

A Wellness Course for Engineering Students

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Abstract

Engineering programs are often rigorous, with high expectations and workload. As a result, poor self-care habits might be perceived as part of the engineering identity, where rigor, stress, and suffering are considered norms of being an engineer. This perception has been studied by scientists, and literature data suggests that undergraduate engineering students are less likely to seek help when suffering from a mental illness compared to non-engineering students. Good self-care habits contribute to overall physical and mental wellness, which is correlated with academic success in the context of engineering education. Not surprisingly, higher education institutions have developed and offer a variety of wellness programs. However, engineering students are less likely to utilize such resources due to their high workload and the stigma associated with engineering identity. Prioritizing self-care activities over coursework may be seen as violating a cultural norm within the engineering discipline. This behavior served as motivation for the authors to develop an elective wellness course housed in the chemical engineering department at the University of California Davis (UC Davis). By offering a course where participants allocate time with their engineering peers and faculty to discuss and practice self-care activities, we aimed that participants would experience a decrease in their stress level and gain training in how to care about their overall wellness. The objective of this work is to describe the development, structure, and activities of the new engineering wellness course at UC Davis, which was piloted during the 2022-2023 academic year. The main goal of the class was to guide students to develop and practice good self-care habits. Each class/activity focused on a self-care domain (cognitive, emotional, interpersonal, physical, practical, and spiritual). Additionally, activities were performed to build positive and meaningful relationships with peers and faculty. Students' feedback indicated that the course helped to decrease their stress level during the quarter, and that the interaction with other students was a valuable part of the course.

Introduction and Motivation

Mental health is defined as “a *state* of mental well-being that enables people to cope with the stresses of life, realize their abilities, learn well and work well, and contribute to their community”.⁽¹⁾ Very often, unequivocally, the term “mental health” is associated with negative connotations such as the presence of a mental illness (e.g. anxiety, stress, and depression).⁽²⁾ This perception is important to consider in the context of engineering education, as poor self-care habits can be perceived as part of the engineering identity, with rigor, stress, and suffering being considered the norm of being an engineer.⁽³⁾ Consequently, the “stress culture” of the engineering discipline is one of the factors that can prevent engineering students suffering from a mental illness from seeking mental health help and engaging in self-care activities as compared to other non-engineering majors, as they would be violating a cultural norm within the discipline.⁽⁴⁾ Moreover, studies have shown that poor mental health and poor overall wellbeing are negatively correlated with academic success and retention of engineering students, particularly from underrepresented groups.⁽⁵⁾⁽⁶⁾⁽⁷⁾⁽⁸⁾ Good mental health and self-care practices are essential not only for academic success, but also for a successful practice of the engineering profession. In fact, most professional

engineers will spend less than 50% of their time in science or engineering focused tasks and this percentage tends to decrease as they move into leadership positions. Most engineers' time will be spent on interaction with a diverse range of people within or outside the organization to define goals, discuss performance, and make decisions where personal biases, cultural background, and emotions are involved. Not surprisingly, the starting point for effective engineering leadership is to learn how to control one's emotions and take care of one's physical and overall well-being in order to be able to guide, give advice, and inspire others.⁽⁹⁾ It is important that engineering students learn how to handle daily stressful situations, as succumbing to high levels of stress can ultimately lead to mental illness. When experiencing different levels of stress, an effective professional engineer is aware of their physical and emotional behavior and is able to self-evaluate in order to respond in different kinds of stresses. Controlling emotions while dealing with stress and being able to use the stressful situation to their advantage can be one of the most difficult aspects of engineering practice. This is vital in working with diverse teams, where using emotional information to guide and make decisions has been reported to be beneficial.⁽⁹⁾

Anecdotally, most universities do not explicitly teach engineering students about emotional intelligence, stress management, and self-care practices, and more significantly, their importance for both academic success and engineering profession. Students may exercise these skills in design and laboratory classes, where teamwork is required. Literature data has shown that the most common coping strategies used by engineering students for stress release are positive interpersonal relationships with peers, faculty support, and health activities such as taking care of plants, journaling, meditation, and exercise, among others.⁽¹⁰⁾ Coping strategies for stress relief is dependent on an individual's preferences, however, reliance on peers has been reported to be the most common approach used by engineering students.⁽³⁾⁽⁵⁾⁽¹⁰⁾

