

Implementation of a new student initiative: Promoting Student Success and Well-Being

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Abstract

In this paper we will describe a multi-faceted initiative we have implemented to promote student success and well-being in the student community of the Electrical and Computer Engineering department at our university. This program has been implemented for about 3 years in partnership with the Counseling and Mental Health Center and the Learning Center on our campus. Both of these centers provide services for all university students, although the objective of this initiative was to tailor their services to the specific needs of engineering students.

Introduction

Just as we teach students content, we can teach them about how to effectively learn that content, stay motivated, and improve their well-being. When students transition from high school to college, they often don't have explicit knowledge and skills in these areas, which can cause them to struggle more than is necessary. Higher education institutions have created programs to provide explicit instruction in these areas through classes in "learning to learn," self-regulation, and self-care. Specific topics in these classes include metacognitive strategies, time management strategies, goal setting, developing a growth mindset, and practicing self-care techniques such as mindfulness and staying socially connected.

Given engineering students have unique experiences and struggles within these different areas, we decided to build our program within the College of Engineering to address their particular concerns. Additionally, due to the COVID-19 pandemic, subsequent move to online learning, and additional environmental stressors students have been experiencing, we needed to adapt the program to target specific needs this context has created.

Research: Supporting college student mental health

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Research demonstrates relationships between student mental health and success in college.^{1,2,3,4} According to El Ansari and Stock (2010), "...in the context of universities or colleges, promoting health and well-being of all members means promoting effective learning" (p. 2). Additionally, other research demonstrates the importance of student "non-academic" factors that impact academic outcomes (e.g., self-confidence, goals, social support, commitment).⁵ Given these findings, it makes sense for postsecondary institutions to design programs that promote student wellness and support not only academic but also social and emotional growth.

In fact, over the past two to three decades, many colleges and universities have begun implementing "health promoting" programs.^{6,7} As Tsouros et al. (1998) state:

Universities can do many things to promote and protect the health of students and staff, to create health-conducive working, learning and living environments, to protect the environment and promote sustainability, to promote health promotion in teaching and research and to promote the health of the community and to be a resource for the health of the community. (p. i)

In 2015, the International Conference on Health Promoting Universities and Colleges produced the Okanagan Charter calling for higher education institutions to "embed health into all aspects of campus culture, across the administration, operations and academic mandates" (p. 3). These endeavors are founded on the idea that health, including mental wellness, is the responsibility of the entire university or college community. Additionally, "health" is defined as "physical, mental and social well-being and not merely the absence of disease or infirmity" (p. 4).^{8,9}

The focus on creating community-wide wellness programs has led postsecondary educators to begin experimenting with different methods for promoting student mental health across their campuses, including in classrooms and other learning environments.¹⁰ For example, Mitchell et al. (2012) describe a curriculum infusion program begun in 2007. The program has faculty collaborate with counselors and other health providers to create mental health promotion projects in their courses.¹¹ Slavin (2019) describes a well-being initiative he started in 2006 to support medical students' resiliency and mental health through a three-pronged approach:

- 1) Decrease stressors and improve different learning environments;
- 2) Teach students specific strategies for managing stress and using resources; and
- 3) Help students find meaning in their work.

The results he presents demonstrate substantial decreases in student depression and anxiety. Students within the initiative also reported improvements in the program promoting "effective stress management, a balanced lifestyle, and overall well-being" and "fostering and nurturing [their] development as a *person*" (pp. 10-11).¹²

As university and college administrators, staff, and faculty have begun experimenting with supporting student wellness across entire campus communities, the number of college students seeking help for mental health problems such as anxiety and depression continues to rise.^{13,14,15} For example, Locke et al. (2017) report a counseling center utilization rate increase of 5 to 6 times the rate of postsecondary institutional enrollment. At our university, the demand for mental-health

services at the Counseling and Mental Health Center (CMHC) increased 87 percent from academic year 2009–2010 to academic year 2018–19, while the total number of students at the university remained basically the same.^{16,17}

