

"I really feel lost:" An exploration of first-year engineering students' self-reported anxieties

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Abstract

The transition from high school to the first year of college is fraught with challenges that students must navigate. Students balance academic, social, professional, and self-regulation tasks in a new and likely unfamiliar environment. Each task comes with expectations, both internal and external, that students use to judge their own progress and performance. The thought of failing to achieve these expectations produces anxieties variable in both source and intensity for many students. This study draws on short-answer responses from more than 400 first-year students to understand what their most significant anxieties were at both the beginning of the fall semester and the end of the spring semester.

Academic performance was the most prevalent theme, and captured students’ reported anxieties around classes, grades, and other aspects of classroom academics. The prevalence may be due to the academic context in which the survey was distributed. *Personal management skills* was the next most common theme across student responses, capturing ideas around *time management*, *balancing* a large courseload, and practicing good *study habits*. Students less frequently reported anxieties around *personal management skills* in the spring. In both fall and spring, students consistently reported anxieties related to *practical planning for the future*. In the fall semester, *Major Selection* and *Career Selection* were more prevalent while *Job Search* was by far the most common sub-code in the spring. *Intrapersonal Struggles* was the least common theme but provided the most personal look at some of the deeper, existential anxieties that participants voiced in their reflections. Finally, participants expressed anxieties about *non-academic elements of the college experience*, including *social* interactions, *finances*, and building out their resumes with the *right experiences*. Insights from this study will enable first-year engineering instructors, advisors, staff, and administrators to better support students both in the classroom and in formal or informal advising settings.

Background

Students are worried about the future, and sometimes the anxieties that they experience impact their schoolwork or ability to engage meaningfully in university experiences. First-year engineering instructors often manage these anxieties in their classrooms and, potentially, in advising capacities. Advisors, staff, and university administrators also play a crucial role in supporting students to manage anxieties throughout their academic journeys. Understanding what these anxieties are and how they change throughout the first year supports instructors and advisors to better support first-year engineering students via class content and formal or informal advising interactions.

Recently, there has been a significant increase in self-reported anxiety and pathological worrying amongst university students broadly [1-3]. While student support services have increased, so has student need for such services such that current modes of delivering support to students may not be sufficient. Studies have shown that there are high levels of anxiety amongst university

students with approximately 1 in 3 students potentially experiencing clinical levels of psychological distress (e.g., [4-5]. Stress levels rise as students enter university and stay elevated throughout a university experience . Post-COVID, faculty are reporting that their students seem more disconnected and disengaged [6]. Anxiety and stress have also been notably linked to decreases in academic performance after the COVID lockdown period [7]. Proactive and personally-targeted support is shown to effectively compliment more traditional support services that rely on students to independently and reactively seek out supports [8].

Engineering Students' Stress Levels

Studies have shown that engineering students may be less likely to seek professional help when they experience mental health issues [9]. A study at one Midwest institution demonstrated that as many as 29% of engineering students experienced severe symptoms of stress and 35% experienced severe anxiety [10]. Further, students with marginalized social identities, such as gender minorities, people of color, LGBTQIA+ students, or first-generation students, more often experience mental health issues such as stress and anxiety [10-13]. Students' stress levels are not constant throughout the semester, further complicating the task of providing support when they need it most. Prior studies indicate that students' anxieties tend to spike around the busiest times of the semester, such as exam times, and gradually increase from the start of the semester to the end [14].

Engineering students' mental health and attitudes towards seeking help are negatively affected by the demands of their engineering degree and the larger culture around engineering [15]. The broader culture of engineering perpetuates ideas of elitism and meritocracy that discourage help-seeking. Engineering students perceive their academics to be more challenging than other majors, with the expectation that the work they put into their studies will lead to comfortable futures in what is called a "meritocracy of difficulty" [16]. A sense of shared suffering is presented in prior research, underlining that students perceive the difficulty as a core part of their engineering experience [17]. The expectation of challenge and culture of meritocracy allow elitest practices such as weed-out culture to persist within engineering [18]. Meritocratic beliefs discourage help-seeking [13] and foster an environment where stress is not only tolerated but expected of engineering students.

