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GIFTS: First-year Engineering Program Success Through High-Contact Support

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Introduction

The Engineering Catalyst Program (ECP) provides academic success, mathematics, mentoring, and financial support to first-year pre-calculus or college algebra-placed students for the first two years of their engineering or engineering science degrees [1]. ECP had its first cohort start in 2022, and from that first year we noticed that students in the program performed better in their mathematics coursework than students outside the program and were retained in the college of engineering and the university at large at higher rates [1]. From the momentum of the first year (2022 cohort, 17 admitted students), we admitted more students into our second cohort (2023 cohort, 28 students). Like that first year, they had an overall academic performance that was higher than other students in the same math course. Unlike the 2022 cohort, however, our 2023 cohort had a lower retention rate within ECP and within the college of engineering. Our goal was to address program supports that could lead to higher retention rates for subsequent similarly sized cohorts and allow for further programmatic growth.

In this paper we will discuss one aspect of our program that we suspect has had the highest impact – our high-contact support. We will outline the various ways we offer this support to students, our results so far with the 2024 and 2025 cohorts, and a brief discussion of the future of the program.

Approach

The overall retention decrease noted with the 2023 cohort became evident early in their tenure. One student changed their major out of the college within the first month of the fall semester. Another student dropped out of ECP within the next month. Another student dropped out of the program at the end of the semester. It's not strange to see students self-select out of a program for various reasons. In each case, these students took permanent action without discussing it with the faculty or staff associated with the program. As a wholistic support program, the ECP aims to support students in making thought-out decisions. As such, we were motivated to find more ways to build trust with the students in the program as they navigated difficult and potentially major life decisions.

Table 1. Engineering Catalyst's First Year of Coursework.

Course Title	Brief Description	Relevant Support
Engineering Catalyst	Required both semesters of the first year. Fall semester focuses on academic success skills. Spring semester focuses on career readiness.	Individual Meetings with faculty. Online journaling.
Math Catalyst	Required both semesters of the first year. Applications of current mathematics content with engineering and engineering science fields and prerequisite coursework.	Individual Meetings with faculty. Facilitated Study Groups. Physical journaling. Support hours with Peer Learning Assistants

Starting with our 2024 cohort, the following supports were implemented or modified. In the following, we described the type of support and which component(s) of ECP to which it is tied. In Table 1, we describe the two courses required during the first year of ECP and the relevant support structures for the course.

Individual Meetings with Faculty

Early concerns about the 1-year retention outcomes from the 2023 cohort drove changes in ECP implementation by the end of their first semester. The instructors for Engineering Catalyst piloted biweekly, one-on-one meetings with each student to discuss their progress in the Engineering Catalyst course and their other coursework. In the 2024 and 2025 cohorts, 30-minute weekly meetings were implemented in the fall semester and reverted to biweekly meetings in the spring. Meetings have allowed instructors to build trust with each student and quickly implement individualized instruction support for academic success and overall wellbeing that match the student's goals. The Engineering Catalyst instructors also implemented a collaborative course grading structure to center each learner's goals in the instructional process [2]. Collaborative grading meetings are facilitated through individual meetings at four points throughout the semester as part of a continuing reflection-feedback process. In Math Catalyst, individual 30-minute meetings like this are not compulsory for each student. Instead, the instructor may decide at any time to have a single check-in or temporarily weekly meetings with a student. The topic of discussion is either specifically about mathematics content or creating a more targeted study plan for their math course. Math-focused meetings are more common in the spring semester. For both courses, interacting with instructors in this way is built into a participation component of their grades.

Facilitated Study Groups

One of the concerns about the 2023 cohort within the Math Catalyst course was tied to their team-based project within the course. Between the various expectations of interacting with a team, interpreting written instructions, and implementing feedback on their work, it was clear that introducing assignments in class with out-of-class work was insufficient. Another concern was that the instructor did not have a lot of smaller-scale opportunities for trust building with students outside of class. The 2024 and 2025 cohorts, then, were placed into project teams based on their availability and met with their Math Catalyst instructor each week as a team. During these Facilitated Study Groups (FSGs), the instructor was able to provide more personalized guidance to support the students' math studying and support their work in the semester-long project [3]. In the spring semester, FSGs are discontinued in favor of increased rates of individual meetings to address unique, individual math challenges. Like individual meetings with faculty, FSGs are built into a participation component of their grade.

