An Analysis of the Impacts of Imposter Syndrome on Engineering Students

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Abstract

This study, led by undergraduate engineering researchers, examines how imposter syndrome changes across students' academic careers and identifies events that increase or decrease imposter syndrome levels.

Imposter syndrome is characterized by persistent self doubt and fear of being exposed as a fraud despite objective evidence of success. Prior research has linked imposter syndrome to decreases in self-efficacy, psychological well-being, and student retention in demanding academic environments. Within engineering programs, competitive grading structures and heavy workloads may exacerbate these feelings, particularly for students navigating additional structural barriers such as gender and socioeconomic status. For this reason, this study was conducted on third- and fourth- year engineering students at Louisiana Tech University enrolled in a National Science Foundation (NSF) program meeting eligibility criteria based on demonstrated financial need. This group was compared to third- and fourth year engineering students from Louisiana Tech University not enrolled in the program. Quantitative data was collected using the Clance Imposter Phenomenon Scale (CIPS), which measures dimensions of imposter syndrome such as fear of failure and discounting success. Group differences were analyzed using independent-samples statistical tests to examine variation across program participation. Qualitative data was collected through open-ended survey responses to determine how students interpret their academic experiences and attribute success or failure to imposter syndrome each academic year.

By integrating quantitative and qualitative approaches, this study aims to better understand how imposter syndrome manifests among financially and socially supported students, and to identify features that may support student confidence and persistence in engineering.

Introduction

Imposter syndrome, also known as imposter phenomenon or fraud syndrome, describes a psychological pattern where high-achieving individuals doubt their accomplishments and fear being exposed as frauds despite obvious successes they may have. Individuals experiencing imposter syndrome often attribute their achievements to external factors such as luck and timing, rather than their own skills or merit [1]-[2]. As a result, they may discount positive feedback and remain unconvinced of their competence. Research has identified several cognitive and behavioral characteristics commonly associated with imposter syndrome, including chronic self-doubt, fear of failure, perfectionism, and harsh self-criticism [3]-[4]. These traits can contribute to emotional distress and negative academic experiences, especially in high-achieving environments.

Imposter syndrome is especially prevalent in higher education, where students may be experiencing heightened academic expectations and frequent evaluations. Prior studies have demonstrated that imposter syndrome is more common in environments where intellectual ability is perceived to be central to success, such as STEM disciplines [5]. Engineering education is often characterized by a culture that emphasizes rigor, competition, and high-performance in its students [6]. High-pressure work environments can also amplify feelings of inadequacy, especially with new hires in a group of experienced employees [7]. In these sorts of environments, imposter syndrome can negatively affect academic performance, sense of belonging, and career persistence [2].

Research has identified several factors associated with higher levels of imposter syndrome, including experiences of discrimination and marginalization. Studies have observed higher levels of imposter syndrome among groups subjected to gender, race, or socioeconomic discrimination [8]-[9]. Findings regarding the influence of socioeconomic status on imposter syndrome are mixed, with some studies reporting no significant correlation [10]-[11], while others indicate a strong correlation [12]-[13]. These inconsistencies suggest a need for more targeted research into how economic factors interact with imposter syndrome in the academic setting.

Imposter syndrome is commonly measured using the Clance Imposter Phenomenon Scale (CIPS), a validated 20-item instrument to measure imposter feelings and fears of intellectual fraud. Prior studies have shown that the CIPS has been reliable in differentiating individuals who experience imposter syndrome from those who do not [4],[8]. While the scale does rely on self-reported perceptions, many studies combine the CIPS quantitative data with qualitative data provided by respondents to gain a more complete understanding of experiences [14]-[15]. The study presented here in this paper uses the CIPS to measure imposter levels.

With the increase in mental health severity in college students [16] and the demanding nature of engineering, imposter syndrome represents a significant concern within this population. Financial stress, in particular, has been linked to both poor mental health outcomes and heightened imposter syndrome, suggesting that programs addressing financial burden alongside academic success and social belonging may help mitigate these effects among engineering students. At Louisiana Tech University, this approach is being implemented through a $1.5 million National Science Foundation (NSF)–funded Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) program.

