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Engineering Student Support 2.0: A Blueprint for Recruitment, Retention, and Success

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Abstract

The Clay N. Hixson Student Success Center within the College of Engineering at Tennessee Tech University has recently undergone a significant transformation, significantly enhancing its support for student success. With an overarching commitment to enabling student success, the Student Success Center has introduced many initiatives over the past three years, focusing on recruitment, retention, and fostering student success.

In recruitment, strategies such as a unified degree map, refined to ensure a consistent first-year course sequence and a math bridge program for incoming first-year students have yielded impressive results. Recruitment efforts have led to a 12% increase in incoming first-year students, effectively expanding the reach of the College of Engineering.

In terms of student retention, changes within the Student Success Center have brought about a substantial 10% improvement in first-to-second-year student retention. Periodic advisor caseload redistribution and advisor cross-training have allowed for timely support of students without overburdening advisors. An academic support program has also reduced the population of at-risk students from 19% to 13%.

The Student Success Center's endeavors encompass extensive activities, from refining the summer camps for high school students to conducting monthly advisor listening sessions and surveys to understand and meet student needs. Furthermore, introducing niche areas for each academic advisor has fostered their professional growth and contributed to improved student success.

This paper will delve into the comprehensive details of these initiatives. It serves as a valuable resource for institutions seeking to enhance their student support services, providing separate insights into the spheres of recruitment, retention, and, most importantly, student success within the College of Engineering at Tennessee Tech University.

1. Introduction

The importance of student success support for engineering undergraduate education is widely recognized, as the field has grappled with high attrition rates for decades. Now is a particularly important time to invest in student support services. The U.S. Department of Labor, for example, projects that "STEM Occupations are projected to grow by 11% by 2031" [1]. Yet, data from the National Center for Education Statistics have shown a 50% attrition rate for STEM majors [2]. Much can and has been done to address the issue of student attrition, retention, recruitment, in engineering and in higher education in general. Underlying factors for attrition have been investigated [3], [4], and specific success tools have been analyzed [5]. Drawing on this body of research, each individual university must address the question, "What can be done to help our engineering students persist toward their degree in the specific context of our programs?" To answer this question, it is useful to remember that "retention is a campus-wide effort" [6].

At Tennessee Tech University, the College of Engineering (CoE) has made a significant investment in student support services through the Clay N. Hixson Student Success Center (SSC). Begun in 2015, the Center has grown from a small staff of three and minimal programming focusing on at-risk advising and professional development to a large staff including a Director and Assistant Director and six academic advisors in addition to a wide variety of programs and activities addressing three major areas of student success: Recruitment, Retention, and Recognition (R^3).

The Center's mission is to recruit diverse and talented students, provide evidence-based programming for retention, and celebrate students' success by recognizing their hard work and accomplishments. This mission is tied to the state's mandate to increase enrollment in higher education [7] and to boost STEM education to meet the growing STEM workforce needs [8]. Tennessee Tech University's strategic plan to increase freshmen-to-sophomore retention rates to 82% and to reach a 50% 4-year graduation rate by 2025 [9] is also reflected in the Center's mission.

The CoE SSC activities and outcomes have been through substantial growth in the past three years, the staff have been intensifying recruitment efforts, developing and implementing evidence-based retention practices, creating innovative initiatives to strengthen staff members' professional development, and offering activities beneficial to the region. In this paper, we detail our efforts to achieve success with recruitment and retention, and we provide an overview of the results.

2. First-Year Student Recruitment

Recruiting talented, diverse students into the College of Engineering is a priority and is in adherence with the university's strategic plan of increasing enrollment by 18% in 5 years; the Clay N. Hixson Student Success Center plays a pivotal role in these efforts, as student success begins with outreach and community involvement. Not only is the SSC involved in the Office Admissions sponsored events, such as campus visits, but the staff have also developed programming and built relationships, programming such as a summer camps, math bridge, a streamlined first-year course degree map, and relationship-building with regional schools and community college faculty and staff. This section details these efforts.

The Center is involved in several activities and events that are sponsored by the university's Office of Admissions: the VIP Program, Preview Day, and Showcase. The VIP Campus Visit program serves as a gateway for prospective students and their families to experience the vibrant and enriching environment offered by the university. Coordinated by the CoE's SSC, this program offers a personalized and immersive campus tour, tailored specifically for those eager to explore specific engineering, engineering technology, and computer science programs. Scheduled three days a week, twice daily, this initiative provides an up-close and comprehensive glimpse into the university's offerings, facilitated by the dedicated admissions team and the trailblazers guiding visitors through the campus.