First Year Students' Stress Levels

The transition from high school to the first year of college is fraught with challenges that students must navigate. Challenges, including the intensity of college courses, exploring adult independence, new and unfamiliar support networks, exposure to alcohol culture, and significant financial burdens, are shown to contribute to university student anxiety and contribute to lowering psychological functioning [19-20]. Students face academic, social, professional, and self-regulation tasks in their new college environment. Each category of task comes with expectations, both internal and external, that students use to judge their own progress and performance. The thought of failing to achieve these expectations produces anxieties variable in both source and intensity for many students. Coupled with a lack of preparation or training in help-seeking behaviors, students often struggle to attend to or overcome their concerns.

Research questions

Prior literature has examined the negative consequences of anxiety and underscores the importance of understanding both the sources of students' anxieties and how instructors and administrators alike can best support them. We seek to gain insight into the anxieties experienced by engineering students in their first year as they begin to enter the culture and community of engineering. The need to explore first-year engineering students' anxieties motivates our exploration of the following research questions:

RQ1. What do first-year engineering students report being most anxious about?

RQ2. How do first-year engineering students' reported anxieties change from the start to the end of their first year, if at all?

Methods

This research was conducted within the engineering school at a large public Mid-Atlantic research-intensive university. All engineering students are required to take a two-semester introductory engineering course sequence, which is taught by the same faculty members who serve as their academic advisors for the first year. Students engage in the engineering design process through three different engineering design projects, two in the fall semester and one in the spring. They work on these projects as a team of 4-5 students. It is important to note that the curriculum of this introductory engineering course sequence includes the introduction and reinforcement of support services available to students. Ranging from tutoring to counselling and accommodations, a wide range of individuals, offices, and programs are presented to students throughout the semester. Individual instructors may cover these specific resources in their own ways, but they are included across all faculty and all sections of the courses. The mention of these resources in the course does not guarantee students use them, but it does establish a backdrop of existing support for the kinds of stressors students may experience in their first year. Students at this institution declare their majors midway through the spring semester of their first year.

Participants

Participants in this study include 411 consenting first-year engineering students who filled out the pre- and/or post-survey. While self-reported demographic data was collected as part of the survey instrument, it was not included in the dataset for this study.

Data collection

First-year engineering students in this two-semester introductory engineering course sequence took a survey at two time points: once in the beginning of the fall 2024 semester and again at the end of the spring 2025 semester. The survey addressed a range of topics, but this study focuses on students' written responses to the question, "What's your biggest source of anxiety, at this stage in your studies? Write N/A if you can't think of anything. Feel free to name multiple items, if you wish."

Analysis

Initially, half of the consenting students' written responses to this survey question were inductively coded by both authors individually [21]. These inductive codes were compared, and a shared codebook was developed (Codes listed in Table 1 in the findings). Codes for the first half of responses were finalized and agreed upon by the authors. The authors then individually applied the final codes to the next quarter of responses. They agreed on over 90% of code applications and reconciled any disagreements. The first author then coded the remaining quarter of the responses.

Following the application of codes to all responses, the authors discussed trends in code applications [21]. These codes emerged themes related to the variety of personal and academic anxieties experienced by first-year engineering students. (Bold, Table 1). Pre-post comparisons of the patterns in codes reveal shifts in reported anxieties, as reported in the findings.

Limitations

Participants may have reported more academic-related anxieties than broader, personal anxieties they are facing due to the context of the survey, which was assigned as part of their introductory engineering course and primarily asked about perceptions of academic contexts. Reported anxieties did not strictly have to be academic or course content related, but many responses were.

Further, coming at the end of a longer survey instrument, this short-answer survey question did not elicit substantial responses from many participants, potentially due to time limitations or boredom. One- or two-word answers often allowed for easy categorization and informed codebook development. Relatedly, as will be discussed in the findings, many students wrote "N/A" or "none," which could indicate a lack of stressors or a placeholder answer to finish the survey more quickly. The question directly prompts students to write "N/A" in the case that they cannot think of an answer, which may mitigate this limitation. The "No Stress" finding is the only outcome impacted by this facet of the limitation.

Finally, we acknowledge that the prevalence of stressors is not static but fluctuates with the circumstances of any particular student as well as the stressors present more generally in their social surroundings. While our data does capture two distinct time points, these are too greatly spaced to capture the nuanced, daily fluctuations of the stressors students experience.

