

WIP: Undergraduate Peer Mentorship in a First Year Seminar

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Abstract

This work-in-progress paper will examine the change in students' sense of belonging, college success, career readiness and self-efficacy over the course of a new First Year Seminar for undergraduate engineering students. Many studies have focused on the importance of mentorship in engineering, particularly for students who might not see themselves represented in engineering spaces. Mentorship improves career outcomes and academic success by providing academic and psychosocial support for STEMM students [1]. Additionally, studies show that First Year seminars can improve learning, personal and professional outcomes for students [2]. In fall 2025, we launched a pilot program for our First Year Seminar course for incoming engineering students and made seats in the class available to the first 75 students expressing interest. In this course, we sought to 1. Increase community within the first-year cohort and between first year students and upperclass students and 2. Teach critical skills necessary to succeed in engineering, (i.e., professional development, work/life balance, working in teams). To accomplish this, we used a group peer mentorship model that randomly assigned first-year students to small groups with an upperclass student teaching assistant (TA). The class structure included both small group meetings and a more traditional classroom model, with interactive guest lectures. We analyzed the results from our pre- and post-survey from the first-year students to examine the change in students' sense of belonging, self-efficacy, and their perceptions of this unique peer mentorship course model. We also present qualitative data on the experiences of our TA mentors. Lastly, this presentation discusses implications, outlines future directions, and highlights key opportunities for course improvements.

Introduction

Historically, undergraduate engineering programs have been characterized as rigorous and demanding, with a "sink or swim" approach that contributes to students choosing to leave the major for other fields of study [3, 4]. While inadequate academic preparation is often cited as the primary factor in students' decisions to leave engineering, prior research suggests that other factors such as highly competitive learning environments, social isolation and a lack of belonging play a significant role in persistence decisions [5]. In response to these challenges, many schools have implemented first year engineering initiatives designed to support students' transition to engineering study, foster community and strengthen engineering identity [6].

With the goal of strengthening our student support structures, we conducted a review of peer institutions to determine their approach to first year engineering support. Among the 23 engineering programs examined, seven offered a dedicated first year seminar for engineering students. These courses varied in structure and emphasis, including seminars focused on

orientation to the engineering curriculum, peer mentoring and strategies for navigating institutional resources. Drawing on these models and the broader literature on first year student success, we developed a draft framework for a first year engineering seminar for our educational environment. Student, advisor, and faculty feedback informed revisions to the course design prior to implementation. The resulting pilot course included two instructors and a team of undergraduate teaching assistants. The primary goals of the seminar were to foster a sense of community within the first year cohort and across class years and to equip students with critical skills necessary for success in engineering. This paper examines how students' feelings of community within Engineering and their critical college success skills changed over the course of this inaugural first-year Engineering seminar.

Pedagogical frameworks

Peer mentorship in higher education has shown to positively impact students academically and personally [1]. Additionally, during undergraduate focus groups conducted prior to designing the course, we repeatedly heard from students that they did not want to hear about topics such as work/life balance and mental health from faculty or staff, but instead from their peers. We intentionally incorporated this feedback into the development of the course to engage the students in the way they identified would be most effective.

In our course, we utilized a peer group mentoring model, where groups of 6-7 first year students were paired with one upperclass student [7]. We chose this model for multiple reasons; having one-on-one mentors for each student was not feasible for a class of 75 students, so a group mentorship model had to be implemented. We also wanted them to have a deeper relationship with other first year students in the course, which would be better facilitated by assigning them the same mentor and small group for the entirety of the semester. Research shows that group mentoring can have additional benefits beyond dyadic mentoring, including building rapport with other peers who can also help provide them with resources [1]. See Appendix A for the full course syllabus.

Teaching Assistants

TAs were selected from a pool of applicants. We sent out the application for TAs to all upcoming sophomores, juniors and seniors in the College at the end of the Spring semester. Applications were anonymized by a staff person who did not review the applications to remove identifying information to minimize bias. Applications were reviewed using a rubric evaluating their enthusiasm for the program, previous TA, mentorship or leadership experience, ideas about fostering community within the class, and relevant involvement on campus. After the initial review, we ensured that there were representatives from all majors in the College and from each year. We interviewed candidates and asked them about their peer teaching skills, time

management, leadership skills, inclusion and belonging, self-motivation, and overall communication skills. We determined the criteria for the applicants based on the skills that we believed TAs needed to be successful based on our job description.

The TAs for this course had some job duties that are similar to what one would normally expect a TA to do, such as grading, recording attendance, attending classes, etc. However, TAs were also expected to lead two class sessions in their small groups, lead three coffee chats, and set up a group chat (in their preferred format) to communicate with their small group. TAs went through a virtual training session over the summer, which went through an overview of the course content, and an all-day in-person training during orientation, where they learned about mentorship skills, handling difficult conversations, and facilitating discussions.

Small Groups

While we discussed multiple different methods for assigning first years to TAs, including by major, hobbies or club interests or by first years indicating their preferred TA, we decided to assign small groups randomly. Ultimately, we decided on this model because we wanted students to talk to first years and TAs from outside of their major and social group to foster a sense of community in the College as a whole. The small groups with the TA as the mentor/facilitator for the group were the primary method to facilitate mentorship. Small groups met five times total: two meetings incorporated class material and three meetings for coffee chats. Coffee chats were semi-structured conversations in the small group. TAs were given a small stipend to buy themselves and the first year students a small food or drink on campus where they would talk about various timely topics. TAs developed conversational questions about topics that were relevant to the time of the semester; the first coffee chat talked about finding social groups on campus and the transition to college generally; the second discussed midterm preparation; the third discussed registration, finals, and housing for the next school year. This format allowed for peer mentoring to happen not just between the TAs and the first year students, but also between the first year students themselves.