2.1.VIP Visit: When students enroll for these visits, the admissions office liaises with the CoE's SSC, ensuring a tailored experience for each participant. In collaboration with the respective academic departments, the SSC meticulously organizes the tour, ensuring an in-depth

exploration of the program's facilities, an introduction to esteemed faculty members, and invaluable interactions with current students. This tour goes beyond showcasing the physical campus; it provides an immersive experience into the academic journey, fostering a sense of belonging and enabling prospective students to envision themselves as part of the dynamic learning community at Tech. These visits are primarily led by faculty members who offer an overview of what their departments offer. Through streamlined efforts, SSC was able to better inform over 850 prospective students just in 2023. In terms of assessment, the Office of Admissions and the SSC retain attendance lists, and many departments provide follow-up communications with prospective students.

2.2. *Preview Day*: In addition to the weekly campus visit program, SSC leads the college-level planning, organization, and execution of Preview Day. This event is offered for students who have yet to apply to Tennessee Tech University, and are just exploring universities and programs. Faculty, staff, and students from the College of Engineering collaborate to showcase our majors, concentrations, and labs. The day begins at 8:00 a.m. and ends at 2:00 p.m. and includes the following activities: an academic tent where all majors in the college are represented; a student organization fair where, along with organizations from across other majors, several student groups from engineering, such as our Baja Team, Civil Engineering organization, the National Society of Black Engineers, et cetera, set up tables; a set of departmental tours led by CoE Student Ambassadors; and departmental open houses.

In 2023, 382 high school students registered as having "engineering interest" and over 120 engineering faculty, staff, and students participated in making the day successful. Leading up to the event, the SSC worked diligently as the point of contact to identify volunteers, develop a minute-by-minute itinerary, choreograph each departmental tour, and ensured that all participants had an informed visit. The SSC and the CoE Dean's Office worked with the Office of Admissions, attending weekly meetings where the day's overall itinerary, layout, and flow were debated, discussed, and shared.

2.3. *Spring Showcase:* Spring Showcase is held in the spring for incoming first-year students that have applied and been admitted for the upcoming academic year. Even though these students have applied to the university, many Spring Showcase attendees are still deciding between multiple universities. Spring Showcase differs from new student orientation because these students have yet to commit to Tennessee Tech University. The Spring showcase aims to help newly admitted students choose Tennessee Tech University by providing interactive opportunities to form relationships with faculty members, current students, and others in their majors. During the Spring Showcase, each college can engage students and their families.

The SSC has supported the Spring Showcase since its inception at Tennessee Tech University. Planning for the Spring Showcase begins each fall in preparation for the spring. In the CoE, the Spring Showcase involves each department. The day starts at 9:00 am and ends at 2:00 pm and includes the following activities: a welcome from the Engineering Dean, a session for parents with a current student panel facilitated by SSC staff, break-out sessions for each admitted student based on the major, and open houses for students and families to explore all majors in the college. Spring Showcase has been very successful in helping students choose Tennessee Tech University, with 80+ percent of event attendees enrolling at

Tennessee Tech University over the past two years. The Office of Admissions has provided a follow-up report from a satisfaction survey that indicates 98% of respondents were either extremely satisfied or somewhat satisfied with their experience.

2.4.Transfers: Attracting talented students from community colleges is a priority for the CoE. However, navigating the intricacies of course equivalencies and transfer pathways can sometimes create obstacles, potentially discouraging promising candidates. Recognizing this challenge, SSC reached out to administrators and faculty members at multiple community colleges in the region and implemented a two-pronged approach to ensure a seamless transition for transfer students. Firstly, SSC collaborated with regional community colleges across the state to develop comprehensive transfer guides for the College of Engineering majors. These guides meticulously outline equivalent courses, providing students with clear roadmaps and eliminating confusion about credit transfer. This collaboration empowered students to confidently navigate the path towards their engineering aspirations. Secondly, the SSC fostered strong relationships with community college leadership. This open communication channel allowed for collaborative efforts to streamline the transfer process. Through such articulation agreements, both institutions worked together to ensure a smooth transition for engineering students, removing unnecessary hurdles and maximizing their academic success. By actively bridging the gap between community colleges and the CoE, SSC paved the way for a rewarding academic journey for future engineers.