Positionality

Both authors are instructors in the introductory first-year engineering course in which the survey instrument was distributed. They are also academic advisors for their students, meaning they exist in close proximity to a number of students' anxieties, primarily but not exclusively around academics, course scheduling, and major selection. This proximity makes them sensitive to how students tend to describe their anxieties and invested in identifying patterns that might inform better support practices. Further, there may be a recency bias from advising interactions with students that predisposed the authors to have certain understandings of student stressors. Greater familiarity with academic stressors may have made the authors more prone to identify those in students' responses, even if subtly mentioned. To reduce these potential biases, the authors

engaged in extensive co-coding and codebook development, followed by an exercise in achieving greater than 90% inter-rater reliability.

Findings

The character of participant responses varied from one- or two-word answers to responses that were multiple sentences long. All responses were coded according to the codes presented in Table 1.

Table 1. Themes and Codes Applied to Fall and Spring Reflections with frequencies

Themes and Codes	Definition, "Anxieties about..."	Fall	Spring
Academic Performance		160	186
GPA	grade point average	36	85
Exams	exams	21	35
Course Difficulty	difficulty of courses, present or future	27	26
Failing	failing a course, multiple courses, or out of the university	18	16
A Specific Difficult Course	performance in a specific course	24	13
Falling Behind	falling behind, with respect to the course material or peers	13	7
Understanding	grasping course content meaningfully or as well as peers	12	4
Specific Course Skills	specific skills required in a course (e.g., public speaking, presentations, using required technologies, teamwork)	9	0
Personal Management Skills		121	74
Workload	workload or course load	56	39
Balance	work-life balance or balancing academic requirements	23	14
Time Management	not having enough time or being able to effectively manage	25	12
Study Habits	study habits (e.g, keeping track of assignments, maintaining focus and motivation)	17	9
Practical Planning for the Future		69	71
Job Search	finding a job	19	48
Major Selection	choosing the right major	29	15
Career Selection	choosing the right career	19	4
Course Selection	choosing the right courses	2	4
Intrapersonal Struggles		43	52
Future	generally, what the future holds	13	17
Self-Doubt	one's own capabilities	15	16
Enough	being or feeling like "enough," against a societal or self-imposed standard	5	6
Mental Health	one's mental health	4	5
Identity	not fitting in, belonging at the institution, and how others view them	5	4
Purpose	why they were doing what they were doing and if it would be fulfilling	1	4
Non-Academic Elements of the College Experience		64	39
Social	finding community, making friends, joining clubs	48	21
Having the Right Experiences	doing or not doing some thing(s) that feel essential to college or an engineering career	8	13
Support	a lack of supporting resources, as a root cause or amplifier of other concerns	0	3
Finance	scholarships, tuition, and housing	2	2
Transition	adjusting to college life broadly, being away from home and usual circumstances	6	1
No Stress	no stressor identified or N/A as response	54	51

After all coding was complete, themes related to the variety of personal and academic anxieties reported by first-year engineering students emerged from the codes, including *Academic Performance*, *Intrapersonal Struggles*, *Non-Academic Elements of the College Experience*, *Personal Management Skills*, and *Practical Planning for the Future*. These themes and the related codes are shown in Table 1.

Academic Performance

The theme of *academic performance* was the most prevalent in participant responses (Table 1). While not explicitly asked about academic anxieties, participants may have reported more academic-related anxieties than personal or social anxieties that they may be facing, due to the context of the survey. Within *academic performance*, anxieties around *Grade Point Average (GPA)*, *Exams*, and *Course Difficulty* were reported more frequently in the spring than they were in the fall-- though these codes, along with a specific difficult course, were still the most common academic performance anxieties listed both spring and fall. The survey was distributed right before final exams in the spring, which may have influenced this trend.