Due to its importance, institutions, departments, and professors have developed programs and/or included assignments to promote wellbeing and stress management techniques to students. Some examples include meditation (mindfulness⁽¹¹⁾⁽¹²⁾⁽¹³⁾, Tamarkoz⁽¹⁴⁾, Yoga⁽¹⁵⁾), a resilience program⁽¹⁶⁾, dance movement therapy⁽¹⁷⁾, engaging in acts of kindness and giving⁽¹⁸⁾, an assignment consisting of developing an actual plan for mental wellness⁽¹⁹⁾, and increasing student-faculty interaction through informal social events.⁽²⁰⁾ It is worthwhile to mention that student counselling with mental health professionals and remote platforms such as apps and videos are also developed and offered by higher education institutions. Nevertheless, schedule requirements, extra time to meet with a counsellor, "allocating time" to address mental health issues, wait lists, cultural background, and required clicking through multiple pages, tabs, and/or links to locate information have been reported by engineering students to be major barriers to utilize such resources.⁽³⁾⁽²¹⁾

To address these issues, the objective of this paper is to present a wellness course for engineering students developed and delivered at UC Davis and offered as an elective by the chemical engineering department. The course emphasizes the importance of self-care, overall wellness (physical and mental health), and emotional intelligence, and their impact on engineering leadership and career development. Each lecture or activity focused on a self-care domain (cognitive, emotional, interpersonal, physical, practical, and spiritual) and stress management techniques. Additionally, activities were performed to build positive and meaningful relationships

with peers and faculty. Our aims for this course are as follows: (i) students will be better prepared for lifelong success in engineering practice and leadership, and (ii) students will develop positive strategies for dealing with unexpected events and interacting with a diverse range of individuals in different contexts, both personal and professional. We also aim to reengage students who may have been considering leaving engineering due to a low sense of belonging.

Course Format

Course Structure

The course was piloted as a lower-division elective class offered to all chemical and biochemical engineering students at UC Davis. During the pilot year, 2022-2023, it was offered during three academic quarters. The course was advertised to students by students' advisors, through an undergraduate student mailing list, and by instructors teaching core undergraduate chemical engineering courses. Initially, the course had two components: wellness and study hall. Since one of the main stressors of engineering students is the heavy coursework load⁽¹⁰⁾, the objective of the study hall was to offer a common space where extra office hours with TAs from all chemical and biochemical engineering core classes was offered and students could work together on their assignments to build community while interacting with the TAs. In this original format, classes were offered once a week and lasted 100 minutes. During the first 20 minutes, self-care activities were performed while the remaining time was devoted to the study hall. The self-care activities were open only to the students registered in the course while the study hall was open to all students in the department.

After obtaining students' feedback, the course format was modified for the 2023-2024 academic year and the wellness component is now offered as a separate class from the study hall. The study hall is offered twice a week as a class and each session lasts 50 minutes. The wellness course is now offered as a separate one-unit class which meets once per week for 50 minutes. Although students receive one lower division unit for each of these courses, the unit does not count towards graduation requirements. There was an average of 15 students enrolled per academic quarter in the wellness course, and this paper will focus on that course. Even though student demographic data was not collected, most of the students enrolled in the course were observed to be junior and seniors. Students were evaluated on a pass/no-pass basis using class participation and homework assignments as described in the "Assessments" section. The wellness course currently does not count towards students' degree requirements, nor does it affect student GPA. However, the course can be used by students to keep their full-time status. The authors are working to get this course approved to be used to satisfy in part the general education (social sciences) requirements at UC Davis. Additionally, the course is currently taught as an overload to the instructor's teaching schedule. There is no limit on the number of times a student can enroll in the course in different quarters.