Through extensive recruitment efforts, the overall first-year student enrollment has substantially increased in the past two years and is projected to increase further in the next academic year, as presented in Figure 1.
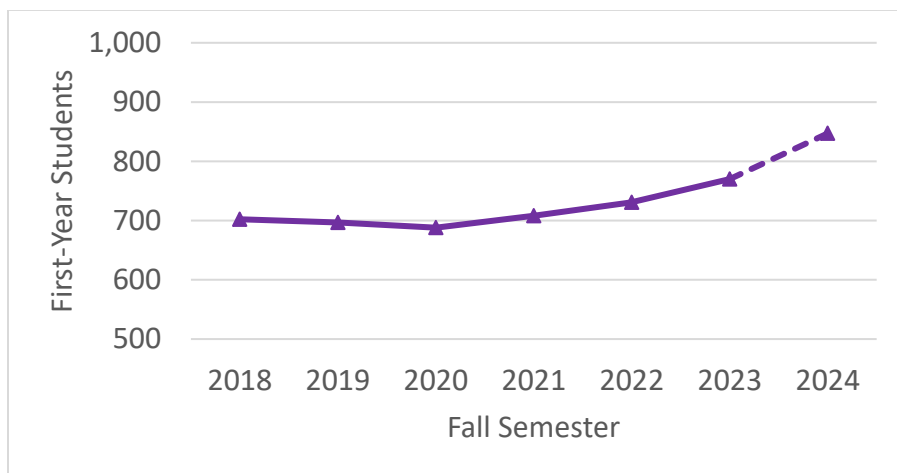

Figure 1: Enrollment for freshmen and all undergraduates

3. First to Second Year Student Retention:

While attracting talented first-year students to the CoE is paramount, nurturing their success and achieving high first-to-second-year retention rates are equally critical. Incoming first-year students often grapple with many challenges – lack of preparation in math courses, demanding academic workloads, unfamiliarity with the university environment, and the newfound independence of living away from home. These hurdles, if left unaddressed, can contribute to

disengagement and, ultimately, attrition, hindering our mission of cultivating the next generation of engineering leaders. Recognizing this, the CoE has established a robust support system spearheaded by the dedicated team at the SSC. Our approach goes beyond traditional academic assistance, offering a holistic range of services tailored to the diverse needs of first-year students.

Overall, these extensive first year retention efforts as described below are in place for the college to achieve the university's strategic goal of an 82% freshmen to sophomore retention rate as well as a higher percentage of students who graduate in four or six years, with the goal being 50% and 60%, respectively. The programming has been chosen to address specific challenges that evidence has shown are unique to engineering education and to our specific college: including poor math preparation, lack of college readiness, and a low sense of belongness.

3.1. *Math Bridge Program:* The Reinforce Advanced Math Placement (RAMP) program addresses critical challenges faced by incoming freshmen enrolled in engineering, engineering technology, and computer science majors, particularly those placed at or below Calculus I proficiency levels. Historically, nearly half of the incoming freshmen at Tennessee Tech University are placed in College Algebra or Pre-Calculus, while a similar percentage placed in Calculus I did not pass, leading to a lower first-year retention rate of 63%, and a longer time to graduation. Addressing this challenge, the CoE has started the RAMP first-year bridge program in 2022. Bridge programs have been used extensively to reduce attrition [10] and provide students with what they need to prepare for college math [11] and for college in general [12].

The RAMP first-year bridge program was developed and implemented in collaboration with the university math department. Incoming first-year freshmen engineering and engineering interest students were recruited through multi-pronged approach that included outreach to recruitment events and notifying and encouraging admitted students to participate. The math department's faculty members developed a 20-hour curriculum for different levels of math (algebra, trigonometry, and calculus), and the CoE SSC staff developed an itinerary for team-building and social activities.

Designed as a one-week residential program, RAMP focuses on preparing students for math and engineering courses, retaking math placement tests, engaging in social team-building activities, understanding available academic support resources, and getting a head start on college life. By targeting students struggling with math preparedness, the RAMP initiative endeavored to improve retention rates, increase diversity in student populations, and reduce the time to graduation, thereby addressing critical issues within the engineering curriculum and the overall success of incoming freshmen in these disciplines. Table 1 shows the results from the two years the RAMP program has been in place.