Course Content

The course content was developed via first and second year student focus groups, surveying undergraduate advisors and faculty, and peer institution comparison. The course was meant to give a broad overview of various topics for students, specifically aimed at developing skills that they would need to succeed in the College of Engineering. In addition to the topics discussed earlier that were covered in the small groups, we had a career panel with CMU's Career and Professional Development Center and alumni, an interactive guest lecture on working with teams, a student panel, a session hosted by another peer group on resilience and coping with struggle, a faculty guest lecture on engineering ethics, and an entrepreneurship panel.

Additionally, our first class session discussed building your engineering community using a mentorship map based on the NCFDD mentorship map for faculty, and our final session was a class networking session with staff advisors and faculty [8].

Grading

Based on peer institutions and staff recommendations, the course was graded as pass/no pass and was largely attendance based. Each class was worth one point with one class dropped. After three missed classes, they would automatically not pass the class. Additionally, each class session had a reflection assignment afterwards that prompted the student to reflect on the class in some way. Reflections could be submitted as written, audio or video assignments and were graded using a specifications grading schema [9].

Methodology

Participants

Participants were 78 first-year students enrolled in the ENG 39-101 CIT First Year Seminar course in Fall 2025. At the start of the semester, the course had a 23-person waitlist. During the add/drop period, 11 students dropped the course and 8 were added from the waitlist. Reasons for attrition were unclear but, anecdotally, were similar to attrition rates in other courses at the institution. Students were not allowed to add after the end of the second week of classes. Of the students enrolled in the course, $n = 70$ completed the pre-test and $n = 53$ completed the post-test. Attrition from the pre-test to the post-test is unclear, but may be due to the lack of grade incentive at the end of the course compared to the beginning, where no one's course grade was impacted by completing or not completing the survey. All data were collected through the university's Center for Teaching and Learning using an Institutional Review Board approved protocol. 2 students opted out of the research and were removed from all analyses presented. The students whose data were retained were $M = 18$ years old ($SD = .27$), 61% male (6 students did not identify their gender), and 54% Asian. The majority of students (76.8%) indicated having completed their K-12 education in the US. Others completed their K-12 education in China, Dubai, India, Jamaica, Singapore, South Korea, and the UAE.

Materials

Pre-Survey

During the first week of class, students were presented a survey on Qualtrics (see Appendix B for full pre-survey). The survey consisted of a 4-item short version of the Sense of Social Fit Scale [10], adapted to ask about students' sense of belonging to the field of Engineering rather

than the university. Students responded to 3 positive worded items (e.g., “I fit in well with people in Engineering”) and 1 negatively worded item (“I feel like an outsider in Engineering”) on a 1 (strongly disagree) to 7 (strongly agree) scale. The short scale showed good reliability ($\omega = .88$). Students were also asked to complete 15 items measuring self-efficacy for course learning objectives. Students were asked to indicate how confident they felt (0-100%) in the moment that they could complete a number of college readiness tasks. Sample items included “compose a respectful and effective professional email,” “prioritize tasks effectively to meet deadlines,” “communicate my ideas clearly in a group setting,” and “describe some potential career paths available to engineers.” Given that self-efficacy is domain-specific, the 15-item self-efficacy scale was developed for the course based on our learning objectives connected to specific course topics. The self-efficacy scale showed excellent reliability at pre ($\omega = .91$). Lastly, students completed basic demographic questions and open-ended questions about their purpose for enrolling in the course and their goals for the course. Open-ended questions were asked to better understand student motivation and whether the course was advertised appropriately, and not for research purposes.

Post-Survey

The post-survey was completed asynchronously on Qualtrics during the last week of classes (see Appendix C for full post-survey). Students again were asked to complete the 4-item Sense of Belonging scale ($\omega = .83$). This time, students were also asked in two separate items to what extent their experience in this course impacted their sense of belonging in Engineering, and at the university. They were further asked to rate the extent to which each of 4 distinct aspects (guest lectures, small-group lessons, office hours, coffee chats) of the course impacted their sense of belonging in Engineering (1 = very negative impact; 7 = very positive impact), and which of these was most impactful to them. Students were also asked in an open-ended question whether the course pointed them to any resources that impacted their sense of belonging in Engineering or at the university. Responses were thematically coded to understand what aspects of the course were most helpful at increasing feelings of belonging and community in the College from the students’ perspective. Students were then given the same 15 self-efficacy items from the beginning of the semester ($\omega = .91$). Lastly, we asked 5 open-ended questions about the course content, what sessions were helpful, what suggestions students may have for the future. These open-ended responses were asked for ideas about how to develop the course further and not for research purposes.

TA Post-Survey

Two TAs associated with the research project created the TA post-survey (see Appendix D for full TA post-survey). The TA post-survey included the sense of belonging questions that the students enrolled in the course also took in addition to questions asking about sense of belonging

among the TAs and in the small groups. There were also open-ended questions about the efficacy of different parts of the course, ways to improve the experience for TAs, and additional comments about feelings of belonging and the course in general for future course development.

Procedure

All students enrolled in the course were informed that research was being conducted in this course in collaboration with the University's Center for Teaching and Learning. During the first week of classes, students were presented with the pre-survey for asynchronous completion. This process was completed with the post-test during the last week of the semester. Participation was incentivized with assigning .5 points credit for taking each survey.