Overview of the S-STEM Program and Activities

The NSF S-STEM Program seeks to increase the success of low-income, academically talented students through academic, financial, and social support. S-STEM participants receive a university scholarship of up to $10,000 annually while benefiting from additional activities and resources [17]-[22]. While various academic and support resources are included in the implementation of the specific S-STEM Program discussed here, this paper focuses on the differences of experiences of imposter syndrome of students within the S-STEM program compared to students not within the program.

The SUCCESS Scholars Program began in fall 2022 with 24 first-year students (Year 1 cohort) and expanded in fall 2023 with 22 additional first-year students (Year 2 cohort). By winter 2025, when this research was conducted, the program consisted of 15 students in the Year 1 cohort and 17 in the Year 2 cohort [21]-[22]. Participants were selected from a pool of low-income, academically talented applicants meeting S-STEM Program criteria. The program aimed to

combine best practices from other S-STEM initiatives, providing tiered support through nine key elements. Initially, the focus was on direct academic support. As students advanced, the emphasis shifted to professional development, including career preparation, interview skills, resume writing, and job applications. A social component was also introduced, with optional weekly professional development lunches and planned social activities to foster community, build connections, and balance academic and professional growth with social engagement.

The institution in which this research was conducted is a PWI, with over 72% of students' race being White [23]. The undergraduate students who are leading this research project are senior- and junior-level students in the SUCCESS Scholars Program. As students in this program and Louisiana Tech University, their experiences may influence the interpretation and analysis of the data in this paper.

Research Questions

This exploratory study seeks to address questions regarding imposter syndrome effects on engineering and engineering technology students within the SUCCESS Scholars Program and general population students. The quantitative component of the study addresses the question: "Do the students in the SUCCESS Scholars Program have decreased feelings of imposter syndrome compared to general population engineering and engineering technology students?" This portion evaluates measurable differences in reported imposter syndrome levels between the two groups. The qualitative component addresses the question: "What events cause an increase/decrease in imposter syndrome, and are the events the same or different for both groups?" This portion explores students' perceived experiences and contextual factors influencing changes in imposter syndrome through open-ended feedback.

Methods

A Google Form was emailed to the general population of third- and fourth-year engineering and engineering technology students as well as the students in the SUCCESS Scholars Program. As a way to gain more interest in the survey, a giveaway of a $50 gift card was advertised for one of the respondents to win. To maintain survey anonymity, students were directed to a different site, and their personal information was verified by a third party.

The survey itself consisted of 37 base questions, with up to 73 questions depending on how many academic years the student had completed. Each academic year was divided into different sections of the Google Form. The goal of this survey was to retrieve data on past and current imposter syndrome levels of the students, gather information as to what sort of things triggered fewer or more feelings of imposter syndrome, as well as gather qualitative data from the students in the form of open-ended questions to fully understand the experiences of the students throughout their academic careers. None of the questions were required to move on to the rest of the survey, and students could elect to leave as many as they wanted blank to ensure all responses were voluntary. The sections of the survey are outlined below.

Background Baseline participant information included three demographic questions, one question identifying academic level based on completed credit hours, one question assessing current socioeconomic status, and one to four questions determining academic standing within the curriculum. Current imposter syndrome perceptions were measured using the 20-item Clance Imposter Phenomenon Scale (CIPS).

Questions regarding prior and current experiences with imposter syndrome were organized by academic year completed, with a maximum of four years represented. Students responded to five questions per academic year completed (ranging from 5 to 20 questions total) assessing previous and current experiences with imposter syndrome. For each academic year completed, students were also asked to rate their overall level of imposter syndrome during that year on a scale from 1 (low levels of imposter syndrome) to 5 (high levels of imposter syndrome), resulting in up to four rating questions. Additionally, for each academic year completed, students identified events that increased their imposter syndrome (up to four questions), selected the most influential event contributing to that increase (up to four questions), identified events that decreased their imposter syndrome (up to four questions), and selected the most influential event contributing to that decrease (up to four questions).

One optional open-ended question per academic year completed (up to four total) allowed students to provide additional qualitative information and further describe their experiences with imposter syndrome.

