. Some participants felt that efforts to support students' wellness are not valued in their roles, as these efforts are neither part of their job descriptions nor included in performance reviews. Many participants taught large-enrollment courses and shared that these classes make it difficult to identify struggling students. Participants shared that large course enrollments also limited individualized flexibility and the opportunity to provide more than general support. Some participants reported that they perceive students as more likely to approach them in smaller classes, particularly in less structured time (e.g., lab sessions rather than lectures). Ultimately, many participants felt they lacked the necessary training or background to teach wellness content effectively. Some participants felt they lacked positive wellness practices in their own lives and questioned whether they could effectively support students.

Despite describing barriers to implementing wellness content in their courses, many instructor participants expressed interest and reported current efforts to do so. We identified four preliminary themes for support described by participants: (1) teaching evaluation and awards, (2) learning from colleagues at retreats, (3) student instructors, and (4) small class sizes. In motivating change in their courses, several participants noted that positive teaching evaluations and awards were important and meaningful, even though they were not the main goal when implementing curricular change. Most participants who implemented strategies learned about

them from co-teaching or from program retreats. The majority of instructor participants are part of teaching teams in their first-year courses, and many shared that team teaching benefited their ability to enact change in their courses. Participants also noted that student instructional support roles were crucial to student success.

*Student Interviews*

Three main themes were identified from our initial interviews with first-year student engineers: (1) academic workload and time constraints as primary wellness barriers, (2) sleep deprivation, and (3) paradoxical peer dynamics of toxic competition versus supportive mentorships.

In terms of barriers, workload and time constraints emerged as the most significant factors in preventing students from incorporating wellness practices into daily routines. Most students reported feeling less confident in their ability to maintain their wellness during high-pressure times of the semester, such as midterms or finals. Time constraints intensified for students who are managing additional responsibilities, such as on-campus jobs or family commitments. For engineering students, tasks that directly affect grades often come first, leading some to deprioritize their wellness when self-care is needed most.

Directly related to the time pressures of being an engineering student was the biggest challenge students face: getting enough sleep. The interviewees recognized how sleep affects every aspect of life, including motivation, productivity, emotions, and performance.

While academic obstacles created wellness challenges, students also expressed that social connections with friends and the community have a significant impact on well-being. All participants emphasized the importance of spending time with friends, whether that means dedicating quality time to a fun on-campus activity or simply getting dinner together in the dining hall. The consistent emphasis on social interactions across all interviews indicates their essential role in maintaining healthy well-being. However, participants revealed a somewhat paradoxical dynamic specifically with their engineering peers. Some students describe a culture of toxic mindsets and competitiveness, in which peers neglect their wellness to gain an academic advantage. The competitive culture creates pressure to prioritize academic success over well-being, often leading to negative feelings among those who aren't living that way. On the other hand, some students find motivation from these same peers, particularly mentorship from upper-level students. Advice on navigating upcoming challenges and understanding how these more experienced students excel in similar circumstances serves as a counterbalance to the competitive culture of the engineering community.

**Discussion and Future Work**

We will leverage the results from both instructor and student interviews to inform the continued development of the *Engineering Wellness* course curriculum, including scaling the course content to reach a larger audience. Feedback from instructors at a range of institutions will be leveraged to develop three preliminary, open-access resources from the *Engineering Wellness* curriculum: (1) module content designed for individual, standalone lessons, (2) *Engineer Your Wellness* workbook to prompt students to reflect on curricular topics to implement in their own lives, and (3) preliminary development of a wellness lesson for teams. To further evaluate the

course's impact, our team is collaborating with an external evaluator to conduct focus groups with past *Engineering Wellness* students.

## Conclusion

Identifying supports and barriers experienced by first-year engineering instructors is critical in informing the development of scalable curriculum and resources. Themes from the interviews will be leveraged to develop resources that other instructors and institutions can utilize, based on the *Engineering Wellness* curriculum. This understanding is critical in informing the future development of modules, a workbook, and teamwork lessons that will create opportunities for additional instructors to integrate wellness content into engineering courses.

## Acknowledgements

This material is based upon work supported by the National Science Foundation under Grant No. 2416080. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation. The authors thank the project advisory board members, Dr. Meagan Pollock and Dr. Holly Golecki, and the project evaluators, Dr. Julie Martin and Dr. Jenny Brown. The authors also thank the students and instructors who participated in the interviews.

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