Table 1. RAMP Program Statistics

Year	No. Student Participants	No. Students Took Accuplacer	% Moved down	%No change	% Moved up
2022	83	74	12%	21%	67%
2023	147	103	7%	30%	63%

This one-week residential RAMP program focused on intensive math preparation, retesting for higher placement, team-building activities, and familiarization with academic resources. The results from the first two years were promising: two-thirds (67% in 2022, 64% in 2023) of RAMP participants who retested moved up a math level, significantly exceeding historical trends. This improvement is crucial, as higher initial math placement directly resulted in students taking an advanced math course than initially planned, better first-year retention rates and projected shorter time to graduation. Furthermore, the program kept downward movement minimal (12% in 2022, 7% in 2023), demonstrating its effectiveness in solidifying existing knowledge. While longer-term data is needed to assess its impact on retention definitively, the program's early success in boosting math proficiency suggests its potential to address critical issues within the engineering curriculum and significantly improve freshman success in these disciplines. To better understand long-term impacts, students in the program are tracked to examine time-to-degree data in the future.

3.2.Degree Maps: Degree maps play a pivotal role in shaping students' academic journeys by providing a structured guide outlining the sequence of courses required to fulfill degree requirements. Prior to 2021, the absence of standardized degree maps within CoE led to department-specific versions that lacked flexibility to accommodate students changing majors after commencing their studies. These disjointed maps often compelled students to shift majors midstream to take classes out of sequence, ultimately extending their time to graduation.

However, a transformative shift occurred after introducing a unified and comprehensive degree map in 2021 across all engineering, engineering technology, and computer science programs. Departments within the CoE were presented with a template for each major and concentration that encouraged departments to lay out a clear four-year plan. This standardized map ensured a cohesive sequence of courses, especially during the initial year of study. Implementing this common degree map fostered an environment where students could easily transition between majors within the first year without falling behind in their coursework. These maps are housed on the departmental websites and continuously updated each year; moreover, academic advisors within the college use them during advisement and ensure that the first-year advisement center have access to them and are aware of curriculum changes. By streamlining the sequence of classes, this approach ensured that students retained the flexibility to explore different disciplines while staying on track for timely graduation within the customary four-year timeframe, enhancing their academic success and bolstering their prospects for timely degree completion. It also allows flexibility for students hoping to pursue a co-op who can have a better understanding of the strategic timing of co-op, in terms of their degree map; moreover, Degree Maps are being developed for 2+2 programs so that community college transfers have clarity in how their courses will transfer. In addition, these consistent degree maps combined with consistent academic advising by professional advisors led to fewer students swaying from the structured degree maps, and are progressing well towards graduation.

3.3. First-Year Professional Academic Advising: A unique two-tiered student success model has been implemented to ensure consistent and tailored support for our CoE students throughout

their academic journey. Previously, college-level advisors and faculty members provided academic advisement to all levels of students. Recognizing that needs differ for incoming freshmen than for sophomores, juniors, and seniors, the university established a centralized advisement center for incoming freshmen only. The center is called "Launchpad." Advisors in this center are assigned populations with specific majors. Once students are classified as sophomores, they transition to the college advisement in the CoE SSC, where academic advisors possess specialized knowledge of engineering students' specific needs and curriculum. This shift fosters deeper, program-specific guidance and mentorship as students delve into their chosen field. However, throughout the first year of the student's time at the university, CoE SSC advisors work closely with Launchpad advisors to ensure a seamless transition.

The CoE SSC administration and professional advisors collaborated with Launchpad advisors to better understand the challenges first-year students face and to collaborate on events meant to help provide a sense of belongingness to the students. This collaboration took place in different ways: working together at orientation, holding Lunch and Learn sessions to have an open forum for discussion, ensuring clear lines of communication between the freshmen advising center and the college advisors, soliciting feedback to understand better specific and unique challenges faced by engineering freshmen, and collaborating on a transition event for students who will move to the college for advisement.

The first form of collaboration took place at orientation, which occurred throughout the summer before the start of the fall semester and is a requirement for all first-time freshmen to attend. The event takes place over two days, and the CoE advisors work closely with Launchpad advisors as well as college faculty to ensure incoming freshmen have the information they need to succeed: this includes informational sessions about engineering disciplines, access to the different majors' degree maps, as well as hands-on registration sessions, where students can update their course schedules.

Throughout their first year of college, the CoE SSC advisors and staff continued to work closely with the Launchpad. For example, the SSC staff solicit feedback from Launchpad advisors to help elucidate why students might migrate to other majors. This informal data-gathering has provided important insights into challenges students struggle with, such as classroom styles and unclear faculty expectations. One particularly useful insight gathered from this feedback is that students may need more clarification on what engineers do as early as orientation to better grasp their major. In addition to providing this type of feedback, lines of communication were open to ensure Launchpad advisors are well-versed on curriculum changes and available academic resources. In the Fall of 2023, this collaboration was taken a step further by creating a "Lunch and Learn" where advisors from both units could spend time together in an open forum to share ideas about how we can best serve our students. This first Lunch and Learn's objectives included sharing challenges for first-year students, best practices for supporting students, best practices and ideas for transitioning students from the first-year advisement center to the college advisors, and best communication practices. The meeting ended with action items: to collaborate on student success workshops and transition events and to include first-year advisors in college communication.