Results

The Google form had 97 responses, 73 of which were general population engineering and engineering technology students, and 24 of those being students in the SUCCESS Scholars Program. After data cleaning to only have responses from third- and fourth-year engineering and engineering technology students by curriculum, 57 students from the general population and 22 students from the SUCCESS Scholars Program met the requirements. The open-ended discussion questions were not a required component of the survey. Therefore, not all respondents answered them. In total, 13 students from the general engineering population and eight students from the SUCCESS Scholars Program responded to at least one of the open-ended questions (not including responses that said "N/A" or the like).

Socioeconomic Status The question regarding students' current socioeconomic status was a multi-select multiple choice question with an optional open-ended "other" question students could fill out to give more information. The students were given the below options, and were prompted to check all that applied.

- I am eligible for Pell Grants or other need-based financial aid
- I have/qualify for student loans
- I have/qualify for a work-study position
- I have significant financial constraints
- Prefer not to say
- Other: _____ (open-ended)

All students from the SUCCESS Scholars Program selected at least one response option, although one student selected only "Prefer not to say." In contrast, 51 students (53%) from the general engineering population selected at least one option, with seven of those selecting only "Prefer not to say." Three students from the general population used the open-ended response to

specify merit-based scholarships they had received, while the remaining 19 students left the financial aid question blank. Eligibility for the SUCCESS Scholars Program requires demonstrated significant financial need, and thus this group was intended to represent the socioeconomically disadvantaged population. However, because the majority of respondents in the general survey who answered the financial aid question indicated receipt of need-based aid, a meaningful financial comparison between groups could not be conducted.

Clance Imposter Phenomenon Scale The Clance Imposter Phenomenon Scale (CIPS) section of the survey included 20 questions to determine the current imposter syndrome level of the respondent [27]. The items were answered using a five-point Likert scale, with values ranging from 1 - not at all true, 2 - rarely true, 3 - sometimes true, 4 - often true, and 5 - very true. The total score for the CIPS ranges from 20 to 100, with this score being the addition of the answers given for the 20 items of the CIPS test. The scores produce four Imposter Syndrome levels: none to mild (0-40), moderate (41-60), significant (61-80), and intense (81-100).

The current Imposter Syndrome levels of the general population of third- and fourth-year students and the SUCCESS Scholars Program students were calculated using the values indicated on the CIPS part of the survey. Overall data from the CIPS questions can be seen in table 11 in the Appendix. The average of both sets of students, divided by third- and fourth-year status, was calculated to serve as a baseline for the current levels. This data can be seen in Table 1.

Table 1. Current Imposter Syndrome Levels for General Population (N = 57) and SUCCESS Scholars Program (N = 22) Students

		N	CIPS Score	IP Level
General Population	Third Year	24	68	Significant
	Fourth Year	33	64	Significant
SUCCESS Scholars Program	Third Year	11	64	Significant
	Fourth Year	11	56	Moderate

After the students took the CIPS section of the survey, the term “imposter syndrome” was then explained to them before they completed the rest of the survey. Imposter syndrome was only defined after the CIPS portion of the survey in an attempt to eliminate student bias in answering the CIPS questions. The definition presented to the students is presented below:

> “Imposter Syndrome is defined as the constant fear of being exposed as a fraud, believing that others are more competent and more intelligent than you are, and believing that your personal successes are due to luck and circumstance rather than hard work and intelligence. The following sections will ask you to reflect on your experiences with imposter syndrome throughout your years of college.”

Statistical Analysis A Mann-Whitney U test was run on each of the four questions asking students to rate their experience with imposter syndrome for each academic year, seen in Tables 2 and 3. The Mann–Whitney U test was chosen because impostor phenomenon scores were derived from Likert-type survey data, and some groups violated assumptions of normality and homogeneity of variance. The data from the SUCCESS Scholars Program and the general population were compared to each other for each of the four questions.