Course activities

Each class period consisted of discussing the importance of good self-care practice, time management, and performing self-care activities with peers and the instructor. Examples of activities during the 2022-2023 academic year included gardening of herbs and spices (donated by

Benary⁽²²⁾), discussion and preparation of healthy/low-cost/easy recipes that could be prepared with the herbs, walking at the UC Davis arboretum, and ice cream happy hour, among others. The gardening activity was delivered by Professor Heiner Lieth from the Plant Sciences Department at UC Davis. Although the course was well received by the students (see “Results and Discussion” section) the authors were intrigued with the low enrollment in the wellness course (total students’ population in the chemical engineering department during 2022-2023 academic year was approximately 400). Informal conversations with students revealed that they preferred to prioritize technical courses and that they perceived the wellness course was targeting students suffering from mental illness and who needed help with their mental health, corroborating literature findings.⁽²⁾⁽³⁾⁽²¹⁾ Therefore, during the 2023-2024 academic year, the course was redesigned to demonstrate the significance of overall wellness and self-care practices to *engineering practice and leadership*. Some of the activities were maintained since social events provide opportunities to build strong interpersonal relationships with peers and faculty in a more informal setting, however, a connection with each of the self-care domains (practical, cognitive, spiritual, interpersonal, emotional, physical) and engineering leadership was made. In addition, informal social events provided the opportunity for students to ask questions and learn personal stories and challenges faced by their peers and faculty. Different stress management techniques were also presented and practiced by guest speakers. The book “Leadership by Engineers and Scientists”⁽⁹⁾ was used as reference to prepare the leadership (cognitive) lectures. Examples of activities delivered during an academic quarter are shown in Table 1.

Table 1. Example of lecture/activities for the wellness and engineering course (one quarter)

Week	Description	Self-Care Domain
1	Introduction and Welcome	N/A
2	Time Management	Practical
3	Technical leadership fundamentals	Cognitive
4	Conflict Resolution	Cognitive
5	Stress management through meditation	Spiritual
6	Ice cream happy hour	Interpersonal
7	Socio horticulture, mental health, and healthy recipes	Emotional
8	Gratitude, resilience, kindness, and empathy	Emotional
9	Arboretum walk	Physical/Interpersonal
10	Meditation with tea	Spiritual

Assessments

In the new class format, students were evaluated on a pass/no-pass basis using class participation and application-based homework as described below:

- a) “Time Management” assignment. One of the main stressors reported by engineering students that affect their mental health is poor time management and many educators suggest including time management lessons in the engineering curriculum.⁽³⁾⁽¹⁰⁾ Therefore, students completed a time management assignment that consists of preparing a quarterly and weekly schedule for week 3, including important deadlines and allocating time for personal goals and self-care. Students were asked to reflect in the middle of the quarter on if their plan was being followed, and to perform adjustments if necessary.⁽²²⁾

- b) “Reflection leadership assignment” which consisted of five reflection questions: (i) describe their long-term goals (>10 years), (ii) list the most important and least important personal values, (iii) describe ineffective leadership habits that were presented and discussed in class, and how they could overcome such habits, (iv) identifying major successes and failures in the next month as well as five years, and (v) describe leadership roles along with a discussion about the major failures and successes. If, a student did not have experience in leadership roles, they should indicate what has prevented them to seek leadership opportunities. This assignment was extracted from the *Leadership by Engineers and Scientists* book.⁽⁹⁾
- c) “Health Recipe assignment”. Horticulture is defined as the use of taking care of plants to improve an individual quality of life. Many studies have shown that horticulture may be an effective treatment for dementia, relief of physical pain, stress, and depression reduction through the observation and immersion of green spaces.⁽²³⁾⁽²⁴⁾ Students were asked to search for a healthy, easy, fast, and low-cost recipe that could be performed with the herbs (thyme, basil, mushroom herb, mint, and rosemary) donated by Benary⁽²⁵⁾ and after attending a gardening guest lecture with professor Heiner Lieth from the plants science department at UC Davis .
- d) “Self-compassion” survey⁽²⁶⁾. Self-compassion has been reported to improve overall well-being and promotes mental health by lowering depression and anxiety.⁽²⁷⁾ The survey evaluates self-kindness, self-judgement, common humanity, isolation, mindfulness, and over-identification domains of students participating in the course. The activity was conducted in class while discussing the importance of kindness and empathy in engineering leadership.
- e) “Kindness and self-care” assignment. Performing an act of kindness to another person has been shown to improve wellbeing and decrease stress and anxiety. Additionally, acts of kindness may generate a “pay-it-forward” phenomenon where the recipients of the act will more likely be motivated to be kind to other people.⁽¹⁸⁾⁽²⁸⁾ Due to the benefits of kindness to the overall wellbeing, students were asked to complete an act of kindness to another individual from a giving list.⁽¹⁸⁾ Additionally, students were also asked to perform a self-care activity of their choice from another list.⁽²⁹⁾ At completion of the assignment, students wrote a reflection about the impact of each of these acts on their feelings.