Finally, the two units collaborated with a spring transition event. This event was open to freshmen and is designed for the students to meet their new advisor. After their freshmen year, these students will no longer be advised by Launchpad advisors, and they will transition to CoE SSC advisors. Faculty, staff, and upper-classmen, in addition to advisors, were invited to this informal event so that the freshmen will have a cohesive experience when they transition. The event is also designed to foster a sense of belongingness, a way for the freshmen students to feel connected with the larger engineering community.

3.4. Cross-training Academic Advisors: In addition to working to increase first-to-second-year retention, the CoE SSC also worked to improve student success for sophomores, juniors, and seniors using a wide variety of methods. The first of these is cross-training. In the past, each advisor is assigned advisees within one major. However, it was deemed important to diversify the advisors' knowledge base. The transition from discipline-specific academic advisors to a more diversified and cross-trained advising team in 2022 marked a significant advancement in supporting students within CoE. Prior to this change, the reliance on discipline-centric advisors had limitations, particularly when faced with increasing enrollments and advising loads. As student numbers grew, the capacity to secure timely advising appointments became challenging, especially during crucial pre-registration periods. This led to some students experiencing delays in accessing essential academic guidance, potentially impacting their ability to plan their courses effectively.

The shift towards cross-training academic advisors across multiple engineering disciplines brought about substantial positive outcomes. The balanced distribution of advising loads ensured that students had more readily available access to guidance and support. This approach facilitated immediate assistance for students, eliminating delays in seeking advice and enabling them to make informed decisions about their academic pathways. By fostering an environment where academic advisors possessed knowledge across various engineering disciplines, students were assured of receiving comprehensive and timely guidance, contributing significantly to their ability to navigate their academic journey smoothly and stay on track towards their educational goals.

3.5. Tutoring and Supplemental Instruction: The CoE SSC also offered traditional academic resources, supplementing the resources available at the university level. These resources include tutoring, supplemental instruction, and peer mentors. Each of these programs has grown and developed over the past three years.

The tutoring program began in the fall of 2022 as a supplement to the general education tutoring offered by the university. The program started with four paid undergraduate peer tutors and has expanded to five undergraduate paid tutors. Tutors cover subject matter from the engineering curriculum, including chemistry, physics, math, and some lower-level engineering courses. The popularity of the program has developed, with an increase in appointments from 378 total in the fall 2021 and spring 2022 academic year to 901 appointments in fall 2022 and spring 2023 academic year. Some ways the CoE SSC has worked to increase tutoring appointments include providing schedules and updates in a timely manner to departments, college advisors, and first-year advisors, as well as posting the schedule on the website and hanging posters in the buildings. The Center also centralized

college tutoring by soliciting information from departments about any tutoring they have in place, including that information in the marketing material, and by including a tutor in the engineering residence hall. Moreover, the Center has surveyed engineering students to determine the subjects they see most need support, such as tutoring, and this information was used to hire tutors with specific course expertise.

The Supplemental Instruction (SI) program at Tech, modeled after the University of Missouri-Kansas City, strategically supports challenging courses like pre-calculus, calculus-I, physics-1, chemistry, and intro to engineering. SI Leaders, accomplished undergraduate students or "near peers" who have excelled in these courses, are hired to conduct interactive group study sessions and collaborate with faculty to clarify complex concepts. These sessions focus on guiding students through difficult subject matter while imparting effective study strategies. SI Leaders attend lectures, design engaging activities, and offer exam review sessions to foster a collaborative learning environment.

Throughout the 2021-22 and 2022-23 academic years, the SI program from the SSC provided support for numerous courses, resulting in increased attendance from a significant portion of enrolled students. As a consequence, the data reflected a reduction in course dropouts and failures (28.5% DFW rate for students who attended SI sessions vs. 35.3% DFW rate for those who did not attend sessions) compared to previous semesters. Moreover, it's worth noting that students who attended SI sessions experienced a substantially lower DFW rate (reduction by half), showcasing the profound impact of this initiative on bolstering student success and retention. This positive trend not only saved students from academic setbacks but also contributed to potential tuition savings. Additionally, an estimated number of students remained at Tech due to the support provided by SI, highlighting its instrumental role in student retention. Research indicates that beyond aiding their peers, SI Leaders themselves acquire invaluable skills and knowledge that benefit their academic endeavors. After validating this model through lowered DFW rates and improved student success, the Math department started sponsoring the SI leaders for their introductory courses