Research: Teaching college students metacognitive and self-regulation strategies

Several researchers have shown evidence for the benefits of metacognitive instruction and its impact on student performance.^{18,19,20,21,22} However, explicit instruction of metacognitive practices in college programs is lacking, with most research simply measuring metacognitive awareness and its link to achievement.^{23,24} While most K-12 educators and administrators are trained to implicitly structure their instruction, class activities and assessments to ensure students make the most gains in learning, these are mostly conducted inside the classroom and without the conscious knowledge of these components on the part of the student. Since high school students are rarely explicitly taught the concept of metacognition and metacognitive strategies, when they arrive at many higher education institutions where these structures have been removed and expectations have shifted to self-directed learning outside of the classroom, initial struggle and sometimes failure become highly probable.

There is limited evidence of teaching engineering students discipline-specific metacognitive strategies. A recent study conducted using modelling and coaching of discipline-specific metacognitive strategies in an introductory computer science course using peer tutors, showed that encouraging students to implement these learning strategies had a significant impact on their ability to apply knowledge to programming problems and also had long-term effects on students' future course outcomes.²⁵ Two of the authors have also conducted a study on the impact of embedding metacognitive instruction into Supplemental Instruction (SI) sessions associated with a first year computing course.²⁶ Quantitative data collected from the end-of-semester *Metacognitive Awareness Inventory (MAI)*²¹ survey responses suggest that students participating in these SI sessions (with metacognitive instruction) measured a higher score on the *Regulation of Cognition* section of the *MAI* survey.

Description of Program

This program incorporates three components designed to target a specific audience and to address specific student needs. The components were introduced at different times, and are listed below in the order that they were introduced.

I. Supplementary course titled *Enhancing Academic Success*.

This is a one-credit hour (elective) course taught by one of the authors, who is an instructor in the engineering department. The course has been offered every semester since Spring 2017, and was loosely based on the *Studying Engineering* curriculum developed by Ray Landis.²⁷ While this course was originally designed for students on academic probation, it covers topics of interest to all students, especially those in their first and second years who are interested in learning how to learn engineering concepts, and become successful students.

Figure 1 below summarizes the course syllabus. The topics listed have been covered each semester,

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with a few changes made each semester to the homework assignments and end-of-semester group project.



Figure 1. Topics covered in the *Enhancing Academic Success* course.

Category 1: Mindset, Motivation, Dealing with Academic Emotions

Students often view their motivation and emotions as out of their control -- they're either motivated or they're not, they're either stressed or they're not. Instead, we can help students reframe these affective states as within their control, meaning they can use strategies to help themselves to feel more motivated, to cope with their stress, and to thrive in the college setting.

A major focus of our program is encouraging students to develop a growth mindset rather than a fixed mindset.²⁸ We feel this motivational aspect is especially important for engineering students to understand and integrate into their learning given their prior experiences in academic settings. Most of these students have been highly successful throughout their educational careers, and they often believe this success comes from their innate superior intelligence rather than from their hard work, use of effective strategies, and support from their family, peers, and teachers. Then, when they struggle or even fail for the first time in their college Engineering program, they aren't sure how to handle it. Instead of viewing this difficulty as a natural part of the learning process, they see it as evidence of their lack of ability or intelligence, and they may begin to experience extreme negative emotional reactions such as anxiety or depression. They may even decide that they're not cut out to be engineers.

In this category, we teach students that failure is where true learning begins; that struggle indicates you're challenging yourself; and that we can deal with it through getting help, evaluating and possibly changing our strategies, and continuing to work hard and persist. We also

teach other motivational techniques like setting mastery-oriented goals. Additionally, we help students learn strategies for coping with academic stress and other negative emotions. These include practicing mindfulness, expressing gratitude, and staying connected to friends and family.^{29,30,31}

Category 2: Goal Setting, Time Management, Self-Management

The college setting presents a whole new set of challenges related to self-regulation. In addition to learning challenging new content, students must learn to set their own goals (academic and otherwise), develop effective time management skills, and regulate their learning. On top of this, they must also learn to live on their own -- doing laundry, making their own meals, managing their finances, possibly finding a job and working, etc. For many students, college is the first time they're expected to be so independent.

