RESEARCH FOR ACTION

Examining the Impact, Implementation, and Cost Effectiveness of Completion Coaching in a Statewide College Promise Program

Final Evaluation Report

September 30, 2023

I. Study Overview & Status Report

In 2015, Tennessee launched the Tennessee Promise (TN Promise), one of the most comprehensive and well-funded statewide free-college scholarship programs in the country. TN Promise provides last-dollar scholarships that ensure that mandatory tuition and fees are covered for all participants. While all Tennessee residents who enroll in community college the fall after high school graduation are eligible for the program, additional annual eligibility requirements include mandatory meetings, 8 hours of community service, filing a federal aid application (i.e., FAFSA form), and maintaining a 2.0 GPA.

The inaugural class of TN Promise saw significant increases in retention and graduation compared to the pre-Promise cohort (Tennessee Board of Regents, 2018a). The 2015 TN Promise cohort's overall success rate[1] was 52%, 2 percentage points higher than the success rate for all community college students in 2014. The 2015 TN Promise cohort's rate of credential attainment was 22%, compared to a rate of 14% for all community college students in 2014.

However, the success rate and credential attainment of 2015 Promise students from the lowest-income households remained lower than that of the overall cohort. Within the 2015 cohort, students with a $0 Estimated Family Contribution (EFC) saw a success rate of 45% and credential attainment rate of 17%, demonstrating an equity gap in retention and completion among Promise students (Tennessee Board of Regents, 2018b). Such differences according to students' socio-economic backgrounds appear even before college, as students from low-income households are less likely to be academically prepared when they begin their postsecondary careers. Data from the 2017 TN Promise cohort show an average ACT score of 19 (indicating academic preparedness) for all students, compared to an average score of 17.5 (indicating academic under-preparedness) for students with $0 EFC.

To support TN Promise students, and especially those from the lowest income households, tnAchieves, a key partner facilitating all non-financial components of TN Promise, implemented completion coaching across the state's 13 community colleges beginning in fall 2018. The completion coaching program was designed to help TN Promise students navigate barriers to college persistence and completion. Completion coaching is a specific form of structured advising focused on supporting students' ability to navigate institutional and personal barriers that can influence college success. Completion coaching has been shown to be particularly effective for first-generation and low-income college students who tend to face substantial barriers to college completion (Deil-Amen & Rosenbaum, 2003).

Under tnAchieves' model of completion coaching, each completion coach has a caseload of approximately 350 to 400 students who receive either *proactive* or *reactive* coaching. *Proactive coaching* is an intensive, high-touch coaching intervention involving one initiated contact between coach and student at least every

[1] Success rate is defined as students who graduated, transferred, or were still enrolled in community college through the five semesters.

three weeks. In contrast, *reactive coaching* is a less intensive, responsive intervention where contact between coach and student is initiated by a student. During the first year of completion coaching in 2018, students were assigned to coaching models based on prior academic performance measured by ACT scores, with lower-performing students assigned to proactive coaching and higher-performing students assigned to reactive coaching. However, beginning with the fall 2019 cohort, tnAchieves targeted proactive coaching to students from the lowest income households, defined by an EFC of $0 (Tennessee Board of Regents, 2018a).

In partnership with tnAchieves, Research for Action (RFA) conducted a three-year mixed methods study to evaluate tnAchieves' completion coaching program, focusing on the relative effectiveness of proactive versus reactive coaching. The study included four parts: an analysis of impact on student outcomes, an implementation study, an exploratory study of dosage effects, and a cost analysis. The impact study used a randomized control trial (RCT) design that randomly assigned the fall 2019 Promise cohort to proactive or reactive coaching conditions. In this report, we summarize study findings and discuss implications for program and policy development.

The remainder of the report is as follows. In Section II below, we present findings from the impact analysis estimating effects of proactive coaching on student outcomes relative to reactive coaching. Section III presents results from the implementation study drawing on coaching logs and interviews with coaches, highlighting how the implementation of completion coaching was disrupted by the COVID-19 pandemic. In Section IV, we present results from exploratory dosage analyses estimating variation in treatment effects by the degree of student-coach contact. We then move to the cost analysis in Section V and conclude with a discussion of our results and implications for practice in Section VI.