Many one-word responses were “GPA,” “grades,” and simple variations thereof. Some participants explained that *GPA* concerns came with connected stressors, like maintaining scholarships or future job aspirations, as exemplified by participant 172’s spring response, “I am on an Air Force scholarship. My GPA impacts my job performance, and I don’t know that I will ever be able to obtain a GPA high enough to get the jobs that I want.” Participant 235 echoed a similar sentiment, sharing in their spring response, “I worry that my grades will be bad, and I will not be a successful systems engineer.” Several other participants expressed that their GPA-focused stress stemmed from their own goals and expectations. For example, participant 513’s fall reflection explained, “My biggest source of anxiety is that my grades will be below my standards and I’ll disappoint myself,” with participant 437 using similar language in the spring to convey, “my biggest source of anxiety is having my grades drop below the desired margins I have for them.” The *failing* code was only applied when participants explicitly expressed anxiety around failing, which was narrower than most participants’ broader grade concerns.

Generally, participants discussed *exams* as their primary stressor through the one-word response, “exams,” or by noting a desire to do well on exams or a fear of failing an exam. In the spring, one participant noted exams as particularly stressful due to both their frequency and difficulty, answering “mainly just the exams, so many midterms and finals, and they are hard.” Adding an additional consideration, participant 270 cited, “not doing well on tests, despite studying” as their primary concern in the fall, indicating stress from the tests themselves, but also the effort of preparing and feeling like it went to waste.

Course Difficulty followed a similar pattern of limited descriptions, with responses like “difficult classes” and was equally prevalent in the spring and fall (Table 1). However, two primary trends emerged within the code. The first was participants broadly concerned with course difficulty generally. For example, in their fall response, participant 179 said “the coursework seems difficult.” The second trend centered on concerns for future courses based on present performance. For example, participant 226 was concerned, “If I can get through hard classes if I am already struggling with Multivariable Calculus.” The two themes illustrate contrasting

examples wherein students express anxiety both about their current courses, but also how their current performance predicts their future potential.

Specific Difficult Course, *Falling Behind*, *Understanding*, and *Specific Course Skills* were more frequently reported in the fall than in the spring (Table 1). When participants cited *Specific Difficult Courses*, they tended to cluster around common first-year requirements like calculus, chemistry, and physics, which are known to be challenging courses for students at the study institution. The remaining codes were largely anticipatory anxieties, including *falling behind* and *understanding*, where participants may not yet be falling behind or not understanding material but anticipate that they might in the future. The sentiment is encapsulated by participant 437's statement, "Getting bad grades, not understanding coursework, not being par in course-understanding with my peers in the classroom." Many of these reported anxieties were colored by an implicit comparison to peers, such as participant 252 who was concerned with "keeping up with other intelligent people." These comparisons led to feelings of anxiety, and perhaps indicate a culture of competition that exists amongst students at this university who demonstrably feel like their success is measured against the achievement of their peers.

Personal Management Skills

Personal management skills was the next most common theme across participant responses (Table 1), capturing ideas around time management, balancing a large courseload, and practicing good study habits. *Workload* and *time management* concerns centered around "not having enough time," "not being able to get assignments done on time," and an assortment of similar one- or two-word responses (e.g., "workload," "course load," etc.). *Balance* included both work-life balance and balancing different academic requirements. The former was exemplified by participant 326, who expressed worry about "maintaining as high of a GPA as I can while balancing extracurricular athletic, research, ROTC involvements, and other clubs." The latter was well summarized by participant 300's spring reflection: "Balancing the courseload and making sure you didn't leave behind classes. I made that mistake too much this semester." These concerns grouped in personal management skills demonstrate that first year engineering students have many different responsibilities, both academic and non-academic, drawing on their focus and energy and are consistently concerned about managing these competing interests.

Across all sub-codes (*Workload*, *Balance*, *Time Management*, and *Study Habits*), more participants reported being anxious about *personal management skills* in the fall than in the spring (Table 1). This may be due to first-year student participants not yet having tested these skills in the fall or may be due to the participants having learned these skills over the course of the first year. We cannot say that the shift is due to increased skill but can report that participants less frequently reported anxieties around *personal management skills* in the spring.