In this category, we teach students how to identify near-term goals that are mastery based rather than performance based, as stated earlier, and devise a plan to manage their time by tracking various aspects of their daily lives.

Category 3: Learning Strategies, Test Preparation, Post Exam Analysis

Making the transition from high school to college-level coursework is more often than not very difficult. As a result, even very high-achieving students struggle in their first year of college. These struggles then continue throughout their engineering studies. One of the reasons for this is that high school study strategies are insufficient for college-level courses. The majority, if not all, of the students coming into our program are among the top students from their high schools, and have succeeded without much effort, or without really learning how to learn. Additionally, most of the high-stakes assessments our students are accustomed to utilize multiple-choice questions, which is not the exam format used in our courses.

In this category we teach our students very preliminary principles of how humans learn, and the role of working memory and long-term memory in learning.³² The objective is to inform students about the basics of learning new and difficult material so that they can more intentionally practice learning strategies that maximize their comprehension and retention.

Shift to Online Learning

With the sudden shift to online instruction in Fall 2020 due to COVID-19, this course was taught online with synchronous class meetings. The course was re-designed such that students examined a different topic related to student success each week. The course content was subdivided into modules as illustrated in Figure 2. Each weekly module followed a standard structure with reading assignments, online discussions on the main topic of the week, videos to watch prior to the lecture followed by class discussions. Most weeks included a homework assignment which required students to apply what they learned to their engineering coursework.