II. Impact Analysis

Coaching interventions have been shown to be effective in promoting college access, persistence, and achievement, especially for students from minoritized backgrounds (Bettinger & Baker 2014; Carrell & Sacerdote, 2013; Ott et al., 2020). "Coaching" or "advising" programs in higher education can vary widely in content and frequency, but the overall value of sustained interpersonal advising relationships has been well-documented in the literature on postsecondary outcomes (Avery, 2013; Barr & Castleman, 2018; Carrell & Sacerdote, 2017). Studies on college coaching (Bettinger & Baker 2014; Ott et al., 2020) have largely focused on one particular coaching program—InsideTrack—which uses a standardized coaching model to support current college students. While these studies have found consistent positive effects on student persistence, in both two- and four-year institutions, there is limited evidence on the effects of coaching on longer-term outcomes such as degree completion. Our study aims to fill this gap by focusing on students in two-year colleges and estimating the impacts of a completion coaching program on students' two- and three-year postsecondary outcomes. We thus build on the coaching literature and provide additional evidence on the potential for comprehensive student coaching support to boost community college completion and success.

Our study focuses on tnAchieves' completion coaching program offered to community college students from low-income households, defined by $0 EFC. We are particularly interested in the effectiveness of offering proactive coaching relative to reactive coaching. Our study is guided by the following primary and secondary research questions:

Primary Research Question: Among TN Promise students from low-income households, what is the impact of offering proactive coaching on associate degree completion within three years, compared to reactive coaching?

Secondary Research Questions: Compared to reactive coaching, what is the impact of offering proactive coaching to community college students from low-income households on:

a. Associate degree completion within two years (i.e., "timely completion")?
b. Certificate completion within two and three years?
c. Transfer to a four-year college within two and three years?
d. Persistence within first semester, one year, and two years?

Research Design and Analytic Sample

To address the primary and secondary research questions, RFA conducted a blocked randomized controlled trial. In September 2019, tnAchieves identified 3,675 full-time Tennessee (TN) Promise students with $0 EFC who were first-time college students registered at one of 13 Tennessee public community colleges in fall 2019. RFA used a blocked randomization method that assigned 65% of students within each community college to the treatment condition (i.e., proactive coaching group) and 35% to the control condition (i.e., reactive coaching group), resulting in 2,393 students in the treatment condition and 1,282 students in the control condition.

After the randomization was performed, 180 students from Pellissippi State Community College were dropped from the initial intent-to-treat (ITT) sample as we learned that a new intervention in Knox County applied the proactive model to *every* Pellissippi State Community College student in that county. An additional 240 students were dropped from the sample as they withdrew college registration before the beginning of the intervention on October 15, 2019. According to What Works Clearinghouse Standards Handbook 5.0, these types of exclusion do not constitute "sample attrition" because the exclusions predated the intervention and were not associated with the intervention conditions (WWC, 2022; pp. 41-42). After excluding these 320 observations, the modified intent to treat (m-ITT) sample for this study includes a total of 3,255 students, 2,101 (64.55%) assigned to the treatment condition and 1,154 (35.45%) assigned to the control condition. Table 1 presents the number of students assigned to the treatment and control conditions at each community college.

Table 1. Number of students assigned to the treatment and control conditions by college

Community College	Treatment	Control	Total
Chattanooga State Community College	214	115	329
Cleveland State Community College	99	59	158
Columbia State Community College	127	72	199
Dyersburg State Community College	63	35	98
Jackson State Community College	136	75	211
Motlow State Community College	237	125	362
Nashville State Community College	175	90	265
Northeast State Community College	167	88	255
Roane State Community College	151	82	233
Southwest State Community College	269	158	427
Volunteer State Community College	235	133	368
Walters State Community College	228	122	350
Total	**2,101**	**1,154**	**3,255**

We tested the baseline equivalence of select variables between treatment and control groups in the modified ITT sample using Hedges' *g* for continuous variables and Cox's *d* for dichotomous variables. Both Hedges' *g* and Cox's *d* are "standardized" effect sizes, meaning that the effects are put onto the same scale regardless of the variable being measured. WWC (2022) considers the baseline equivalence requirement to be satisfied if a standardized effect size (difference) is equal to or less than 0.05. Table 2 presents means for baseline covariates, mean differences between the treatment and control groups, and standardized effect sizes.