3.6. Peer Mentors: The Peer Mentor Program is structured to aid the transition of new students to Tennessee Tech University and the College of Engineering by connecting them with upper-level students who will serve as role models, mentors, guides, and as a resource. Peer mentors assist new students by using their knowledge and experience on campus, in collaboration with engineering instructors, to navigate the challenges they experience during their first year of college. A peer mentor handbook was developed to aid student peer mentors in understanding the program expectations and available resources to help first-year students inside and outside of the classroom.

The purpose of the peer mentor program is to increase the first-year retention rate of students in all majors of engineering. Also, it is to provide first-year students with connections to other students, faculty, and resources available. Peer Mentors are matched with ENGR 1020 instructors to help facilitate classroom lectures, assignments, and events. Peer Mentors meet with their students outside of the classroom by attending campus events and fostering regular meetings to develop trust, a support system, and friendships with their students.

3.7. Professional Academic Coaching: In addition to cross-training, advisors were tasked to assist with an academic at-risk program that has been developed, named Professional Academic Coaching for Engineers (PACE). The PACE program was developed to address alarming retention issues among at-risk engineering students. Since 2016, the number of at-risk students has risen. Historically, over 18% of our CoE students fall into the academic at-risk category. This urgent situation demanded a proactive intervention to foster student thriving. The PACE program adopts evidence-based practices and strategies backed by research on student success, including intrusive advising, tutoring, supplemental instruction, peer mentoring, and professional development opportunities. By dismantling barriers to student achievement, ranging from academic and personal challenges to major or career-related concerns, the program aims to foster improved academic standing, enhanced graduation prospects, and heightened success for aspiring engineers [13], [14].

In the two years since launching in 2021, the PACE program has significantly supported the at academic risk students to stay on track. Participant surveys cite the immense value of one-on-one guidance in overcoming barriers like poor study habits, lack of preparation, and stress. The at-risk population across CoE has dropped from 19% to 13% over this short period. These outcomes align directly with TTU's strategic plan goals of academic excellence, student success, and a supportive environment while contributing to the university's objectives to boost graduation and freshmen-to-sophomore retention rates. Beyond mere statistics, the PACE program enabled meaningful connections and revealed pathways for student success. The multi-faceted approach could be scaled up and serve as a model for other universities nationwide. The PACE program addressed the rising population of at-risk students and empowered our students and affirmed the promise of supportive environments where all have the ability to excel. Figure 2 illustrates how the number of at-risk students has lowered from 2020 to 2022.
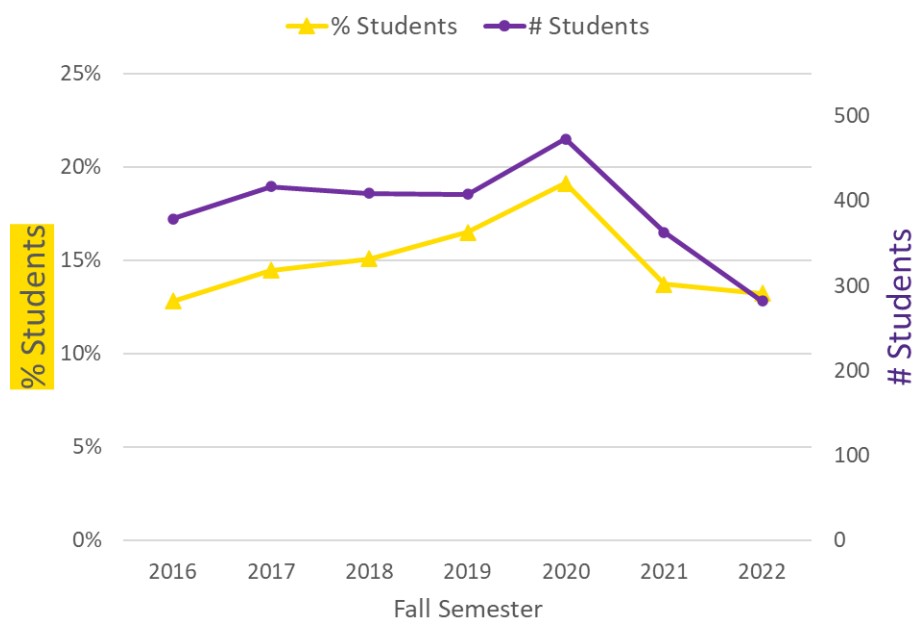

Figure 2: Trends demonstrating the decline in number and percentage of students in academic risk

3.8.Listening Sessions: While the importance of advising and academic support services cannot be overstated, there is also a need to empower students to provide feedback about their experiences in the CoE and to create a culture where students feel comfortable approaching administrators, faculty, and staff. To this end, there are several opportunities for interactions to take place.