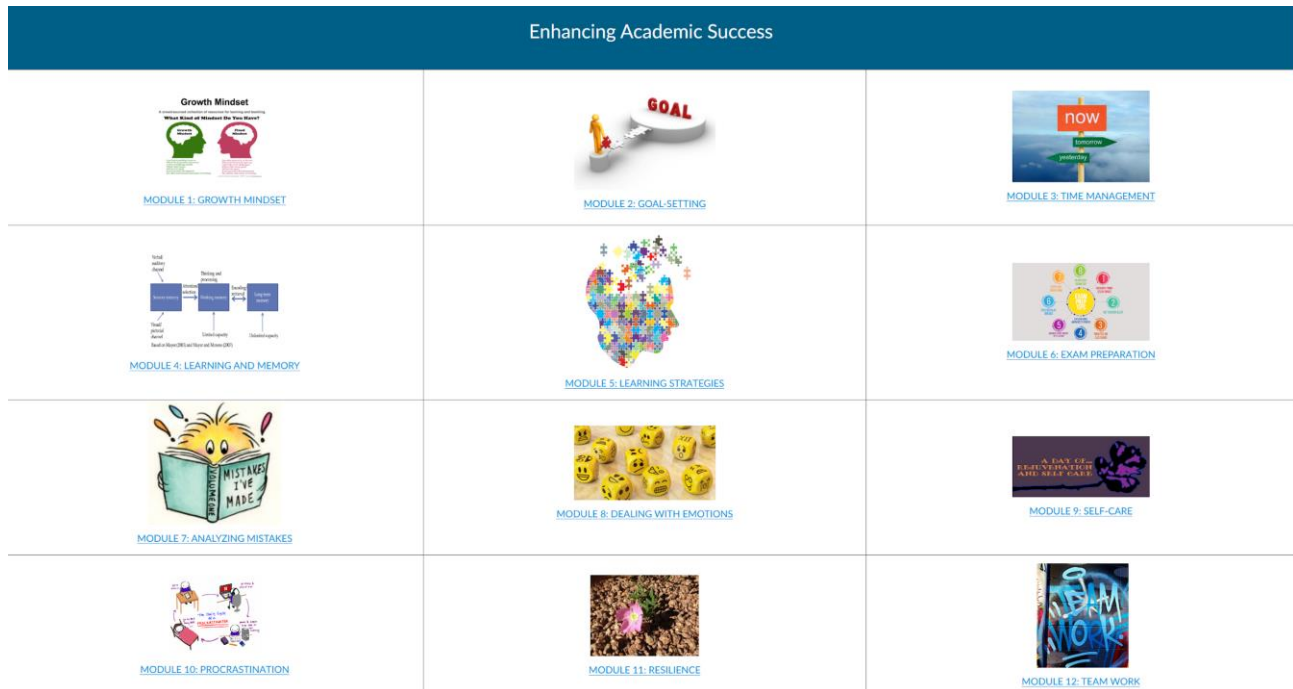


Figure 2: Weekly modules

Besides homework assignments and online discussions that required participation, students engaged in a 10-week long individual project titled, *The Quantified Self*. The objective of this project was to develop self-regulation and time management skills, by quantifying, analyzing, and reflecting on various aspects of their daily lives. Students were provided with a spreadsheet, shown in Figure 3 below, which they used to track their time (and other parameters) on various tasks. Analyses of these data included: (i) identifying up to three aspects of their daily lives that the student wanted to focus on to look for any trends in the data or correlations between different parameters; and (ii) interpretations of the weekly trends in the data. At the end of each week, students were required to write a one-page reflection on their usage of time, quality of time spent on various activities, and their analysis. Students were also encouraged to reflect on their strengths and weaknesses and strategies they would adopt to make changes or improvements.

Week	1						2						
Day	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28
Mood (emoji) of your choosing(not analyzed)(optional)	☹️												
Mood (0 - 10) [10=best]	0												
Food (# of meals)	0												
% Attended Classes	0												
Attention level in class today	(rating)	(rating)	(rating)	(rating)	(rating)	(rating)	(rating)	(rating)	(rating)	(rating)	(rating)	(rating)	(rating)
Time in Lectures/Labs/Recitations	0												
Time Spent in Office Hours	0												
Time Studying	0												
Screen Time	0												
Social Activities	0												
Self Care	0												
Exercise	0												
Sleep	0												
Student Organization and related	0												
Work	0												
(Fill in your own)	0												
(Fill in your own)2	0												
TOTAL HOURS	0	0	0	0	0	0	0	0	0	0	0	0	0
Target of the Week	% Attended Classes						% Attended Classes						
Satisfaction Level	(level:rating)	(level:rating)	(level:rating)	(level:rating)	(level:rating)	(level:rating)	(level:rating)	(level:rating)	(level:rating)	(level:rating)	(level:rating)	(level:rating)	(level:rating)
Weekly Notes													
What category was your strongest?	% Attended Classes						% Attended Classes						
What category was your weakest?	% Attended Classes						% Attended Classes						

Figure 3: The Quantified Self Project daily tracker

Figure 4 shows one student’s analysis where they have identified the following three aspects of their daily life to monitor: (i) time studying; (ii) sleep; and (iii) exercise. While the data clearly show fluctuations in each category, it also illustrates some relationships between these different categories, especially between the time spent studying and sleep.