Table 2. Baseline equivalence statistics for the modified intent to treat sample

Variable: Student Characteristics	Mean		Mean Difference	Effect Size
	Treatment	Control		
ACT score	18.122	18.224	-0.102	-0.030
Female	0.658	0.650	0.008	0.021
Black	0.255	0.238	0.017	0.055
Hispanic	0.111	0.107	0.004	0.025
White	0.535	0.549	-0.014	-0.059
Other Race/Ethnicity	0.099	0.106	-0.007	-0.046
First Generation College Student	0.548	0.557	-0.009	-0.022

Overall, the treatment and control groups are balanced on baseline covariates. All effect sizes reported in the table meet WWC's requirement for baseline equivalence (0.05), except for the proportions of black and white students. The treatment group has a slightly higher proportion of black students than the control group while having a slightly lower proportion of white students. Following the WWC (2022) recommendation, we incorporate the covariates that show greater than 0.05 baseline equivalence (i.e., race/ethnicity) into the regression model estimating the treatment effects to statistically control for the remaining imbalance at the baseline.

Treatment Contrasts

Students assigned to the treatment condition were offered *proactive coaching*, a high-touch, intensive coaching intervention. Following random assignment to the proactive model, treatment group students received an email from their assigned completion coach introducing the proactive coaching model as well as a text message prompting them to check their email. Following the email and text message introduction, coaches began the first round of proactive interventions, which involved initiating contact with each student at least every three weeks. Students who responded to coach contact participated in individualized coaching meetings focused on co-developing individualized success plans that included personalized activities such as connecting students with academic resources and supporting annual FAFSA completion. All student-coach meetings were logged by completion coaches using tnAchieves' relationship management tool, Salesforce.

Students who were assigned to the control condition were offered *reactive coaching*. Reactive coaching was offered to all TN Promise students regardless of family income, and therefore, it represents a business-as-usual control condition. Under the reactive coaching model, students received weekly emails and reminder text messages regarding TN Promise requirements. However, in contrast to proactive coaching, reactive coaching required any additional contact with coaches to be initiated by students, with coaches responding to, rather than initiating, contacts. Any personalized coaching (e.g., success plans and FAFSA completion support) delivered to students in the reactive coaching group occurred only by student request.

Data

Data on student demographics, enrollment, and postsecondary outcomes came from the National Student Clearinghouse (NSC). NSC collects data from colleges and universities around the country on postsecondary enrollment and degree attainment. Using data obtained from NSC, we tracked student outcomes in three domains: degree and certificate completion, transfer to four-year college, and persistence in postsecondary education. We tracked these outcomes across a three-year period from fall 2019 to fall 2021. We used these variables to construct the primary and secondary outcome measures, which are presented in Table 3. The primary outcome measure of interest for this study is completion of associate degree within three years. All other measures listed in Table 3 are secondary outcome measures.

Table 3. Outcome measures examined in the study

Outcome Category	Outcome Measure
Completion of Associate Degree	Attain associate degree within two years (by August 2021)
	Attain associate degree within three years (by August 2022)
Completion of Certificate	Attain certificate within two years (by August 2021)
	Attain certificate within three years (by August 2022)
Transfer to Four-Year College	Transfer to a four-year college within two years (by August 2021)
	Transfer to a four-year college within three years (by August 2022)
Combined Completion	Attain associate degree/certificate and/or transfer to four-year college within two years (by August 2021)
	Attain associate degree/certificate and/or transfer to four-year college within three years (by August 2022)
Persistence	First semester persistence: Enrolled in college from fall 2019 to spring 2020
	First year persistence: Enrolled in college from fall 2019 to fall 2020
	Two-year persistence: Enrolled in college from fall 2019 to fall 2021