Practical planning for the future

Participants consistently reported anxieties related to *practical planning for the future* in both fall and spring (Table 1). Within the theme of *practical planning for the future*, we noticed a clear shift in participants' reported anxieties. In the fall semester, *Major Selection* and *Career Selection* were more prevalent than they were in the spring (Table 1). *Major Selection* appeared in the fall in the form of stress about making the right choice at the major selection deadline,

which was midway through the spring semester. By the time participants took the survey in the spring, they had already selected a major, but several participants expressed doubts about their choice, like participant 584, who pondered if they had decided on, “a major that pursues my professional and financial ambitions but doesn’t lead to moral satisfaction.” In contrast, *Job Search* was by far the most common sub-code in the spring (Table 1), likely as participants were looking for summer employment opportunities, though some participant, like 584, also expressed such concerns in the fall.

Though less commonly reported (Table 1), *Career Selection* and *Course Selection* both highlighted participants at difficult intersections during their first year. In the fall, participant 256 said, “my biggest source of anxiety is choosing the right career. Everything revolves around the future, and now knowing what I want to do causes anxiety.” Participant 243 emphasized that even by the end of their first year, “I don’t really know what a job in engineering *looks* like; all I know is it’s different from an office or retail job, but I have no idea how I would feel actually working as an engineer.” Such concerns are not surprising, given how early the participants are in their academic careers, and the frequency in which they appear illustrate the common desire to have the future laid out, while the unknown of the future leads to anxiety. Concerns about *Course Selection*, the least common sub-code for this theme, reflected more short-term stress about the college experience. Participant 307 worried about “not knowing if I will get into all the classes I want,” while others like participant 424 worried about the puzzle of fitting a study abroad experience into their next seven semesters. These anxieties illustrate, on a smaller scale, the anxiety that students experience around uncertainty and planning for the future.

Intrapersonal Struggles

Intrapersonal Struggles was the least common theme (Table 1) but provided the most personal look at some of the deeper anxieties that participants voiced in their reflections. The sub-code *future* frequently appeared alongside codes like *Major* and *Career Selection* but was only applied when there was a more general concern as well. For example, participant 490’s response embodied this well, worrying about “if I am making the right choices and where to go after making those decisions.” Other participants noted a desire to have a “plan for the future,” and several pointed to specific concerns like “political uncertainty.” Concern for the future is not surprising and is even healthy and appropriate for first-year students who are sitting at the precipice of so many potential futures; however, this concern can easily become overwhelming and the anxiety about the future can hinder student experiences if students do not have appropriate support and resources to investigate their potential futures.

Self-doubt captured specific instances where participants’ anxieties stemmed from their own capabilities, like participant 591’s spring reflect: “Sometimes I think that I am over my head and do not think I will pass.” *Self-doubt* was often co-coded with *enough*, the sub-code applied when participants measured themselves against a standard, whether societal or self-imposed. Participant 499’s fall reflection captured both, as they feared “not being good enough to make it to the end.” These low-frequency but high-intensity anxieties about self-ability reflect a larger issue of engineering students viewing themselves as alone in a competition to prove they are worthy to achieve some “elite” status of engineer. Students’ perception of their own inadequacy has convinced them that they are “less-than” their peers and perhaps undeserving of success in

engineering. Meanwhile, current support structures more commonly address symptoms of this lack of confidence or self-belief without addressing the underlying cause.

While the remaining codes in this theme were infrequently present (Table 1), they were often personal and likely underrepresented in the data due to the impersonal, short-form nature of the survey responses. One such code, *Mental Health*, appeared in relation to its impact on the participants' capacity to perform academically and succeed broadly. Participant 417 took this one step further, explaining how mental health struggles made other stressors worse:

I feel that I need to decide on a major as soon as possible. I also feel that I cannot keep up with the various things that are expected of me. Most of the time I am doing well in class and socially, but I continually struggle with my mental health, and the pressure of my studies is an additional stressor that can exacerbate other things. I worry that I won't be able to cope with it and will be forced to withdraw even if I am doing well.