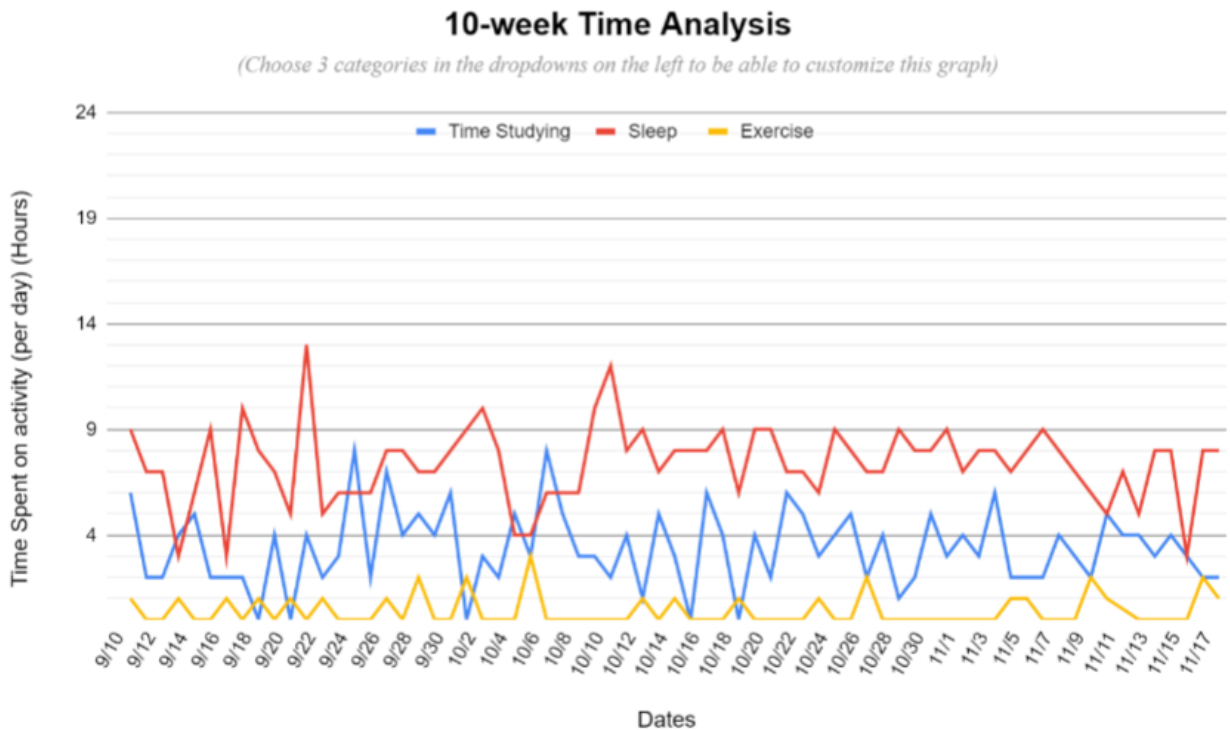


Figure 4: The Quantified Self Project student time analysis example

Over the six semesters that this course has been offered, more than 270 students have completed the course. Enrollment continues to be strong, and student responses in end-of-semester surveys have been very positive and encouraging. Some of the student comments have been listed below, including a few that refer to the time when instruction went online due to COVID-19.

“This class is extremely useful in developing tactics for overcoming stress! Understanding a growth versus fixed mindset has allowed me to overcome significant stress during this semester.”

“I strongly believe this course should be a requirement for every (engineering) student in the program, I wouldn't (have) learned all of the study skills, sleeping skills, relaxation and anti-anxiety techniques, etc that I did in this course. GREATLY benefits my academic success as a student.”

“I think more so than other classes, this was great to have during the transition to online. With it, I at least get to have some interaction with others during the week and see other people's faces.”

“I've learned a lot about myself this semester through this class and I really appreciate it. Out of the more technical classes I had to take this semester, this class was a huge break from that and a chance for me to gain perspective and look at the bigger picture.”

“We had check-ins at the beginning of each meeting, in which we shared how we felt and what we gained from our QSP data. Then, the latter half was spent going over a technique or concept that would help us understand how to be a more successful student. These ranged from the topic of procrastination, to the Pomodoro technique. Even though I knew most of the general topics and how they are useful, I found it very meaningful to hear more about the science behind them and better ways to implement them. The workload seemed tedious at first, but I now believe it was the right amount. The homework assignments and discussions are not difficult, but they challenge us to reflect on our mindsets and tendencies.”

“This semester was incredibly difficult for me due to the numerous unprecedented events that happened in my life. (The instructor) was always willing to make the time to talk to me outside of class and help me through lots of the things that I was going through. I am very grateful to have had (this instructor) because she was always an adult that I could turn to, and she genuinely helped me have a different viewpoint towards certain things which helped ease lots of anxiety for me. Additionally, her class taught me many techniques that also helped me get through several different situations. She helped me learn how to study more effectively and efficiently. The course taught me life skills that will help me be successful throughout the rest of my college career, and I am very happy that I took this course.”