Results

Sense of Belonging

Students who completed the pre and post surveys ($n = 49$) showed a strong sense of belonging to engineering at pre ($M = 5.62$, $SD = .87$) and this increased marginally over the course of the semester ($M = 5.79$, $SD = .92$), $t(48) = 2.01$, $p = .05$, $g = .28$. Students felt that the experience in this course moderately impacted their sense of belonging in Engineering ($M = 2.81$, $SD = .93$; 1 = not at all, 5 = extremely) and at CMU ($M = 3.50$, $SD = 1.38$; 1 = not at all, 7 = extremely). Students felt that the coffee chats, guest lectures, office hours, and small group lessons all had a positive impact on their sense of belonging (see Figure 1), although students felt coffee chats had the most positive impact. Coffee chats were also by far the most frequently mentioned course element when students were asked to identify which element most strongly influenced their sense of belonging. Of 47 students who responded to this question, 36 identified coffee chats, 8 identified guest lectures, and 3 identified small-group lessons as the course component that most strongly influenced their sense of belonging. Nobody identified office hours as the course element that most contributed to their sense of belonging.

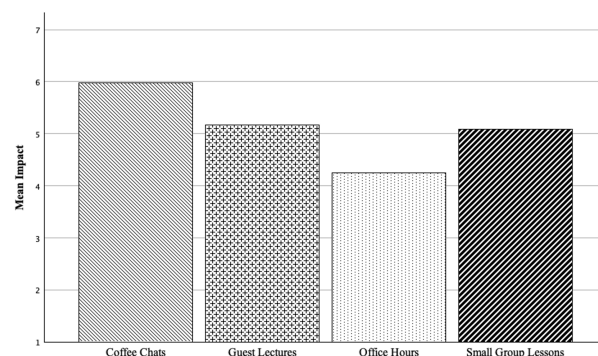


Figure 1. Mean Impact of Course Elements on Sense of Belonging in Engineering (1 = very negative impact; 7 = very positive impact)

We also thematically coded the qualitative responses to how or why these course elements most strongly affected students' sense of belonging in their perception (collected at post). 44 students responded. Those who identified coffee chats as most strongly having influenced their sense of belonging did so because it helped them form peer connections and relationships (20 mentions) in a positive, low-stakes environment (12 mentions) that facilitated exchange between students and older students (8 mentions) and provided a lot of information and resources (6 mentions). 2 students specifically mentioned that they found coffee chats helpful because they normalized struggle (see Figure 2). Guest lectures were impactful because they exposed students to diverse perspectives (6 mentions) and engineering identities that gave students a professional vision for the future (2 mentions) and, again, normalized struggle (2 mentions, e.g., "Guest lectures help give a different perspective on topics of engineering and how people struggle just as much as me.") Small-group lessons reiterated the themes of interactivity and community building, although to a much lesser extent (only 3 students identified these as central to their sense of belonging).

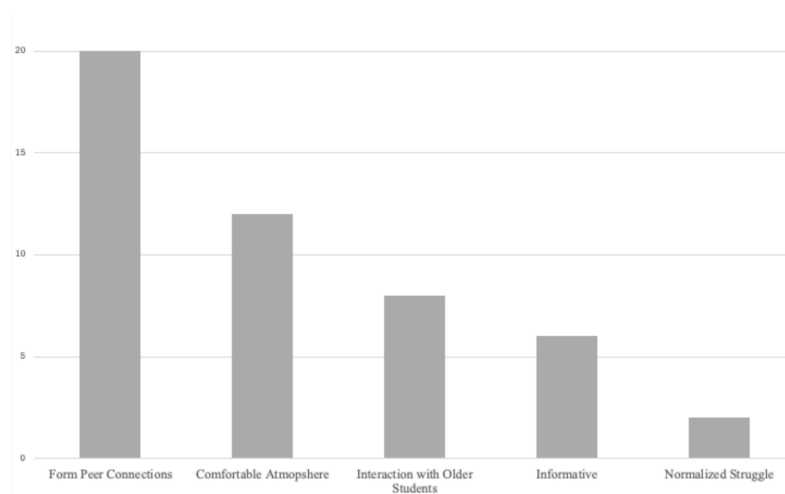


Figure 2. Why Coffee Chats Contributed to Students' Sense of Belonging: Frequency of Thematic Mention

Self-Efficacy

Self-Efficacy increased for all measured course-relevant skills, although repeated-measures t-tests revealed that increases on 4 items were not statistically significant (see Appendix F for all items, descriptive statistics at pre and post, and p-values). The largest gains were observed in students' abilities to describe the functions and locations of specific campus offices, though students also showed lowest self-efficacy for those items at pre. The smallest gains were to students' confidence in their time management and self-care. Anecdotal feedback from TAs and students suggested that these lessons could be revised to increase relevance and engagement. Confidence in engineering-specific projects and professional development showed moderate

increases of around 12% from pre to post. These data show that students overall increased their confidence in the learning objectives of the course.

Teaching Assistants

Eight TAs out of ten responded to the post-survey. TAs felt a strong sense of belonging in the College of Engineering (see Figure 3). Responses to the sense of belonging questions were overwhelmingly positive, with the only negative responses recorded in response to the “I feel like an outsider in Engineering,” a reverse-coded item. TAs also reported a high sense of belonging with other TAs and within their small groups.

Question	I feel like I belong in Engineering.	I fit in well with Engineering.	I feel like an outsider in Engineering.	I feel comfortable in Engineering.	I feel a sense of community with the other TAs in the course.
Average	6.43	6.14	2.86	6.57	6.14

Figure 3. TA Responses to Sense of Belonging Questions (1 = strongly disagree; 7 = strongly agree)

Conclusion

This paper shows that a sense of belonging meaningfully increased for students and TAs over the course of a semester. Students largely reported that the peer mentorship opportunities through coffee chats made the largest impact on their feelings of belonging. This aligns with other research, which shows that peer mentorship has a positive impact on students’ sense of belonging [12]. This course offered a number of best practices for impacting students’ sense of belonging (e.g., older students sharing their struggles and thereby normalizing them), which has been found to be important for student retention and wellbeing [10, 11].