This response in particular, and participants' discussion of mental health and anxieties more broadly, illustrate the interconnected nature of these anxieties. It is not one cause, but a litany of factors that contribute to students' anxieties and success. College is a time for self-discovery in addition to learning that happens in the classroom and students' anxieties are therefore much bigger than anxieties about academic performance alone and supports must account for this. To illustrate students concerns about who they are becoming, responses from participants 192 and 550 captured two facets of *identity* concerns, expressing concerns about "the way people perceive me" and "not being recognized for my achievements," respectively. These reflections underscore anxieties of "self" in the present, with external perceptions defining their place in engineering. Another code, *purpose*, captured participant anxieties about "self" in the future. Participant 380 questioned their *purpose*, wondering "If I'll always remain the same, if I can improve for the better, get out of my habits that prevent me from being happy and fulfilled and value living." Participant 465 captured the intersection of *self-doubt* and *purpose* in their spring semester reflection, dreading the possibility of "wak[ing] up at 35 years old and I haven't figured it out nor achieved contentment or happiness." The intersection of these two codes suggests that participants are anxious that if they can't thrive in the present, how are they supposed to thrive so in the future? Across this theme, responses dealt with more existential anxieties than the responses found in, for example, the *academic performance* theme, and illustrated the ways that the various themes are related.

Non-Academic Elements of the College Experience

The most common concern in the *Non-Academic Elements* theme was social concerns (Table 1). Noticeably more common in the fall than the spring, participants noted how important it was to find people to spend time with. Participant 458 worried about "not being able to make the kind [of] friends I had in high school," while participant 479 feared "the possibility of being alone." A distinct comparative dimension of the *social* sub-code emerged during analysis as participants worried that they weren't measuring up to their peers. What separated this dimension from the previously noted sub-code *enough* was the lack of an absolute measure or standard. There was no specific goal for these participants, other than matching what they perceived their peers to be capable of. Participant 513 provided an example of this anxiety, in combination with the *Having the Right Experiences*, sharing that:

I am anxious that I am not doing enough outside of the classroom. I get good grades and keep myself busy in my free time doing things important to me, but I see peers doing research and leading organizations and feel that I am behind them.

Others expressed similar sentiments, using language like, “not lagging behind my peers” and, worrying that, “it should be easy when many of my peers understand something and I don’t.” The comparison to peers again in these quotes further illustrates the culture of competition in which students are experiencing self-discovery and learning to be engineers. They are constantly measuring themselves against others in both academic settings via GPA, but also in these non-academic facets.

The final few sub-codes only appeared a handful of times (Table 1), but marked important considerations, nonetheless. Participant 197 captured the essence of *Support*, reflecting, “I don’t know where I am going in my life, with career, major, and what I want to be honest. I feel really lost and don’t feel I have enough support.” Finally, present almost exclusively in the fall semester, *transition* was exemplified by Participant 179 noting that “the shift from high school to college is a bit of a jump, but it takes time to get used to.” Two others used the phrase “new environment” in their responses to similar effect, and another described the difficulty of being away from home and family.

No Stress

As the fourth most common response, numerous participants responded “none” or “N/A,” indicating that they did not have any specific anxieties to report (Table 1). It is possible that the prevalence of this code is skewed by participants who did not want to answer the short answer questions at the end of the survey due to the length of the instrument and used a filler answer to move forward with the survey.

Discussion

We anticipate that these results may seem obvious to those who interact with first-year engineering students but assert that this study provides research-based evidence that promotes action. These insights enable first-year engineering instructors, advisors, staff, and administrators to better support students both in the classroom and in formal or informal advising settings through improved understanding of the types of concerns and anxieties that students bring with them.

To address both research questions, we will first discuss the most prevalent stressors students experienced and the implications thereof, and then we will examine a range of semester-to-semester changes and theorize why such differences were observed.

Research Question 1: Most Common Anxieties

At the heart of these findings—and the answer to the first research question—was the prevalence of academic stressors. Academic performance was the most reported stressor, which was not surprising. Prior work has come to similar conclusions in different contexts, even if their categorizations of academic stressors vary slightly from those used for this study (e.g., time

management being categorized as academic vs. Personal Management; [14]). What stood out about the prevalence of academic anxieties, however, was how students tied other concerns back to their academic woes in one way or another. Due to how many surveys included academic concerns, it was not surprising to observe that they were also the most frequently co-coded anxieties both within and across themes. However, the way students reported their worries paints a more insightful picture.