Note:

1. The primary outcome measure is bolded in the table.
2. We compute a persistence rate for a given period by including students who transferred to two or four-year colleges, completed a certificate, and attained an associate degree. These students were considered as "persistent" for the given period.
3. Combined completion represents an aggregate measure of college completion. It is a binary variable coded as 1 if students achieve at least one of the following completion outcomes: completion of associate degree, completion of certificate, or transfer to four-year college. This variable is coded as 0 if students do not achieve any completion outcome.

In addition to the student outcomes data, the NCS data also included student-level demographic (e.g., gender, age, race/ethnicity, and first-generation college student status) and pre-college academic (e.g., ACT scores) variables. We used these variables to test for baseline equivalence, presented in Table 2 above. We also incorporated these student-level covariates in the impact analysis model to statistically control for any remaining observable differences between the randomized treatment and control groups.

Statistical Model

We estimate the intent-to-treat (ITT) effect of offering proactive coaching on student outcomes using the following linear probability model:

$$y_{ij} = \alpha + \beta COMPLETE_{ij} + \delta X_{ij} + \gamma_j + \varepsilon_{ij}$$

where y_{ij} is the dichotomous outcome for student *i* at college *j*; $COMPLETE$ denotes whether the individual is randomized into the proactive coaching program ($COMPLETE$=1) or reactive coaching program ($COMPLETE$=0), and X_{ij} is dummy variables for race/ethnicity. We also include institution fixed effects to account for unobservable college effects (γ_j)[2]. In this model, β represents an estimate of the impact of proactive coaching on student outcomes, compared to the outcomes of students who received reactive coaching.

Results

Table 4. Comparison of average student outcomes between the treatment and control groups

Outcome Category	Outcome Variable	Mean		Mean Difference
		Treatment (N=2,101)	Control (N=1,154)	
Completion of Associate Degree	Attain associate degree within 2 years	11.1%	10.4%	0.7%
	[Primary] Attain associate degree within 3 years	20.5%	18.8%	1.7%
Completion of Certificate	Attain certificate within 2 years	2.8%	3.2%	-0.4%
	Attain certificate within 3 years	4.5%	4.7%	-0.2%
Transfer to Four-Year College	Transfer to a 4-year college within 2 years	10.8%	10.1%	0.7%
	Transfer to a 4-year college within 3 years	20.4%	18.5%	1.9%
Combined Completion	Combined completion within 2 years	17.8%	16.1%	1.7%
	Combined completion within 3 years	31.3%	28.3%	3.0%
Persistence	First semester persistence	76.8%	78.1%	-1.3%
	First year persistence	50.5%	50.5%	0.0%
	Two-year persistence	26.6%	27.9%	-1.3%

Table 4 above reports unadjusted averages of the primary and secondary outcomes for the treatment and control groups. Overall, we find that average outcomes among students who were offered proactive coaching (treatment group) are generally higher than those of students who were offered reactive coaching (control group), with the exception of certificate attainment and persistence. Students who were offered proactive coaching are more likely to complete an associate degree, and for our primary outcome measure – completion of associate degree within three years – the mean difference is 1.7 percentage points. Average rates of transfer to a four-year college are also higher among the proactive coaching group, as are combined

[2] As specified in the pre-analysis plan, RFA initially planned to include coach fixed effects terms, with the assumption that student assignment to coaches would not change over time. However, we learned that this assumption of "fixed" coach assignment did not hold due to (i) coach turnover and (ii) reassignment of sample students to different coaches as sample students lost their Promise eligibility. With these changes in student-coach assignment, coach fixed effects are no longer appropriate. Instead, we replaced coach fixed effects terms with institutional fixed effects terms. Because the initial assignment of students to coaches was based on the student's institution, institutional fixed effects terms may be good proxies for coach fixed effects (at least for the first year). Additionally, institutional fixed effects terms control for all time-invariant, unobservable college-level variables that may be associated with our outcomes of interest, improving the precision of our impact estimates in the linear probability model.

completion measures. For certificate attainment and persistence, average outcomes are lower among students who were offered proactive coaching, with mean differences ranging from 0 to -1.3.