Furthermore, students’ self-efficacy scores showed that overall, students’ confidence increased in skills related to central learning goals of the course. Questions involving orientation to the college and university showed the greatest gains, suggesting that the course was most helpful in building confidence in these skills. Although we did not measure students’ actual performance on those skills, self-efficacy has been found to predict persistence, performance, and retention [13, 14].

Admittedly, our research lacked a control group without the interventions described herein and as such precludes causal conclusions. Future iterations of this work will look at comparing students enrolled in the course to students not enrolled to see the impact of the course on feelings of belonging and self-efficacy to establish more direct causation.

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Appendix A: Course Syllabus

39-101 First Year Seminar

Instructors (email)

Wednesdays 4 to 4:50 PM

Office Hours:

Course Description:

The CIT First Year Seminar is a pilot course designed to orient first year engineering students to the College of Engineering. The transition from high school to college can be challenging, especially at a fast-paced school like CMU. This course will teach essential skills that all students need to succeed, from career and professional development, to finding your place in the College, to work/life balance. Through a mix of interactive lessons, peer mentor instruction, and guest speakers from around the University, students will learn about all of the resources and opportunities CMU has to offer.

An essential and unique part of the course is the small group structure. First year students will be paired with an upperclass student TA in small groups, where they can ask questions, get guidance, and learn tools from an upperclass peer.

Course objectives:

- Identify and utilize different resources on campus, including but not limited to, CaPS, the Student Academic Success Center, the Career and Professional Development Center, and University Health Services.
- Develop professional skills including but not limited to communication etiquette, time management, and work/life balance.
- Connect with other first year students and with upperclass TAs about course topics to develop a first year cohort community.
- Explore engineering specific skills and opportunities, such as ethics, entrepreneurship, teamwork and communication.

Policies:

Attendance

Attendance for this course is mandatory. This course is largely discussion based, meaning most of the material will be discussed in class. This course has the unique opportunity for you to connect with your peers and your TA to help you learn more about CMU and how to make the most of your time here. Not attending class means you miss out on this invaluable information.

You are allowed one unexcused absence, no questions asked. After that, you will receive a grade deduction for each missed class. If you miss more than 3 classes without talking to an instructor, you will not pass the course. If you need to miss class for a significant reason (illness (physical or mental), religious observance, death of a loved one, university-sanctioned event, etc.), please reach out to us at least 24 hours before the course so we can make a plan to keep you on track for the course. In the event of repeated absences due to extenuating circumstances (illness (physical or mental), etc.) please reach out as soon as possible so we can connect you with the appropriate resources. **Attendance will be taken by your assigned TA at the beginning of each class period. Please check in with your TA at the beginning of class to ensure that your attendance is recorded.** Additionally, you should not be working on other course assignments, research, or other activities during class time. Those found doing so will lose attendance points.

Grading

1 syllabus quiz (1 point)

12 reflection prompts: 1 points each (completion based on specifications grading schema) (12 points)

12 classes: 1 points each (12 points)

2 surveys: .5 points each (1 point)

Total: 26 points

Minimum grade to pass: 19 points

Reflection Prompt Grading Criteria

Reflection prompts are graded as pass/no pass. Reflections are not graded on grammar or written skill; they are meant to encourage you to self-reflect on each week's topic. Reflections can be 150 words written (typed or handwritten and scanned in), or a one minute audio or video recording "podcast" of you speaking. **Each reflection prompt must meet the following criteria to get credit. If any part of the following criteria is missing, no credit will be given:**

- Must be at least 150 words if written or 1 minute if spoken/video recorded
- Must directly answer at least one of the questions given in the reflection prompt
- Must be turned in by class time

Technology Policy

This course is largely discussion based, which means that course information will be largely conveyed during class. If you are distracted during class doing other assignments or on the Internet, you miss out on the opportunity to build a community with your other first year students and to hear the guidance of your TAs. In most cases, there will be no use for laptops or phones during class, and as such, we will have a **no technology classroom to encourage discussion**. If there is a class where you will need technology, we will let you know in advance. If you have an

accommodation that requires the use of technology, please talk to one of the instructors. If you have your laptop, phone or other technological device out when you're not supposed to, you will get one warning. After that, you will lose attendance points for the class period.

Academic Integrity/AI use statement

Students are expected to follow all of CMU's policies in regards to [academic integrity](#). CMU's policy is that "in any manner of presentation, it is the responsibility of each student to produce their own academic work." This means that cheating and plagiarism in their many forms are prohibited. Additionally, **in this course, use of any artificial intelligence to produce or generate assignments is strictly prohibited and will be treated as an academic integrity violation.** While AI is an incredibly useful tool, our assignments are meant to have you reflect on your experiences, and using AI to reflect for you defeats the purpose. You may use AI software to edit your responses, but as reflections are not graded on grammar or written skill, please do not feel the need to edit them beyond ensuring that your responses are clear.

Respectful Communication

This course is meant to provide you with the tools and skills you need to be successful in your future career. Clear and respectful communication is vital to any career path, and as such is a part of this course. **Please communicate with your instructors, your TAs and your classmates in a respectful and professional manner, as you would in a workplace.** To reach your TA, please use the email address they provided and they will reply to your message within 24 business hours. If you need to reach one of the course instructors, please use the email addresses provided at the first page of the syllabus. When messaging any of the course instructors or TAs, please be clear in what you are asking about, phrase requests politely, and be patient while awaiting a response. If you're confused on what constitutes a polite and professional email, this [tutorial](#) can be informative. If you do not respect these guidelines, we will provide you with guidance on how to phrase your request professionally, and will expect you to resend the email in order to receive a response. Repeated and/or egregious violations of these guidelines will result in a grade reduction. Professional communication is a reciprocal process; you can expect your instructors and TAs to also communicate with you in a respectful and professional manner.