II.A student success and well-being Canvas course.

Canvas, which is the Learning Management System used at our university, was used to create a Sandbox Course, available for all engineering students, both undergraduate and graduate, to enroll in voluntarily and was not associated with a university course. It was published right after all instruction shifted online due to COVID-19. All self-enrolled students had access to the materials provided. More than 2000 students are currently enrolled, and refer to the materials as needed.

The objective of the course materials was to promote well-being and educate students on strategies to become successful in their studies. It offered modules designed by mental health professionals and learning specialists. Listed below are the modules currently offered:

1. Physical Health
2. Mental Health

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3. Self-Care Techniques
4. Staying Motivated in an Online-Class Environment
5. Resilience in College Students
6. Growth Mindset; Embracing Failure
7. Study Strategies and Exam Preparation
8. Social Connections and Community Care

Each of the above modules include subsections on specific topics of student interest. Providing these university resources in one location allows ready access for students. It also serves as a reference for all faculty and staff who are approached by students seeking help. In Spring 2020 when all students were sent home due to COVID-19, this course provided a platform for all our students to come together in a virtual setting. It enabled weekly informal group meetings with students, which helped to preserve a sense of community.

III. Workshops on specific topics led by professionals.

There is a well-documented link between mental health and academic success for college students.^{33,34,35,36} Anecdotally, it was the authors' experience in working with students in each speciality area (instruction of engineering content, mental health counseling and academic counseling), that students often view these components as separate and disconnected. However, it is our view that these aspects are closely interconnected and can have a cyclical effect, i.e. increasing students' awareness and use of strategies that improve mental health positively impact academic performance,^{33, 35} and using effective organizational and learning strategies improve students' academic success and therefore their self-efficacy, motivation and overall mental health.^{34, 36}

Starting in Fall 2020, we planned and offered 1- to 1.5-hour workshops covering specific topics of interest to our engineering students. The purpose of these workshops was to provide a more in-depth understanding of topics to enhance student academic success and foster well-being, as well as their inter-relatedness. Below are the titles of the four workshops offered, with short descriptions included.

1. Motivation, Self-Regulation, and Metacognitive Strategies

In this workshop, the authors presented multiple theories of motivation and self-regulation, as well as applicable strategies to improve motivation and self-regulation, such as setting sub-goals, getting into a state of flow and learning to accept which aspects are within one's control. Metacognitive strategies were presented as a related form of self-regulation, specific to learning and studying. Students were given a short engineering homework problem to read and conducted the reading using metacognitive reading strategies, with a debrief from a content expert (one of the authors, who is an engineering instructor).

2. How to Foster Self-Care

In this workshop, one of the authors presented important practices for fostering positive mental health. Specific strategies shared included practicing gratitude, being self-compassionate, focusing on physical health through exercise and sleep, and maintaining social connections. Students took the *Person-Activity Fit Diagnostic* from the book *The How of Happiness* (<https://patthohappier.com/>) to identify specific happiness activities they could commit to

participating in over the next few weeks.³⁷

3. Time Management; Procrastination and How to Deal with It

One of the authors presented on the concept of procrastination and how it can impact both mental health and academic performance, how it must be distinguished from common misconceptions (such as laziness or lack of care) but rather is defined as an imbalance between self-regulation and demotivating or hindering factors. Students developed SMART objectives, both process and outcome-oriented, for a personal goal. Students were also presented with anti-procrastination techniques that were behavioral or cognitive approaches to redirect procrastinatory habits and discussed which would be most effective for them.

4. Resilience and Taking Stock of Grades

As the final workshop in the series, the authors presented on the definition of resilience and methods to develop resilience, such as practicing mindfulness and self-reflection and developing a growth mindset. As a practical application of self-reflection and fostering a growth mindset, students reviewed grades in their classes at that point in the semester, calculating how much of the grade was completed and how much was left, i.e. what they still had the ability to impact, as well as prioritizing which courses were most important to their long-term goals.