Journals

Motivated by minute-papers [4], both Engineering Catalyst and Math Catalyst implemented a journal as part of class each week. In Engineering Catalyst, the journal is online in a living document to support the course's goals related to awareness of and using academic technology.

Journal topics each week include gratitude practice, resiliency checks, metacognitive regulation (involves goal setting, monitoring progress, and evaluation of outcomes), In Math Catalyst, the instructor provides a physical notebook, and class time prompts related to studying and learning mathematics are alternated with prompts directly from the instructor – personalized to the student within the journal. In this way, the journal aims to create a pen-pal type relationship that continues the trust-building that begins in the FSGs. These journals are not for a grade, though it is implied that completion of journal writing is tied into participation in the class.

Support Hours with Peer Learning Assistants

The Engineering Catalyst and the Math Catalyst courses implement a Peer Learning Assistant (PLA) into class time. Except for our inaugural 2022 cohort, PLAs are selected from the pool of previous ECP students. In addition to supporting the work inside the classroom, PLAs hold support hours – times which they are available to support students in their ECP coursework, math content, or other aspects of their academic or personal life. PLAs offer personalized support from a perspective that cannot be duplicated by faculty relationships [5]. It is required that students attend at least one support hour visit each week as part of the participation component in Math Catalyst. This requirement is the same for both the fall and spring semesters of the class.

Results and Discussion

Our efforts for high-contact support have paid off so far. Table 2 shows the retention rates of students in ECP for each cohort so far – from the inaugural 2022 cohort to the available data from the 2025 cohort. In this table, we define "retention" within the first two years to mean that they are still in or have completed the requirements of ECP. After the completion of those first two years, we define "retention" to mean continued degree progress within their engineering or engineering science major.

Table 2. Engineering Catalyst's Retention as of January 2026.

Cohort Year	Cohort Size (in students)	1-Year Retention	2-Year Retention	3-Year Retention	4-Year Retention
2022	17	88%	82%	65%	65% (expected)
2023	28	54%	39%	36% (expected)	-
2024	28	89%	75% (expected)	-	-
2025	37	95% (expected)	-	-	-

In our 2024 cohort, we saw a similar retention within the first year to our 2022 cohort while admitting an increased number of students. Impacting the fall semester of the second year for the 2024 cohort was a series of personal and/or financial concerns for some students which were outside of the program's or students' control. We consider our efforts with the 2024 cohort to be a huge success. Furthermore, we increased the number of admitted students again for the 2025 cohort. Although the first year is not complete, we are hopeful that we can maintain retention

amidst a growing program. Data presented in this study are used to interrogate the impact of the new support structures within the program context. Validation of the ECP with comparative analysis will be detailed in future work.

Growth is wonderful, but it is not without its discomfort. High-contact support is a consumer of both energy and time. We would like to continue the growth of the program in order to spread support to more students, and this will mean readjusting our approach to high-contact support moving forward. In some cases, this might mean looking for a sweet spot in the amount of support we provide. For example, weekly individual meetings and FSGs in the first semester appear to be sufficient, but are they necessary? In other cases, we may explore alternative offerings for a similar level of support. For example, do all meetings need to be with a member of faculty, or will a dedicated graduate teaching assistant be a sufficient addition to these components? We wonder, moving forward, how to maintain our momentum into increased admissions at the university and opening the program to students beginning in other math courses.

Beyond adjustments to how we implement the high-contact support within the program, our next steps also include assessing each support outside of retention numbers. The sudden shock of low retention of the 2023 cohort alongside repeated conversations about students deciding to leave their major, the program, or the university was our inspiration for many of these added supports, but retention numbers do not explain how each support is impacting the students in ECP. We've seen a substantial shift in how students have come into and out of the program; students share their experiences and concerns with our faculty more openly through this new approach. Over the two newest cohorts, no student leaving the university, major or ECP has been a surprise when a final decision occurred. Through the presentation of this paper, we hope to elicit feedback from our peers about the creation of an interview protocol or other research techniques that will help us to answer questions about these components of ECP.

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