A Note on Pronouns: As a part of our classroom agreements to use respectful communication, you should use the names and pronouns that your instructors and classmates share. If you accidentally mess up, that's okay, just apologize, correct yourself, and move on, similar to what you would do if you accidentally got someone's name wrong. This policy also applies to your classmates.

Academic Freedom and Inclusion

As a community where inquiry is nurtured and theories are tested, the University must be a place where every individual has the right to feel safe to express ideas that differ from those held by others. At the same time, inquiry cannot thrive in an environment of intolerance, bigotry, or

derision. This means that we hold to the highest standards of civility in our classrooms and department cultures; we are committed to the inclusion of diverse voices, experiences, and opinions, and we commit to the value of dignity in all our dealings with one another. This policy is meant neither to proscribe nor to inhibit discussions, in or out of the classroom, of complex, controversial, or sensitive matters, but rather to allow everyone to have the ability to share their thoughts in a professional and respectful environment. While we all inevitably make mistakes, repeated and/or egregious violations of this policy will result in you being kicked out of the course.

- **Bias Reporting:** The university's [Campus Climate and Bias Reporting Protocol](#) offers support and an online mechanism to report a bias incident. NOTE: This is not an emergency service. If you have an emergency, call University Police at 412-268-2323.

Talk to us:

Our goal is for you to learn and to enjoy in the process. In order to ensure the best experience for you all, please do not hesitate to reach out with constructive feedback - both about what is working and what is not. Dr. Allen and Kaz are available to chat after class, through email, or during office hours. If you do not feel comfortable talking to us directly, you can also talk with your TA after class, through email, or during a coffee chat, and they will pass along your feedback to us. If you would like to submit your feedback anonymously, please use the mid year and end of year feedback forms.

Accommodation Needs:

Every attempt will be made to accommodate qualified students with disabilities (e.g. mental health, learning, chronic health, physical, hearing, vision, neurological, etc.) You must have established your eligibility for support services through the appropriate office that services students with disabilities. Note that services are confidential, may take time to put into place and are not retroactive. Captions and alternate media for print materials may take three or more weeks to get produced. For more information about accommodations, see this website <https://www.cmu.edu/disability-resources/>.

Notice of Mandatory Reporting of Sexual Misconduct:

As your instructors, one of our responsibilities is to create a positive learning environment for all students. Title IX and CMU's Sexual Misconduct Policy prohibit sexual misconduct in any form, including sexual harassment, sexual assault, stalking, and dating and domestic violence (<https://www.cmu.edu/policies/administrative-and-governance/sexual-misconduct/index.html>). If you have experienced sexual misconduct, or know someone who has, the University can help. You can find University resources here:

<https://www.cmu.edu/title-ix/resources-and-information/index.html>.

It is also important that you know that Title IX and University policy require us to share any information brought to our attention about potential sexual misconduct with the Office for

Institutional Equity and Title IX. In that event, those individuals will work to ensure that appropriate measures are taken and resources are made available. Protecting student privacy is of utmost concern, and information will only be shared with those that need to know to ensure the University can respond and assist. If you wish to discuss something confidentially, you can reach out to CMU CaPS (<https://www.cmu.edu/counseling/contact/index.html> ; 1-412-268-2922) or Pittsburgh Action Against Rape (<https://paar.net/> ; 1-866-363-7273)

CMU Cares

We understand that sometimes during crises it's hard to come to class, reply to emails and/or reach out for help. We also recognize that as adults, it's your decision if you want to stop coming to class and not respond to any emails. As your instructors, we care about you and want to make sure that you are physically and mentally okay and to provide you with the support and resources you need to succeed. To that end, if you have not shown up to class and have also not responded to any emails we send over the course of a month, we will submit a [CMU Cares](#) ticket on your behalf to ensure you are okay. A CMU Cares ticket starts the process of a CMU Cares representative to reach out to you to ensure you are safe and provide you with additional support and resources. If you do not want us to submit a CMU Cares ticket, you just have to respond saying that you don't want us to submit a ticket on your behalf.

Research to Improve the Course

For this course, the Eberly Center is working with your instructor on educational research. This research will involve your coursework. You will not be asked to do anything above and beyond the normal learning activities and assignments that are part of this course. You are free not to participate in this research, and your participation will have no influence on your grade for this course or your academic career at CMU. If you do not wish your course work to be used as research data or if you are under 18 years of age, please send an email to Chad Hershock (hershock@andrew.cmu.edu), and then your data will not be included. You will still be required to complete any activities assigned by the instructor as part of the learning experience, but your data will not be analyzed for research purposes. Participants will not receive any compensation. The data collected as part of this research will include student grades. Data analysis of coursework will be conducted after the course is over and final grades are submitted. In the future, once we have removed all identifiable information from your data, we may use the data for our future research studies, or we may distribute the data to other researchers for their research studies. The Eberly Center may provide support on this research project regarding data analysis and interpretation. The Eberly Center for Teaching Excellence & Educational Innovation is located on the CMU-Pittsburgh Campus and its mission is to support the professional development of all CMU instructors regarding teaching and learning. To minimize the risk of breach of confidentiality, the Eberly Center will never have access to data from this course containing your personal identifiers. All data will be analyzed in de-identified form and presented in the aggregate, without any personal identifiers. If you have questions pertaining to your rights as a research participant, or to report concerns to this study, please contact Chad Hershock (hershock@andrew.cmu.edu).