While attendance in these workshops was low (between 5-10 students in each workshop), the qualitative feedback recorded from post-workshop surveys was very encouraging. Below are some responses we'd like to highlight:

Tell us why you chose to attend this workshop

"I've also been pretty demotivated this semester so far (feel like all my classes went full-steam too quick and I'm trying to catch up), but attending this helped my mood and that I just got to do it (listen to the recordings/videos/quizzes/emails) to get to my goals (learning the material/applying to grad schools)."

"It seemed interesting and I could benefit from learning how to "learn" and motivate myself."

"I have been struggling with procrastination for many years. Every year, semester, week and day I remind myself that I will not procrastinate but I always manage to let myself slip."

"I procrastinate daily even when using techniques to help me stop, so I wanted to find other resources to help me reduce the procrastination."

"I wanted to learn more from the experts! It's always great to hear these messages as they are uplifting and give students such as myself confidence going into a tough time of the semester."

"I wanted to find ways to become more resilient."

"So I could learn about how others take stock of their grades."

Please tell us how you think you will implement (X) strategies in academic and/or non-academic environments.

"I will focus more on the internalized motivation reasons when it comes to things, instead of external motivations. I will also find ways to consider different perspectives when I am faced with a reading in an exam or homework problem!"

“Biggest thing honestly was the re-connection. Like it doesn't really feel like I'm in school as part of the ECE program with lots of professors and advisors and all other students. Idk... I've rarely left home since March (was on WFH internship for the summer) and recordings, quizzes, projects, GRE, and grad apps feel like faceless mountains of work and effort. I guess I should stop by office hours for professors, but there's so much that ended up on my calendar from Canvas I don't like looking at it to see when those actually are.”

“I'll try to not multi-task and focus more on reading and retaining info rather than just working to “get it done.””

“I liked the idea of thinking about each sentence of my reading individually. I think the strategies I learned will make me a more efficient reader.”

“I will implement metacognitive learning strategies in academic environments by tackling homework/exam problems by thinking about my own 'thinking'.”

“I will create Smart goals and really get them down to as specific a task and time as I possibly can. I will categorize my goals into things that need to get done right away and other things that would be nice. I will create long term goals as well as short term goals”

“I want to use the Pomodoro Technique because I have previously tried timing myself to only work and then having breaks and it has worked well. The issue with this is that I did not time the breaks which led me to long breaks that usually exceeded the amount of time worked. Adding the work cycles of the Pomodoro Technique should help because I will be able to see an end to my work for the day, instead of trying to work until I finish an entire assignment for the day which can be unrealistic and overwhelming.”

“I will use it to gauge how I am doing and to be mindful of the process. I will work to keep learning at the center of what I do and good grades will come as a result of that. I think knowing why you want to work hard in a certain class is a really good idea.”

Summary and Conclusions

In this paper we have outlined the implementation of a Student Success and Well-Being program in an engineering department at our university. While all aspects of this program are offered to all our students, the three different components of this initiative were intentionally introduced to target different student bodies, and offer different levels of detail on topics influencing student success and well-being. As a result, the student participation in each of these three components of the program is very different. The following describes these three components:

1. The supplementary *Enhancing Academic Success* course is a semester-long, 1-credit-hour course that has been taken by 270+ students so far. This course covers topics including student motivation and mindset, goal-setting, time management, and learning strategies.
2. The *Student Success and Well-Being* Canvas course, a course that all our (2000+) students, both undergraduate and graduate, have access to always. This course has provided our department community a platform to connect with each other, which was especially helpful when the pandemic forced the sudden shift to online instruction.
3. The *Success and Wellness workshops* led by mental health professionals and learning specialists on specific topics which have not only served to educate our engineering students, but also sparked an awareness through discussions of the factors that influence student success. These 1- to 1.5-hour long workshops were introduced in Fall 2020, and the participation was quite low with only ~25 students attending. We are hopeful that with more advertising, more students will attend in the coming semesters.

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