The course was assessed through two anonymous and voluntary surveys: the campus students’ evaluation of teaching, and a course-specific survey conducted by the instructor. Both surveys were completed during the final week of classes.

Results and Discussion

Topical assessments

a) *Time management*

In this course, the topic of time management was presented from different perspectives: (i) prioritizing tasks that are important and not urgent, (ii) estimating the number of hours expected for outside classwork (Carnegie’s rule and peers), (iii) including time for self-care activities, (iv) identifying the most productive hour of the day, and (iv) a planning to work on a personal goal (career related or not). The reflection assignment revealed that out of the 15 students taking the

course, there were three categories of students: 1) students who procrastinated (e.g. social media, YouTube, Netflix, etc) for a long period of time in a day (> 3 h, $n = 3$), 2) students who prioritized their studies and had little personal time, including skipping meals ($n = 10$), and 3) students who had a good academic and social balance ($n = 2$). Some of the strategies reported by students to refocus and follow their plan was to reserve time on their schedule to cook a healthy meal and eat, work on assignments from the classes they enjoy the most which resulted allocating more time for the assignments from the classes they enjoyed the least, write a detailed daily plan every day, and spend less time on social media and use this extra time to sleep more. It was interesting to notice that the two students who retook the class in subsequent quarters reported that the plans made in the beginning of the quarter were being followed and helped them to be on top of their assignments and studying while balancing self-care, social time with family and friends, and extra-curricular activities.

b) Reflection leadership assignment

Class time was devoted to discussing effective and ineffective qualities of a leader and emphasized the importance of identifying potential causes of high stress level in leadership positions. About 60% of the students reported taking a leadership role in the past which includes students' clubs, group projects, sports, scout, and activism. The students who have not taken leadership roles reported what had prevented them from seeking such opportunities. Examples were lack of confidence, and being afraid of criticism, judgement, and failure. Since the class discussed the importance of "failures" as opportunities for learning and that a good leader recognizes that they will face failures, these students have reported in their assignment they would be looking for leadership positions in the future. Fear of failure and being judged and compared to others were also identified by students as potential causes of high stress-levels. Students were asked to report what ineffective habits of a leader they possess and even though this is based on each individual personality, some habits were unanimously reported in the assignment. These included poor time management, perfectionism, and poor communication.

c) Health recipe assignment

For this assignment, herbs were donated to students, so they could take care of the herbs. Additionally, they were encouraged to search for healthy recipes they could make with the herbs, and they could work in groups if they wished. The instructor shared all the recipes on her professional website. Half of the students cooked in groups while the other half cooked for other friends or family members. From the reflection assignment, many students commented they appreciated this assignment since they had not had a healthy meal for a while, and it provided an opportunity to make new friends in the program.

d) Self-compassion survey

The self-compassion survey⁽²⁶⁾ was performed in class after discussing each of its domains (self-kindness, self-judgement, common humanity, isolation, mindfulness, and over-identification) and their importance to engineering practice and leadership. The instructor allowed students to share their results if they were comfortable. Students opted to share their results in pairs with their closest friends, and indicated the survey provided a baseline for them to react when going through difficult times and failures. In the future, other instruments⁽³⁰⁾⁽³¹⁾ for students to set goals and evaluate their progress on non-technical skills, including self-compassion, could also be used.

e) Kindness and Self-care assignment

The acts of kindness to be chosen by students were divided into four categories: 1) expressing gratitude (n=1), 2) being gracious (n=2), 3) paying for someone else (n=4), 4) giving an unexpected gift (n=3), and 5) (re)connecting with someone (n=3). Most of the students performed the act of kindness to a friend or a family member (92%), except for one student who donated money to a homeless person in the streets. The same result was observed in a study conducted with MIT students⁽¹⁸⁾, since people feel more comfortable performing kindness to a friend or a family member rather than strangers. Nevertheless, the preferred category by students was “paying for someone else”, which is contrary to the study performed at MIT, where zero students selected this category. From the reflection assignment, some students indicated that paying for a coffee or a meal for a friend who was going through difficult times made them happy and they were thankful for this opportunity to treat their friends.