Plain language interpretation:

- *After* the semester is over, the data generated by students in this course, which often comes from things like assignments, projects, surveys, etc., is stripped of all identifying information and aggregated into a larger research dataset for analysis.
- As a potential participant in this research, you have a say in what happens to your data. If you are OK with data generated by you in this course being de-identified and aggregated into a larger research dataset, then there is nothing you need to do - simply proceed through the course as you would with any other course.
- IF you would NOT like your data to be used for that purpose (or you are under 18) that is when you email Chad Hershock and say "Hi Chad, this is my name and course number, I would like to opt-out, thanks, goodbye", and your data will not be included in the research analyses.
- This opt-out process is confidential with the Eberly Center, and your instructor(s) will not know whether you have opted out of the research study or not.
- Importantly, your decision in this matter will NOT affect your experience in the course. You are only making a decision about what happens to your *data* AFTER the course is over.

Below are some potential questions students may have...

QUESTION	ANSWER
What do I need to do?	If you would like to opt out of your data being used in research analyses, all you need to do is email Chad Hershock (email is in the syllabus) with your name, course number, and say "I'd like to opt out". If you do <u>not</u> wish to opt out, you do not need to do anything.
What is this research about?	This research is focused on better understanding teaching and learning at CMU. The data will be used for various projects on educational interventions and measured impacts on learning and/or attitudes. The specifics of this educational research may vary from course to course or instructor to instructor. If, after the course is over, you're curious about this kind of work, please contact Chad Hershock or the Eberly Center (eberly-assist@andrew.cmu.edu) who can provide additional details.
Do I have to make up my mind right now?	No, there is no need to make up your mind right now. You can choose to opt out anytime, even if it is on the last day of the semester.
What if I don't want to participate, what happens?	If you'd like to opt out, the only thing that will change is what happens to your data AFTER the course is over. Your required coursework will be the same regardless of your decision.

Can I see the results?	Often the results from this kind of work do not come together right away. If you are curious about the results after this course is over, please feel free to contact your course instructor or the Eberly Center and we would be happy to give you an update, if possible.
How will the data be used?	In two ways: to help improve the course and to contribute to educational research on teaching and learning. Note that all analyses occur after course grades are submitted and student identifiers are removed.
If I opt out, do I still have to complete work assigned by the instructor?	Yes.

Syllabus

Week 1 (August 27)

Building Your Engineering Community

Reflection (due September 3): What areas on your mentor map do you want to build on? How can you intentionally connect with people to add to your engineering community? Which organizations do you want to talk to during the FAIR?

Additional Homework (due September 3): Syllabus quiz

Week 2 (September 3)

CPDC and Corporate Panel in [Bosch Conference Room \(Scott Hall\)](#)

Reflection (due September 10): What was it like hearing from individuals in different fields and careers? Was there anything that surprised you about what they said? How can you continue to network with individuals and companies that you're interested in?

Events: Go to Student Activity Fair, September 3rd 4:30 to 6:30 PM (Outside on the Cut)

Week 3 (September 10)

Coffee Chat- TAs will send out information about where to meet

Reflection (due September 17): How have you developed your engineering community during the first two weeks?

Week 4 (September 17)

Work Smarter not Harder

Reflection (due September 24): How have you had to adapt your study skills from high school to college? Are there academic challenges that you're troubleshooting? How can you utilize your engineering community to support you?

Week 5 (September 24)

Working with Teams

Reflection (due October 1): What challenges have you faced working in teams in the past? What strategies have you used to create more effective teams? What strategies do you want to try in the future?

Week 6 (October 1)

Coffee Chat- TAs will send out information about where to meet

Reflection (due October 8): What are two questions you have for the What I Wish I Had Known (WIWIHK) Panel? What made you think about asking these questions?

Week 7 (October 8)

Work/Life Balance

Reflection (due October 22): Has there been a time in your life where your work/life balance was unstable? What made you recognize that you needed to change your habits?

Week 8 (Fall Break, October 12 to 18) NO CLASSES

Week 9 (October 22)

What I Wish I Had Known Panel-[in Singleton](#)

Reflection (due October 29): Now that we're halfway through the semester, what challenges have you faced that you didn't anticipate? How have you adapted to these obstacles? What was effective and what wasn't effective? How have you leaned on your engineering community through these setbacks?

Week 10 (October 29)

Resilience and Coping with Struggle

Reflection (due November 5): When you encounter a setback, how have you previously coped? How could you have applied a growth mindset to the setback?

Week 11 (November 5)

Coffee Chat- TAs will send out information about where to meet

Reflection (due November 12): We're nearing the end of the semester! How do you feel about your first semester at CMU? What has gone well? What do you want to do differently next semester? How do you plan to implement those changes?

Week 12 (November 12)

Engineering Ethics

Reflection (due November 19): What was it like going through the ethics case study?
How does ethics play a role in the kind of engineering you're interested in?

Week 13 (November 19)

Engaging with Entrepreneurship- at Swartz

Reflection (due December 3): What surprised you most about the panel's experiences with entrepreneurship? Has your perspective on entrepreneurship changed based on the panel? How might you engage with entrepreneurship in the future?

Week 14 (Thanksgiving Break, November 23 to 29) NO CLASSES**Week 15 (December 3) Last Day of Classes is December 5**

Survey/Celebration- [in Singleton](#)

Survey due December 10

Appendix B: Pre-Survey

Dear Student!

Your instructors are collaborating with the Eberly Center to collect data that will help them understand and improve the course experience from the students' perspective. Your responses will be kept confidential and identifying information will NOT be shared with your instructors.

We are asking you for your Andrew ID to track participation. All Andrew IDs will be removed from data before it is analyzed, and data will be examined in the aggregate only. This survey should take approximately 10 minutes or less.

Please take your time and respond as honestly as you can.

Thank you!

Please enter your Andrew ID: [short response]

Page break

Instructions: Please respond to the following items regarding the field of Engineering. Indicate the extent to which you agree or disagree with each statement using the scales below. Please use the whole range of each scale.