Table 2. Response Number per Academic Year Question

First Year		Second Year		Third Year		Fourth Year	
General Population	SUCCESS Scholars Program	General Population	SUCCESS Scholars Program	General Population	SUCCESS Scholars Program	General Population	SUCCESS Scholars Program
55	23	51	22	48	21	29	11

Table 3. Mann-Whitney U Test on Imposter Syndrome Levels per Academic Year

				95% Confidence Interval (absolute value)			
	Statistic	p	Mean difference (absolute value)	Lower	Upper		Effect Size
First Year	549	0.249	3.59e-5	1.00	8.12e-5	Rank biserial correlation	0.162
Second Year	550	0.699	3.01e-5	1.000	1.000	Rank biserial correlation	0.0566
Third Year	439	0.269	4.31e-5	9.35e-5	1.00	Rank biserial correlation	-0.164
Fourth Year	149	0.377	2.77e-5	8.01e-5	1.00	Rank biserial correlation	-0.172

Note $H_0\ \mu_{General\ Population} \neq \mu_{Program}$

No statistically significant differences were observed for first-year ($p = 0.249$), second-year ($p = 0.699$), third-year ($p = 0.269$), or fourth-year and above students ($p = 0.377$). Nonparametric Mann–Whitney U tests corroborated these findings. Effect sizes across all comparisons were small, suggesting minimal practical differences between groups.

Table 4. Cronbach's α Analysis

	Cronbach's α
SUCCESS Scholars Program	0.881
General Population	0.841

Cronbach's α was also performed on both groups, to verify internal consistency for each of the four questions rating imposter syndrome levels. The results demonstrated good internal

consistency reliability for both the SUCCESS Scholars Program ($\alpha = 0.881$) and general population students ($\alpha = 0.841$), indicating that the instrument functioned reliably across groups.

Activities that Affected Imposter Syndrome As part of the section collecting data on past and current imposter syndrome experiences, students were asked to identify activities and events that triggered either increases or decreases in their imposter syndrome levels, addressed as separate questions. These scores were different from the CIPS scores, as they were reflective of how students remembered their imposter syndrome in the past and were therefore less accurate than the CIPS scores. The list of activities and events varied slightly by academic year to reflect milestones encountered as students progressed through their studies. Examples of survey options included "performing well or poorly on a math, engineering, or major-specific exam," "receiving or not receiving an internship or full-time offer," and "dropping or failing a class." Students were first instructed to select all events that contributed to either an increase or a decrease in imposter syndrome feelings and were subsequently asked to identify the single most influential event associated with that change. With the comparison of these groups, it is important to note that there are overlapping socioeconomic statuses, and being in the SUCCESS Scholars Program did not produce a significant result in lowering imposter syndrome levels. Comparisons between the two groups are made below, but it should be noted that the differences are not statistically significant.

Tables 5-6 below show the top three most frequently listed events that students from the general population and the SUCCESS Scholars Program listed as increasing their level of imposter syndrome for each academic year. Each event has the frequency that the event was listed per academic year.

Table 5. Top 3 Most Frequently Listed Events for Causing an Increase in Imposter Syndrome in General Population Students

First-Year		Second-Year		Third-Year		Fourth(+)-Year	
Event	Frequency	Event	Frequency	Event	Frequency	Event	Frequency
Performing poorly on a math/engr exam	31	Performing poorly on a math/engr exam	33	Performing poorly on a major specific exam	32	Performing poorly on a major specific exam	13
Performance at the ENGR122 Design Expo	24	Dropping/ failing a class	25	Dropping/ failing a class	16	Not receiving a full-time job offer	9
Transition from high school to college	20	Negative feedback from professors/ employers	14	Negative feedback from professors/ employers	11	Negative feedback from professors/ employers	8

Table 6. Top 3 Most Frequently Listed Events for Causing an Increase in Imposter Syndrome in SUCCESS Scholars Program Students

First-Year		Second-Year		Third-Year		Fourth(+)-Year	
Event	Frequency	Event	Frequency	Event	Frequency	Event	Frequency
Transition from high school to college	15	Performing poorly on a math/engr exam	15	Not receiving an internship offer	10	Not receiving a full-time job offer	3
Performing poorly on a math/engr exam	11	Not receiving an internship offer	10	Performing poorly on a major specific exam	9	Negative feedback from family	2
Not receiving an internship offer	7	Dropping/ Failing a class	8	Negative feedback from professors/ employers	5	Negative feedback from professors/ employers	2

The event most frequently listed for causing an increase in imposter syndrome levels was also the same event identified to be the most important, except for the second-year students in both

the general population and SUCCESS Scholars Program. For these groups, dropping/failing a class was identified as the most important factor contributing to increased imposter syndrome. Twenty-two respondents from the general population said that dropping/failing a class was the most important factor, compared to 15 respondents for performing poorly on a math/engineering exam. For the SUCCESS Scholars Program students, 8 respondents marked dropping/failing a class to be the most important factor, while 6 respondents marked performing poorly on a math/engineering exam.