For the self-care activity, there were 134 items for students to select.⁽²⁹⁾ It was interesting to note that 32 % of the students selected to be in nature by walking at the UC Davis arboretum and/or by buying a new plant. It was hypothesized that the class on horticulture and its benefits to mental health may have influenced the students to choose these activities. Some students mentioned in the assignment they were grateful for it since it provided an excuse to perform activities they enjoyed during a busy week in the quarter.

Course Assessment

The course was well received by students. It was ranked 4.8 on a 5.0 scale for the following question: “please indicate the overall educational value of this course”. Students’ comments also reflected the impact of the course on their overall wellbeing:

“I loved the mental health aspect of this, and the Wednesday lectures were designed quite well and allowed me to reflect and stop, sometimes after stressful weeks. I loved being able to develop much more interpersonal connections with my fellow peers and my professor, and I can’t wait to take this course next year.”

“This class helped me regulate and prioritize my mental health.”

“I think this class gave us a break we sorely needed because of our hectic schedules.”

Students were asked to voluntarily answer a course specific survey at the end of the quarter. Results from that survey indicated that 61% of the students enrolled in the course experienced high levels of stress and mental health issues (Figure 1), and for 70% of respondents the class helped to decrease their stress level (Figure 2). Additionally, 84% of respondents would recommend this class to other classmates (Figure 3). However, it is important to note that this survey was conducted only during the first two quarters the course was offered (Fall 2022 and Winter 2023), and data for the new modified course discussed in this paper has not yet been collected.

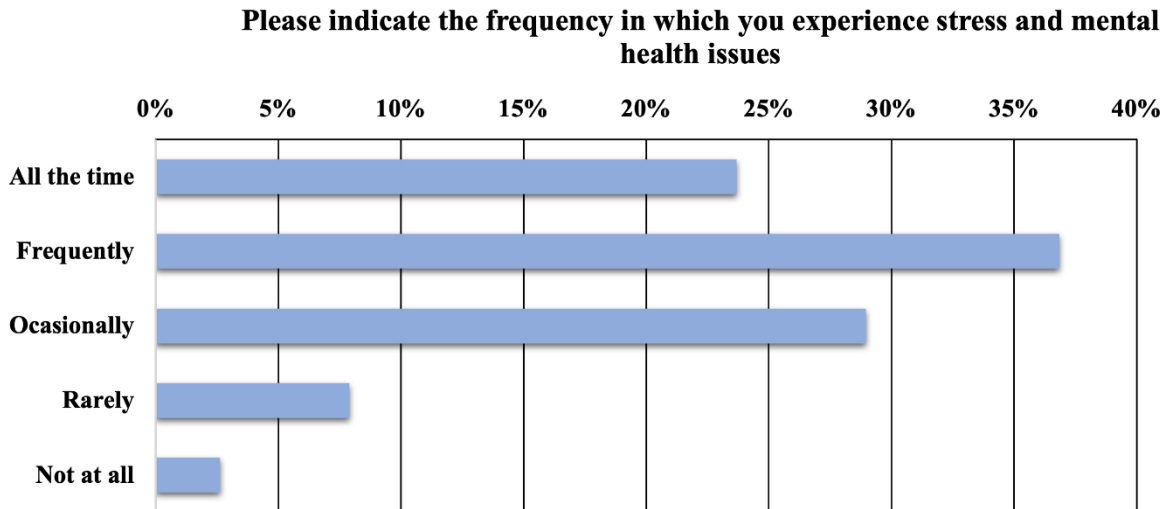


Figure 1. Results of a survey on students' stress level and mental health issues at the end of the quarter (n=37)