One opportunity is Donut Stop, which served as a valuable and interactive platform that fostered open communication between the leadership team, students, and faculty members within CoE. By setting up a casual yet welcoming environment once a month, the associate dean and an academic advisor demonstrated a commitment to listening to students' voices. This initiative encouraged students and faculty to engage directly with the leadership, allowing them to express their experiences, enthusiasm, and concerns. The casual nature of these interactions and the inviting gesture of offering donuts created a relaxed atmosphere that encouraged open dialogue and bridged the gap between the students, faculty, and the leadership team.

The "Donut Stop" initiative has proven to be instrumental in several positive outcomes for the engineering college. It has enabled the leadership team to gain firsthand insights into the students' experiences, challenges, and aspirations within the academic setting. By creating a space for candid conversations, students and faculty feel heard, valued, and understood. This engagement has not only helped establish a sense of approachability and care from the leadership but also demonstrated a genuine belief in the students' success. Overall, this initiative cultivated a stronger sense of community and inclusivity, fostering a collaborative environment where students' voices are acknowledged, and their needs are addressed.

Another opportunity is Fuel to Fly, a program supported by the CoE SSC once per month, which provides breakfast pastries and coffee to students and serves as an opportunity to engage with academic advisors and hear about other available resources that may assist them in their academic and personal lives.

In addition, a monthly open advising session in the physical location of the SSC started in 2022. While an open-door policy allows for greater accessibility between students and advisers, it still has the limitation that students must physically go to the adviser's office, which may be far from their classrooms and usual study spaces. As [15] notes, closer engagement with advisers can raise satisfaction for both groups. Yet the typical office set-up prioritizes one-on-one scheduled meetings with minimal flexibility. Our program has implemented bi-weekly "roaming advisor" hours directly within the engineering student lounge to address this gap. With advisers setting up a small table amidst the regular student activities, study groups, and peer discussions, guidance becomes conveniently embedded into existing habits and pathways.

Since launching the roaming advisor pilot, student feedback has been overwhelmingly positive. By bringing advising to where students already congregate, their questions and concerns can be addressed immediately, organically folding support into the rhythm of their day. While email and virtual modes facilitate some access, face-to-face interaction enables

relationship-building on students' own turf. The lounge setting also relieves the formality of a typical across-the-desk appointment, opening new avenues for casual connection. By transitioning the advisory role beyond the confines of the office, this initiative aligns with research emphasizing the importance of diverse spatial experiences and the potential benefits of advisers engaging with students beyond traditional office settings [16], [17].

Finally, student focus groups have been implemented. Implementing focus groups targeting distinct student cohorts has yielded profound insights and beneficial outcomes within the college's academic environment. The first focus group, comprising students who transitioned from engineering to alternative fields, uncovered critical information regarding students' departure from the engineering programs. Key findings revealed that a significant factor contributing to their major change was the lack of a sense of belonging and uncertainty about seeking assistance. Subsequently, proactive measures were initiated to address these issues. Activities focused on fostering a sense of belonging were introduced, ensuring continuous receptivity to students' feedback and adopting various approaches to enhance approachability, thereby creating a more inclusive and supportive atmosphere within the college.

Following this initial focus group, a subsequent session was conducted specifically for first-time freshman students, aiming to gauge their sense of belonging within the college and their experiences seeking help when needed. This second focus group provided valuable insights into the factors contributing to students' sense of belonging and their perceptions regarding access to support systems within the academic environment. The outcomes facilitated the college in identifying areas for improvement and implementing tailored strategies to enhance the first-year experience. As a result, the college has been better equipped to proactively address student concerns, fortify support networks, and create a more conducive and supportive climate, thereby contributing to increased student satisfaction and success within the engineering programs.

4. Professional Development for Academic Advisors
As mentioned earlier, the university has created a two-tiered approach to academic advising, where first-year students meet with advisors in a centralized advisement center called the Launchpad, and then they transition to an advisor in the CoE SSC. The CoE SSC employs six advisors who are assigned a population for a specific engineering major, and those students remain with their college advisor up through graduation. Because sophomores, juniors, and seniors have different needs and challenges than first-year students, efforts have been made to develop a supportive environment for both advisors and for students, and to encourage advisors to develop their skills and knowledge of the academic advising profession. These efforts are described below.