While academic performance–related events were the most frequently reported triggers of increased impostor syndrome across both groups, SUCCESS Scholars Program students consistently reported career-related and transition-based stressors earlier than general population students. First-year program participants most frequently cited the transition from high school to college, whereas general population students emphasized exam and design-course performance. By the third and fourth years, both groups increasingly identified internship and full-time employment outcomes as primary contributors to impostor feelings.

Tables 7-8 show the top three most frequently marked events for causing a decrease in imposter syndrome levels for general population students and SUCCESS Scholars Program students.

Table 7. Top 3 Most Frequently Listed Events for Causing a Decrease in Imposter Syndrome in General Population Students

First-Year		Second-Year		Third-Year		Fourth(+)-Year	
Event	Frequency	Event	Frequency	Event	Frequency	Event	Frequency
Performing well on a math/engr exam	38	Performing well on a math/engr exam	27	Positive feedback from peers	31	Positive feedback from peers	22
Positive feedback from peers	30	Positive feedback from professors/ employers	26	Performing well on a major specific exam	26	Positive feedback from professors/ employers	19
Positive feedback from professors/ employers	27	Positive feedback from peers	25	Positive feedback from professors/ employers	26	Performing well on a major specific exam	11

Table 8. Top 3 Most Frequently Listed Events for Causing a Decrease in Imposter Syndrome in SUCCESS Scholars Program Students

First-Year		Second-Year		Third-Year		Fourth(+)-Year	
Event	Frequency	Event	Frequency	Event	Frequency	Event	Frequency
Performing well on a math/engr exam	16	Performing well on a math/engr exam	10	Performing well on a major specific exam	16	Positive feedback from professors/ employers	8
Positive feedback from professors/ employers	14	Positive feedback from professors/ employers	10	Positive feedback from professors/ employers	13	Positive feedback from peers	7
Positive feedback from peers	13	Positive feedback from peers	10	Positive feedback from family	10	Positive feedback from family	6

The most important factor contributing to decreases in imposter syndrome levels did vary slightly from the event most frequently reported as influencing the decrease. For first- and

second-year students in both the general population and the SUCCESS Scholars Program, no differences occurred between the most frequently listed event and the most important factor. However, differences did occur among third- and fourth-year general population students. For third-year students, getting an internship was identified as the most important factor with 10 responses, compared to receiving positive feedback from peers with 8 responses. For fourth-year students, the most important factor was split between getting a full-time job offer and performing well on a major specific exam with 7 responses each. The most frequently listed factor of positive feedback from peers only received 4 marks as the most important factor.

Across all academic years, both general population and SUCCESS Scholars Program students most frequently identified academic success and positive social feedback as factors that decreased impostor syndrome. First- and second-year students in both groups emphasized performing well on math and engineering exams, while third- and fourth-year students increasingly reported positive feedback from peers and professors/employers. SUCCESS Scholars Program students consistently prioritized validation from professors and employers across all years, whereas general population students more frequently cited peer feedback, particularly in later years.

Open-Ended Feedback Students were able to provide additional context through an open-ended question for each academic year, offering qualitative insights into how students interpreted their academic experiences and attributed success or failure over time. The feedback provided by the students was analyzed in conjunction with the students' respective CIPS scores and ratings of imposter syndrome per academic year. The open-ended responses gave clarity to some of the students' answers, as well as a more personalized and in-depth look into how imposter syndrome impacted each individual.

One general population student reflecting on their sophomore year described feeling that many classes were "a lucky break," while another student noted that failing a class for the first time led them to pivot to an "easier" engineering technology major.

A general population senior reflected on a contradictory relationship with imposter syndrome during their third year of college, explaining that praise sometimes felt genuine, but other times felt like they had "tricked" others into thinking they were smart. This student indicated that receiving a sort of positive feedback was the most important factor in both increasing and decreasing their level of imposter syndrome for this academic year. Other students shared this sentiment, sharing that some doubted the authenticity of positive feedback. In contrast, a SUCCESS Scholars Program senior reflected on their third-year by mentioning how "getting recognition from [their] student organization . . . helped solidify to [themselves] that [they] had gotten to where [they were] because [they are] awesome and that it is ok to be celebrated." This student noted their realization as being the most important factor in decreasing their imposter syndrome that year.