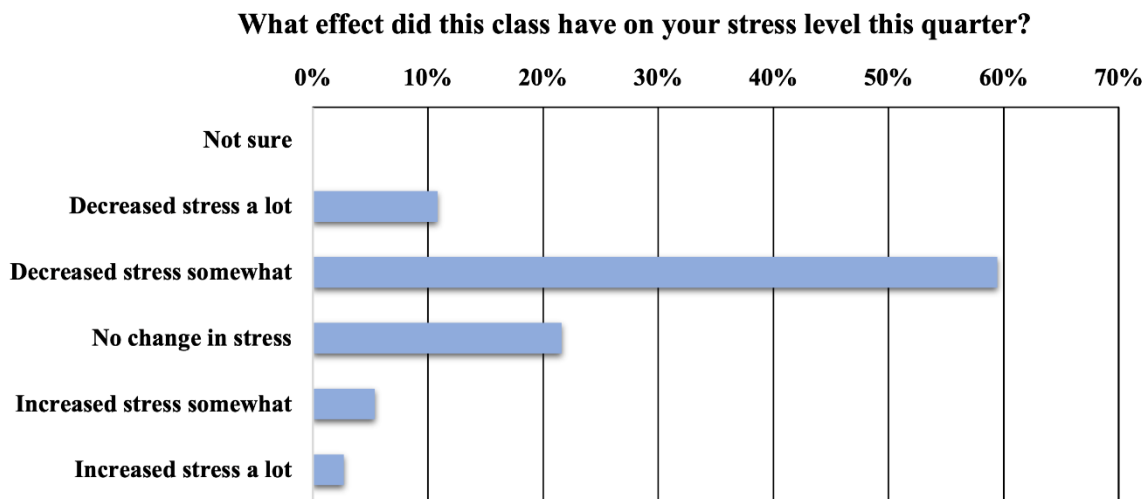


Figure 2. Results of a survey on students' stress level at the end of the quarter (n=38)

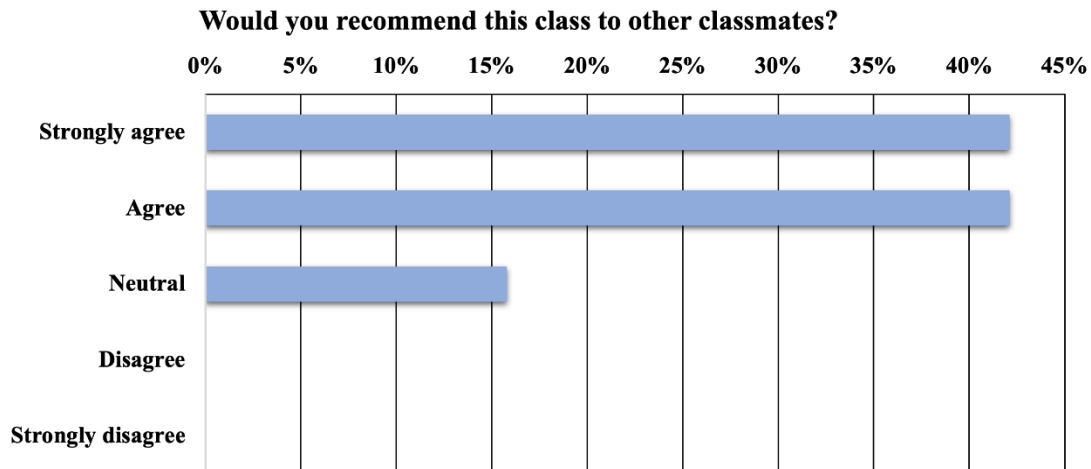


Figure 3. Results of a survey on students' recommendation of the course to other classmates (n=19)

Conclusions and Future Work

This work describes the development, structure, assessments, and the outcomes of an elective wellness course for engineering students, offered within the department of chemical engineering at UC Davis. The course was well received by students and it helped to decrease most students' stress levels during the quarter. In addition to the noted observations, the following future investigations were identified (those currently under investigation are noted below):

- (a) Collect demographic information of students interested in the wellness course. This will help to identify if the course is attracting students from underrepresented backgrounds and potentially increasing their sense of belonging in engineering and the department. This study is currently under investigation.
- (b) Interview former students who participated in the program. This will provide more information on what practices discussed in class have been adopted by students and if they are helpful to improve their overall wellbeing.
- (c) Evaluate stress level of students in the beginning and in the end of the quarter by using validated surveys.
- (d) Evaluate the impact of the course on students' emotional intelligence (emotional, self-control, well-being, and sociability) and psychological capital (self-efficacy, optimism, hope, and resiliency), which are skills discussed and practiced in the new class format and essential for engineering practice and leadership. This study is currently under investigation.
- (e) Expand the availability of the wellness course to other engineering disciplines at UC Davis.

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