Job prospects hinged on getting high enough grades. Students felt they couldn't measure up to their own expectations, their peers, or the pressures being applied from others in their lives, all due to slipping GPAs. Financial aid—and by extension, continued undergraduate study—hung in the balance of their transcripts. Academic concerns were not just the most common; they were the root of many other anxieties that students described. Even when not co-coded, many of the other codes sit in support of academic performance. *Time management* and *study habits* functioned as tools to mitigate academic anxieties. *Balance* often described the struggle of trying to keep up with a life around a rigorous academic schedule. Students worried about their *major selection* because they didn't know if they would be able to succeed. Whether students were chasing them or trying to build a life around them, grades dominated the forefront of the students surveyed in our study.

Importantly, findings demonstrate that first year engineering students commonly experience many, varied anxieties across both academic and non-academic dimensions. To fully support students, instructors and advisors must begin to understand the symptoms but also the complex, underlying sources of students' anxieties. For example, students are, understandably, concerned about their future and the unknowable nature thereof. They want their future to be “solved,” from their course schedule to their post-graduation plans. Resources are necessary not only to help students come to realize their futures, but also to embrace the uncertainty and potential in the many possibilities before them. Many students feel the need to have a career and even a job lined up in their first year of college, but this isn't the reality, and instructors and advisors have a role in easing this anxiety. Concerns about the future hinder student experiences in the present if students are not equipped to investigate their potential options and are instead pressured to prematurely choose a single future.

Further, participants' reflections about self-doubt and wanting to be “enough” illustrate the related nature of academic and non-academic stressors. Supports may address the symptoms, such as academic performance, while overlooking the deeper issue of student self-discovery. Tutoring, for example, might make a student feel more comfortable with course content, but likely does not impart them with the belief that they can succeed independently in future courses. Such confidence is developed incrementally through repeated successes, external support, and internal reflection, underscoring the need for a multi-faceted approach to support students to address the underlying doubts. Higher levels of self-confidence and a perceived culture of support have both been identified as crucial factors for improving students' persistence in engineering [22]. Additionally, issues of self-doubt and “enough-ness” are linked to comparison and the implicit competition that accompanies it. Feeling inadequate is widespread, despite the evidence that graduates of the study institution are often successful as recognized by their peers and the institution. Due to the implicit competition, students may feel alone in their anxieties and

self-doubts and, despite available supports, may not be comfortable seeking help, in line with prior research that shows engineering students are less help-seeking [9], [13].

Finally, issues of self-doubt and concerns about the future are also interconnected, as demonstrated by students' anticipatory anxieties about difficult classes, failing exams, finding jobs, and achieving their purpose. This illustrates that students may feel anxious when they don't embrace a growth mindset and feel like their futures are tied to their performance in a single course or exam.

Research Question 2: Change from the Beginning to the End of the First Year

A number of shifts were observed from the fall semester survey responses to the spring semester responses, and while this study's dataset does not provide concrete causal explanations, we present some theories for why these trends appear.

Students' anxieties about their *GPA* surged in the spring. A likely reason for this is that by the end of the spring semester, students have an actual concrete figure to work with and be worried about. At the beginning of the fall semester, anxieties about grades would be purely theoretical, as their undergraduate careers were only beginning. In the spring, however, students had one full semester of recorded grades and likely had a sense of how the second semester grades were going to turn out as well. As such, the increase in reported *GPA* anxiety might be attributed in part to when the question was asked. With numbers to worry about, stress about their academic performance became more concrete. Anxiety about exams similarly increased in the spring. Again, this is not surprising given that the spring survey was distributed immediately before final exam week, and, having previous experience with midterms and final exams, it made sense that students identified exams as a key stress point in the spring. This finding is broadly in line with prior work that emphasizes exams as a time of peak stress [14].

There was a noticeable decrease in the prevalence of *Personal Management Skills* codes from the fall semester to the spring. As students spend more time adjusting to college, it makes sense that many of them would become more comfortable with the skills they need to manage their schedules, balance their coursework, and stay on top of the multitude of demands on their time. The first-year engineering course sequence at the study institution does introduce strategies for improving many of these skills both in the engineering design process (e.g., Gantt charts for project timeline management) and informal academic settings (e.g., prioritizing assignments, not procrastinating, etc.). However, time and workload management, finding and enforcing balance, and planning ahead are best developed through intentional practice. As a result, it is difficult to attribute the decrease in reported anxieties around *personal management skills* to any one factor, as it is more likely a combination of multiple.