Current general population juniors reflecting on their third year had both positive and negative interactions with internships and their effect on imposter syndrome levels. A student mentioned not believing that they deserved their internship due to low academic performance, and another student mentioned receiving an immediate return offer to the company for the next summer boosted their confidence. Getting an internship offer was the most important factor for general population third-year students in decreasing their imposter syndrome levels.

In senior year, a general population student reflecting on their senior year questioned whether "the feeling of not deserving of this degree ever go anyway [*sic*]," illustrating the uncertainty and self-doubt that may persist as students approach graduation and prepare to enter the workforce. In contrast, other students reported feeling more adequate during their senior year, with a student noting that they had "made the transition required" from student to engineer. A senior in the SUCCESS Scholars Program reflected on their current relationship with imposter syndrome by describing how they did not feel like they were ready, and that they've "barely learned anything (even though [they] know that's not true)." This feeling of not being ready is what the student marked as being the most important factor in increasing their imposter syndrome during their fourth-year of college.

The qualitative survey responses highlight how students' interpretations of success, failure, and feedback evolve throughout their academic careers and strongly shape their imposter syndrome experiences. Across years, general population students questioned the authenticity of positive feedback and expressed persistent self-doubt. Conversely, students in the SUCCESS Scholars Program more often described moments of recognition and self-reflection reducing their feelings of imposter syndrome. These narratives underscore that imposter syndrome is impacted by different milestones and experiences, and suggest that support and validation may assist students in accepting their accomplishments over time.

Conclusions

This exploratory study examined differences in imposter syndrome levels between students participating in an NSF S-STEM SUCCESS Scholars Program and general population engineering and engineering technology students at Louisiana Tech University. The study also investigated events associated with an increase or decrease in imposter syndrome levels and evaluated if these events differed between the groups. The data was collected using a Google Form emailed to students, and the Clance Imposter Phenomenon Scale (CIPS) was used to assess imposter syndrome levels.

Quantitative analyses did not reveal statistically significant differences in imposter syndrome levels across program participation. While these results suggest that imposter syndrome may be broadly experienced across engineering student populations rather than concentrated within specific subgroups, they should be interpreted in light of the study's sample size and scope. Despite there not being any statistically significant findings, qualitative student responses highlighted common patterns in student experiences of imposter syndrome levels over time. Student comments showed how positive feedback and academic and professional accomplishments reduced imposter syndrome over their academic career, while poor exam performance and not receiving an internship offer increased their feelings of inadequacy over their career.

These findings carry important implications for future research, theoretical development, and practical interventions in engineering education These findings carry important implications for

future research, theoretical development, and practical interventions in engineering education. From a research perspective, the lack of statistically significant quantitative differences underscores the need for longitudinal and multi-institutional studies to better capture how imposter syndrome evolves over time and across contexts, particularly in relation to structured support programs. Theoretically, the results suggest that imposter syndrome in engineering may be less tied to program participation alone and more closely related to situational academic and professional experiences, pointing to the value of integrating frameworks such as social comparison theory, belongingness, and self-efficacy into future models of engineering student persistence. Practically, the qualitative findings indicate that timely, specific positive feedback, structured mentorship, transparent discussion of failure, and support during high-stakes academic and internship application periods may serve as effective intervention points. Engineering educators and program designers may therefore consider embedding reflection activities, normalization of struggle, and intentional recognition of student achievements into curricula and co-curricular programming to proactively reduce imposter-related feelings and support student confidence and retention.

Future work with larger and more diverse samples may further clarify trends and evaluate the effectiveness of targeted interventions to mitigate imposter syndrome. Further research may also be done to compare imposter syndrome levels between SUCCESS Scholars Program students and financially-disadvantaged general population engineering students. Gender and race differences may also be analyzed to determine imposter syndrome levels over each group.