4.1.Brainstorming Sessions: In regards to professional development, monthly academic advisor brainstorming sessions have been implemented. Fostering student success demands a collaborative spirit and open communication channels between all stakeholders. To strengthen this alliance, the CoE established regular brainstorming sessions where academic advisors can surface pressing student issues to college leadership. This platform for candid dialogue has driven positive transformations college-wide. In the year since its inception in 2021, the monthly discussions have already catalyzed key policy and curriculum

enhancements. Advisors highlighted mounting concerns around academic stress and gaps in peer support, spurring new on-ramp programs for struggling learners. They also relayed course-specific bottlenecks in required sequences, prompting redesigns to ease progression.

Through these brainstorming sessions, the Associate Dean actively engaged with department chairs and faculty, utilizing the insights gained to refine the curriculum, tackle limitations, and establish tailored on-ramp programs aimed at bolstering student success. By translating advisors' firsthand observations into actionable steps, this collaborative effort led to tangible improvements within the CoE. Adjustments in the curriculum were made to better align with student needs, providing a more supportive academic environment. By elevating advisor insights directly from the frontlines, the leadership team was able to pinpoint barriers and act accordingly to address them.

4.2.Leadership through Niche Areas: The initiative to cultivate leadership among academic advisors by encouraging them to specialize in niche areas presents an innovative approach towards both professional development and student support within CoE. By empowering advisors to identify and focus on niche areas that align with their unique skills, interests, and career aspirations, this initiative not only harnesses their individual potential but also enhances their ownership and dedication to their roles. Allocating 5% of their weekly time to these specialized areas, coupled with facilitated professional development and mentoring, aims to transform advisors into resident experts and champions in their respective niches. This strategic endeavor not only serves as a source of motivation for advisors to pursue areas they passionately believe in but also signifies a significant shift towards advisor autonomy, ensuring a more personalized approach to supporting student success.

In the first year, the advisors have already made strides by spearheading working groups, collaborating with campus partners, and pursuing targeted professional development. Their domains range across advancing diversity, equity and inclusion, strengthening residence hall connections, transfer student support specialist, promoting engineering to K-12 students through outreach, etc. With continued support, the CoE SSC advisor cohort are serving as change agents elevating the student experience across critical dimensions. Their grassroots advocacy embodies our vision for academic advising as a hub for innovation, where creative solutions begin with empowering talent from within. Though these niche areas are only in their beginning stages, the SSC is committed to evaluating their impacts and better understanding how they impact recruitment and retention.

5. Conclusion
The CoE's commitment to fostering a supportive and enriching academic environment for engineering students has yielded remarkable results. The first-to-second year retention has witnessed a steady upward trajectory over the past two years, surpassing the university's ambitious goal of 82% retention by 2025. In 2023, CoE achieved an impressive 83.3% retention rate, solidifying its dedication to student success. This achievement can be attributed to a multifaceted approach that prioritized academic preparedness, comprehensive support services, and open communication. Initiatives like the RAMP program, standardized degree maps, and cross-trained academic advisors have empowered students to navigate their academic journey

seamlessly. Additionally, robust tutoring, supplemental instruction, and peer mentoring programs have provided invaluable guidance and fostered a sense of belonging within the CoE community.

The CoE is equally committed to listening to students' voices and fostering a culture of open dialogue. Programs like Donut Stop, Fuel to Fly, and roaming advisor hours have created platforms for meaningful interactions and enabled the leadership team to address their concerns promptly and tailor the support accordingly. By actively soliciting feedback through student focus groups, the CoE leadership team gained valuable insights that propelled continuous improvement and ensured initiatives remained aligned with student needs.

In conclusion, the CoE SSC's transformation journey is a blueprint for fostering engineering student success through a comprehensive focus on recruitment, retention, and overall well-being. The CoE SSC has taken a multi-pronged approach to implement activities for one mission: the academic success of the students. While we cannot point to one specific program that has had the most impact, the presented combined efforts yielded positive outcomes, including a 12% increase in first-year enrollment, a 10% improvement in first-to-second-year retention, and a significant reduction in at-risk students. Yet, the CoE remains committed to continuous improvement and expansion. Deepening existing programs, embracing innovative technologies, forging stronger partnerships, and disseminating best practices are key areas on the CoE's horizon.

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