The trend that was most concretely mapped out by student responses was the recharacterization of what the *Major Selection* code covered between the fall and spring. At the study institution, students declare their engineering major in the middle of the spring semester, between the first and second distribution of the survey. As a result, we saw a reduction in reported anxieties about major selection. Instead, that stress was replaced by a retrospective concern about whether they had made the right choice. Students were reminded that the choice they made was not permanent

and could be changed, but the choice to change majors later on carried financial and academic stressors like wasted credit hours and extra semesters for many students all the same. There was a decline in frequency from fall to spring as well, indicating that the anticipatory stress of major selection was more prevalent than the uncertainty that followed.

There was little meaningful change in the frequency of *Intrapersonal Struggles* codes between the fall and spring. This suggests that there is some degree of consistency in student anxieties around self-doubt, belonging, and what the future could hold, even if it wasn't always the same students experiencing them. In contrast to the *Personal Management Skills*, internal doubts and uncertainty about the future are more difficult for students to practice or work on without much greater intentionality. Where academics are a required part of day-to-day life for students, managing intrapersonal difficulties in a meaningful and productive way often requires connecting with outside resources or purposeful practice. Thus, academic supports alone may not address the intrapersonal difficulties students are experiencing.

The frequency of reported *Social* anxieties decreased substantially in the spring, particularly in the areas of making friends and finding community. This was unsurprising, as students looking ahead to their very first semester of college are more likely to feel adrift and isolated until they have a chance to be socialized into their new environment (e.g., [23-24]). By the end of the spring semester, many of the students who initially reported that they were worried about making connections had done so, at least to a point where it was no longer the foremost anxiety on their mind. Both the semester-to-semester change and the remaining students for whom *social* connections remained a predominant source of stress underscore the importance of socialization in the first year. Prior research has demonstrated the value of early social connections for students' sense of belonging [24-25], academic success, and long-term satisfaction with their undergraduate experience. While the decline in frequency was good to see, the remaining population suggests there is more work to be done to support first-year students' social integration in a new campus environment.

Finally, as previously noted, it was difficult to assess how many students were actually experiencing no anxieties versus how many entered N/A to complete the survey and move on to other tasks. The implications of this number are important, as it speaks to the potential population of students who are adapting well to their first year of college.

Conclusions and Future Work

This work presents a series of observations about students' self-reported anxieties at the beginning and end of their first year in engineering. At the center of these findings was the high prevalence of academic pressures—GPA, exams, and an intense workload—not only as primary sources of anxiety, but the root cause for a number of related anxieties as well. When students were focused largely or entirely on their academic outcomes, it affected their abilities to find balance with other aspects of life, manage their time, and find confidence in their own capabilities. These anxieties, in turn, turned into worries about future success, fitting into a perceived culture of achievement, and finding fulfilling work after graduation. The findings do not assert that every anxiety stems from an academic cause, but the pattern emerged for many students all the same.

The question that follows, then, is if we alleviate the pressure that students feel to perform academically, would it alleviate stress in other areas as a result? There is substantial emphasis from instructors, administrators, parents, and other key figures in students' lives to achieve academically, but prior research has shown that a good GPA alone is not a good predictor of a student's ability to perform in engineering industry [26-27]. Students are pushed to pursue extracurriculars, summer engagements, and social outlets during what is inarguably a formative period of life. The non-academic benefits of a college degree are frequently touted by universities for promotional media, from finding community to developing a purpose. Future work will investigate the academic stress students are experiencing further. In order to best manage it, the engineering education community must better understand where the stress comes from, how it affects students in their day-to-day lives, and what can be done to most effectively mitigate its consequences.

The clearest direction for future work is to expand the study to begin exploring the causes of students' anxiety in greater depth. Where survey responses provided a useful overview of the trends, including interviews or more detailed written responses would provide insight into both the origins of students' anxiety and the reasons for the fall to spring changes observed in this work. This study could also be furthered by broadening the study population to include second-, third-, and fourth-year students, providing a cross-sectional examination of how anxieties persist or change throughout the rest of students' academic careers. Furthermore, while this study sought to examine general trends without delineating results by any kind of demographic identifiers, applying those lenses would likely provide useful information about the differential anxieties for different student populations.

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