1. I feel like I belong in Engineering.
2. I fit in well with Engineering.
3. I feel like an outsider in Engineering.
4. I feel comfortable in Engineering.

Scale: Strongly Disagree - Disagree - Somewhat Disagree - Neutral - Somewhat Agree - Agree - Strongly Agree

Page break

Please rate your 0-100% confidence in your ability to do each of the following at this moment. There are no “right” or “wrong” answers. We are interested in better understanding your sense of yourself.

Right now, I feel ____% confident that I can...

1. ...describe what services CaPS offers.
2. ...describe what services the Student Academic Success Center offers.
3. ...describe what services the Career and Professional Development Center offers.
4. ...compose a respectful and effective professional email, e.g. to a professor.
5. ...identify when an email is the most appropriate method to contact a professor as opposed to another means of communication, e.g. office hours or discussion boards.
6. ...prioritize tasks effectively to meet deadlines.
7. ...regularly manage competing responsibilities without becoming overwhelmed.

8. ...prioritize my personal well-being while also meeting my academic responsibilities.
 9. ...take appropriate steps to seek help or use available resources when I feel lost or overwhelmed.
 10. ...collaborate effectively with peers on engineering-related projects.
 11. ...communicate effectively to resolve disagreements between members on a team.
 12. ...communicate my ideas clearly in a group setting.
 13. ...can build and maintain professional relationships to support my engineering career goals.
 14. ...I can explain the importance of ethical principles when making decisions in engineering projects.
 15. ...describe some potential career paths available to engineers.
1. Please briefly explain your ratings above. What has contributed to your current level of confidence in the items above? [short response]
 2. Please briefly share with us why you chose to enroll in this course. [short response]
 3. Do you have any specific goals or expectations for this course? [short response]

Page break

1. How old are you? [short response]
2. What is your gender identity? [short response]
3. There is substantial variation in how people think about race and ethnicity around the world. Do any of these response options describe your racial or ethnic identity? If so, please select all that apply. If not, please provide your racial or ethnic identity in "Prefer to use a different term." If you do not have a racial or ethnic identity, select "Non-identifying." (select all that apply)
 - a. Asian
 - b. Black
 - c. Hispanic or Latino
 - d. Middle Eastern or North African
 - e. Native or Other Indigenous Peoples
 - f. Pacific Islander
 - g. White or Caucasian
 - h. Prefer to use a different term: ____
 - i. Non-identifying
 - j. Prefer not to answer
4. Where did you complete the majority of your K-12 education (kindergarten through high school) ?
 - a. In the US
 - b. Outside the US (enter country or countries, if you're comfortable)
 - c. Prefer not to answer

Appendix C: Post-Survey

Dear Student!

Your instructors are collaborating with the Eberly Center to collect data that will help them understand and improve the course experience from the students' perspective. Your responses will be kept confidential and identifying information will NOT be shared with your instructors.

We are asking you for your Andrew ID to track participation. All Andrew IDs will be removed from data before it is analyzed, and data will be examined in the aggregate only. This survey should take approximately 10-15 minutes or less.

Please take your time and respond as honestly as you can.

Thank you!

Please enter your Andrew ID: [short response]

Page break

Instructions: Please respond to the following items regarding the field of Engineering. Indicate the extent to which you agree or disagree with each statement using the scales below. Please use the whole range of each scale.

5. I feel like I belong in Engineering.
6. I fit in well with Engineering.
7. I feel like an outsider in Engineering.
8. I feel comfortable in Engineering.

Scale: Strongly Disagree - Disagree - Somewhat Disagree - Neutral - Somewhat Agree - Agree - Strongly Agree

Page Break

1. To what extent did your experience in this course impact your sense of belonging **in Engineering**?

Scale: Not at all - Slightly - Moderately - Very much - Extremely

2. Reflect on your experience in this course. Then, please indicate if any of the following had a positive or negative impact on your belonging in Engineering.
 - Coffee chats
 - Guest lectures
 - Office hours
 - Small-group lessons
 - Other (optional; please specify)

Scale: Very negative impact - Negative impact - Slightly negative impact - Neutral - Slightly positive impact - Positive impact - Very positive impact

3. Of the item(s) above, which ones most strongly influenced your sense of belonging in Engineering? [short response]
4. How, or why, did the item you chose above most strongly influence your sense of belonging in Engineering? [short response]
5. To what extent did your experience in this course impact your sense of belonging **at CMU**? [short response]

Scale: Not at all - Slightly - Moderately - Very much - Extremely

6. Did the course point you to any resources that impacted your sense of belonging in Engineering *or* at CMU in any way? If so, which ones and how? [short response]

Page break

Please rate your 0-100% confidence in your ability to do each of the following at this moment. There are no “right” or “wrong” answers. We are interested in better understanding your sense of yourself.

Right now, I feel ____% confident that I can...

16. ...describe what services CaPS offers.
17. ...describe what services the Student Academic Success Center offers.
18. ...describe what services the Career and Professional Development Center offers.
19. ...compose a respectful and effective professional email, e.g. to a professor.
20. ...identify when an email is the most appropriate method to contact a professor as opposed to another means of communication, e.g. office hours or discussion boards.
21. ...prioritize tasks effectively to meet deadlines.
22. ...regularly manage competing responsibilities without becoming overwhelmed.
23. ...prioritize my personal well-being while also meeting my academic responsibilities.
24. ...take appropriate steps to seek help or use available resources when I feel lost or overwhelmed.
25. ...collaborate effectively with peers on engineering-related projects.
26. ...communicate effectively to resolve disagreements between members on a team.
27. ...communicate my ideas clearly in a group setting.
28. ...can build and maintain professional relationships to support my engineering career goals.
29. ...I can explain the importance of ethical principles when making decisions in engineering projects.
30. ...describe some potential career paths available to engineers.