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Appendix

Table 9. Clance Imposter Syndrome Scale Questionnaire

Question
I have often succeeded on a test or task even though I was afraid that I would not do well before I undertook the task.
I can give the impression that I'm more competent than I really am.
I avoid evaluations if possible and have a dread of others evaluating me.
When people praise me for something I've accomplished, I'm afraid I won't be able to live up to their expectations of me in the future.
I sometimes think I obtained my present position or gained my present success because I happened to be in the right place at the right time or knew the right people.
I'm afraid people important to me may find out that I'm not as capable as they think I am.
I tend to remember the incidents in which I have not done my best more than those times I have done my best.
I rarely do a project or task as well as I'd like to do it.
Sometimes I feel or believe that my success in my life or in my job has been the result of some kind of error.
It's hard for me to accept compliments or praise about my intelligence or accomplishments.
At times, I feel my success has been due to some kind of luck.
I'm disappointed at times in my present accomplishments and think I should have accomplished much more.
Sometimes I'm afraid others will discover how much knowledge or ability I really lack.
I'm often afraid that I may fail at a new assignment or undertaking even though I generally do well at what I attempt.

When I've succeeded at something and received recognition for my accomplishments, I have doubts that I can keep repeating that success.
If I receive a great deal of praise and recognition for something I've accomplished, I tend to discount the importance of what I've done.
I often compare my ability to those around me and think they may be more intelligent than I am.
I often worry about not succeeding with a project or examination, even though others around me have considerable confidence that I will do well.
If I'm going to receive a promotion or gain recognition of some kind, I hesitate to tell others until it is an accomplished fact.
I feel bad and discouraged if I'm not "the best" or at least "very special" in situations that involve achievement.

Tables 10-17 below present student responses regarding which academic activities during each year of their academic career contributed to either increases or decreases in imposter syndrome. The question shown on the left of the table was multi-select, allowing students to choose all activities that applied to their experience in a given year. In contrast, the question on the right was single-select (multiple choice), requiring students to identify the one activity they perceived as most influential that year.

Importantly, the answer choices were identical for both the "increase" and "decrease" questions. While this structure may initially appear contradictory, it was intentional. Providing the same options for both increases and decreases in imposter syndrome helped mitigate framing bias and allowed students to accurately represent the complexity of their experiences. The same activity could increase imposter feelings if a student perceived themselves as underperforming relative to peers, but could also increase imposter feelings if they performed well yet attributed their success to luck or a "fluke." Similarly, certain experiences might decrease imposter syndrome for some students while increasing it for others.

Table 10. Activity Questions Increase in Imposter Syndrome - First Year

Questions	
What are some things that occurred during your first year of college that caused this feeling of imposter syndrome to increase? (Multi-select)	**If you had to say which of these things was the most influential in causing your imposter syndrome to increase your first year of college, which one would it be?** (Multiple choice)
Receiving positive feedback from professors or employers	Receiving negative feedback from professors or employers
Receiving positive feedback from peers	Receiving negative feedback from peers
Receiving positive feedback from family members	Receiving negative feedback from family members
Performance at the ENGR XXXX Freshman Design Expo	Winning an award or receiving high-recognition for something
Performing well on a math/engineering exam	Performing poorly on a math/engineering exam
Getting an internship	Not getting an internship
The transition from high school into college	Other: _____

Table 11. Activity Questions - Decrease in Imposter Syndrome - First Year

Questions	
What are some things that occurred during your first year of college that caused this feeling of imposter syndrome to decrease? (Multi-select)	**If you had to say which of these things was the most influential in causing your imposter syndrome to decrease your first year of college, which one would it be?** (Multiple choice)
Receiving positive feedback from professors or employers	Receiving negative feedback from professors or employers
Receiving positive feedback from peers	Receiving negative feedback from peers
Receiving positive feedback from family members	Receiving negative feedback from family members
Performance at the ENGR XXXX Freshman Design Expo	Winning an award or receiving high-recognition for something
Performing well on a math/engineering exam	Performing poorly on a math/engineering exam
Getting an internship	The transition from high school into college
Other: _____	

Table 12. Activity Questions - Increase in Imposter Syndrome - Second Year

Questions	
What are some things that occurred during your second year of college that caused this feeling of imposter syndrome to increase? (Multi-select)	**If you had to say which of these things was the most influential in causing your imposter syndrome to increase your second year of college, which one would it be?** (Multiple choice)
Receiving positive feedback from professors or employers	Receiving negative feedback from professors or employers
Receiving positive feedback from peers	Receiving negative feedback from peers
Receiving positive feedback from family members	Receiving negative feedback from family members
Performing well on a math/engineering exam	Performing poorly on a math/engineering exam
Getting an internship	Not receiving an internship offer
Becoming involved with student organizations	Dropping/failing a class
Winning an award or receiving high-recognition for something	Other: _____