Please briefly explain your ratings above. If your confidence has changed since the last time you took this survey, what contributed to the change?

Page break

Finally, we have a few more questions about your experience in this course.

1. I found the course content relevant to my academic or career goals.
2. I felt comfortable asking my TA questions about academic or personal concerns.
3. I feel less apprehensive about seeking out student support services (Student Academic Success Center, Counseling and Psychological Services, Career and Professional Development Center)
4. I feel more confident that I can navigate struggles in constructive ways than I did at the beginning of the semester.

Scale: Strongly Disagree - Disagree - Somewhat Disagree - Neutral - Somewhat Agree - Agree - Strongly Agree

Page break

1. What aspects of this course were most valuable to your growth as an engineering student and why? [short response]
2. What suggestions do you have for future iterations of this course? [short response]
3. Do you have any thoughts on the timing of specific lessons or modules? Was their sequencing effective in your view? [short response]
4. What skills, if any, do you wish we had addressed or emphasized more? [short response]
5. Is there anything else you would like us to know about your experience in this course? [short response]

Appendix D: TA Post-Survey

The purpose of this survey is to collect feedback on your experience as a TA for CIT First-Year Seminar (39-101)

It will take only 3 to 4 minutes. Your feedback will be used to help us improve the course for future semesters

Page break

What aspects of the course structure, training, and/or materials were most helpful to you in supporting students? [short response]

Which lessons/topics in the course were most relevant and engaging to students? [short response]

Were there any topics or instruction styles that students struggled with? How could the course better teach this content? [short response]

How well prepared did you feel to handle student questions and challenges? What additional training or resources would have helped? [short response]

What tools, activities, or teaching methods were most effective during large group instruction, small groups and your coffee chats? [short response]

I feel like I belong in Engineering.

Scale: Strongly Disagree - Disagree - Somewhat Disagree - Neutral - Somewhat Agree - Agree - Strongly Agree

If you would like to comment on your response to the previous question you can do so here: [short response]

I fit in well with Engineering.

Scale: Strongly Disagree - Disagree - Somewhat Disagree - Neutral - Somewhat Agree - Agree - Strongly Agree

If you would like to comment on your response to the previous question you can do so here: [short response]

I feel like an outsider in Engineering

Scale: Strongly Disagree - Disagree - Somewhat Disagree - Neutral - Somewhat Agree - Agree - Strongly Agree

If you would like to comment on your response to the previous question you can do so here:
[short response]

I feel comfortable in Engineering.

Scale: Strongly Disagree - Disagree - Somewhat Disagree - Neutral - Somewhat Agree - Agree - Strongly Agree

If you would like to comment on your response to the previous question you can do so here:
[short response]

I feel a sense of community with the other TAs in the course.

Scale: Strongly Disagree - Disagree - Somewhat Disagree - Neutral - Somewhat Agree - Agree - Strongly Agree

If you would like to comment on your response to the previous question you can do so here:
[short response]

I feel a sense of community with the students in my small group.

Scale: Strongly Disagree - Disagree - Somewhat Disagree - Neutral - Somewhat Agree - Agree - Strongly Agree

If you would like to comment on your response to the previous question you can do so here:
[short response]

What changes would you recommend to the course to improve the TA experience? [short response]

Is there anything that should be added, removed, or modified to make the course more helpful for future students? [short response]

Page break

We thank you for your time spent taking this survey.

Your response has been recorded.

Appendix F: Self-Efficacy Means (SD) at pre and at post, and the gain in self-efficacy per item

Right now, I am ____% confident that I can...	N	Pre: M (SD)	Post: M (SD)	Gain
...describe what services CaPs offers	47	45.21 (24.05)	63.23 (24.49)	18.02**
...describe what services the Student Academic Success Center offers.	47	51.06 (23.66)	73.23 (21.58)	22.17***
...describe what services the Career and Professional Development Center offers.	46	56.28 (22.01)	73.93 (17.99)	17.65***
...compose a respectful and effective professional email, e.g. to a professor.	47	79.79 (17.38)	87.15 (13.94)	7.36**
...identify when an email is the most appropriate method to contact a professor as opposed to another means of communication, e.g. office hours or discussion boards.	47	71.15 (19.06)	83.87 (16.34)	12.72***
...prioritize tasks effectively to meet deadlines.	47	76.34 (15.15)	80.74 (17.85)	4.40
...regularly manage competing responsibilities without becoming overwhelmed.	47	69.89 (17.75)	74.87 (19.48)	4.98
...prioritize my personal well-being while also meeting my academic responsibilities.	47	70.77 (20.00)	75.53 (22.01)	4.76
...take appropriate steps to seek help or use available resources when I feel lost or overwhelmed.	47	64.91 (20.68)	77.00 (18.80)	12.09***
...collaborate effectively with peers on engineering-related projects.	47	78.06 (14.56)	83.15 (13.10)	5.09
...communicate effectively to resolve disagreements between members on a team.	47	74.04 (18.12)	81.74 (14.57)	7.70*

...communicate my ideas clearly in a group setting.	46	72.63 (18.05)	82.87 (13.34)	10.24***
...can build and maintain professional relationships to support my engineering career goals.	47	65.60 (19.34)	77.04 (17.65)	11.44**
...I can explain the importance of ethical principles when making decisions in engineering projects.	47	66.13 (22.04)	78.17 (20.35)	12.04***
...describe some potential career paths available to engineers.	47	69.36 (19.02)	81.79 (14.65)	12.43***
SE_total	45	67.92 (13.93)	78.22 (11.93)	10.30***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$