Table 13. Activity Questions - Decrease in Imposter Syndrome - Second Year

Questions	
What are some things that occurred during your second year of college that caused this feeling of imposter syndrome to decrease? (Multi-select)	**If you had to say which of these things was the most influential in causing your imposter syndrome to decrease your second year of college, which one would it be?** (Multiple choice)
Receiving positive feedback from professors or employers	Receiving negative feedback from professors or employers
Receiving positive feedback from peers	Receiving negative feedback from peers
Receiving positive feedback from family members	Receiving negative feedback from family members
Performing well on a math/engineering exam	Performing poorly on a math/engineering exam
Getting an internship	Not receiving an internship offer
Becoming involved with student organizations	Dropping/failing a class
Winning an award or receiving high-recognition for something	Other: _____

Table 14. Activity Questions - Increase in Imposter Syndrome - Third Year

Questions	
What are some things that occurred during your third year of college that caused this feeling of imposter syndrome to increase? (Multi-select)	**If you had to say which of these things was the most influential in causing your imposter syndrome to increase your third year of college, which one would it be?** (Multiple choice)
Receiving positive feedback from professors or employers	Receiving negative feedback from professors or employers
Receiving positive feedback from peers	Receiving negative feedback from peers
Receiving positive feedback from family members	Receiving negative feedback from family members
Performing well on a major specific exam	Performing poorly on a major specific exam
Getting an internship	Not receiving an internship offer
Becoming involved with student organizations	Dropping/failing a class
Winning an award or receiving high-recognition for something	Other: _____

Table 15. Activity Questions - Decrease in Imposter Syndrome - Third Year

Questions	
What are some things that occurred during your third year of college that caused this feeling of imposter syndrome to decrease? (Multi-select)	**If you had to say which of these things was the most influential in causing your imposter syndrome to decrease your third year of college, which one would it be?** (Multiple choice)
Receiving positive feedback from professors or employers	Receiving negative feedback from professors or employers
Receiving positive feedback from peers	Receiving negative feedback from peers
Receiving positive feedback from family members	Receiving negative feedback from family members
Performing well on a major specific exam	Performing poorly on a major specific exam
Getting an internship	Not receiving an internship offer
Becoming involved with student organizations	Dropping/failing a class
Winning an award or receiving high-recognition for something	Other: _____

Table 16. Activity Questions - Increase in Imposter Syndrome - Fourth + Year

Questions	
What are some things that occurred during your fourth + year of college that caused this feeling of imposter syndrome to increase? (Multi-select)	**If you had to say which of these things was the most influential in causing your imposter syndrome to increase your fourth + year of college, which one would it be?** (Multiple choice)
Receiving positive feedback from professors or employers	Receiving negative feedback from professors or employers
Receiving positive feedback from peers	Receiving negative feedback from peers
Receiving positive feedback from family members	Receiving negative feedback from family members
Performing well on a major specific exam	Performing poorly on a major specific exam
Getting a full-time job offer	Not receiving a full-time job offer
Becoming involved with student organizations	Dropping/failing a class
Winning an award or receiving high-recognition for something	Not applicable
Other: ____	

Table 17. Activity Questions - Decrease in Imposter Syndrome - Fourth + Year

Questions	
What are some things that occurred during your fourth + year of college that caused this feeling of imposter syndrome to decrease? (Multi-select)	**If you had to say which of these things was the most influential in causing your imposter syndrome to decrease your fourth + year of college, which one would it be?** (Multiple choice)
Receiving positive feedback from professors or employers	Receiving negative feedback from professors or employers
Receiving positive feedback from peers	Receiving negative feedback from peers
Receiving positive feedback from family members	Receiving negative feedback from family members
Performing well on a major specific exam	Performing poorly on a major specific exam
Getting a full-time job offer	Not receiving a full-time job offer
Becoming involved with student organizations	Dropping/failing a class
Winning an award or receiving high-recognition for something	Not applicable
Other: ____	