We also find that mean differences in outcomes between the treatment and control groups tend to increase over time, particularly on measures where means are higher in the treatment group. For example, the average rate for four-year college transfer in two years is 10.8% for students who were offered proactive coaching and 10.1% for those who were offered reactive coaching, for a difference of 0.7 percentage points. For transfers within three years, the average rate among the proactive coaching group is 20.4% and 18.5% for the reactive coaching group, for a mean difference of 1.9 percentage points. A similar pattern emerges for completion of associate degree and combined completion. For measures of certificate completion and persistence, where means are lower among the proactive coaching group, mean differences either shrink over time (certificate completion) or move in both directions (persistence).

We next move to results from our fully specified ITT model. Table 5 below shows ITT estimates of the effects of offering proactive coaching on students' two- and three-year outcomes. We report the estimated impact on each outcome in terms of the percentage point difference in probability of achieving the given outcome between the average treatment and control group student, controlling for the effects of student-level covariates and institution fixed effects.

Table 5. Estimated ITT impacts on student outcomes from the linear probability model

Outcome Category	Outcome Measure	Estimated Impact
Completion of Associate Degree	Attain associate degree within 2 years	0.8%
	[Primary] Attain associate degree within 3 years	1.8%
Completion of Certificate	Attain certificate within 2 years	-0.4%
	Attain certificate within 3 years	-0.04%
Transfer to Four-Year College	Transfer to a 4-year college within 2 years	0.8%
	Transfer to a 4-year college within 3 years	2.0%
Combined Completion	Combined completion within 2 years	1.8%
	Combined completion within 3 years	3.2%*
Persistence	First semester persistence	-1.3%
	First year persistence	0.02%
	Two-year persistence	-1.2%

Note: * significant at 5%; ** significant at 1%; Full parameter estimates for all ITT models are reported in Appendix A1, A2, and A3.

Estimated ITT impacts are generally consistent with mean differences reported in Table 4, supporting the validity of random assignment into treatment. We do not find statistically significant effects of proactive coaching on our primary outcome of interest, completion of associate degree in three years, nor do we find statistically significant effects on several secondary measures, including completion of associate degree in two years, completion of certificate (within two or three years), transfer to four-year college (within two or three years), and all persistence measures. However, we find that the offer of proactive coaching has a statistically significant effect on students' three-year combined completion rate, which captures the sum of students who completed associate degrees, certificates, and/or transferred to four-year colleges by the end of their third year in community college. The proactive group's combined completion rate is 3.2 percentage points higher than that of the reactive coaching group.

It is also noteworthy that the estimated effects on associate degree, transfer to four-year college, and combined completion outcomes – while not all statistically significant – are trending positive over time, similar to the observed patterns in unadjusted mean differences reported in Table 4. For example, the estimated effect on the completion of associate degree within three years, which is the primary outcome of interest in this study, is more than two times greater than the completion of associate degree within two years. We also observe similar trends for the four-year college transfer and combined completion outcomes. These positive trends suggest that the value of having an interpersonal relationship with a college coach, or advisor, may build over time, such that the benefits of coaching increase as the student-coach relationship develops.

To check the robustness of the impact estimates from the linear probability model, we also estimated the impact of offering the proactive coaching model on student outcomes using the logit model. The proactive coaching program impact is estimated in terms of the log odds ratio that corresponds to treatment and control groups' outcomes. For ease of interpretation, we report estimated treatment effects in terms of marginal probabilities that indicate the difference in the predicted probability of achieving a given binary outcome between the treatment and control group, for the average student (i.e., holding all covariates at their means). The magnitude and significance of impact estimates reported in Table 6 are consistent with those reported in Table 5, suggesting the robustness of the linear probability model's impact estimates.

Table 6. Estimated ITT impacts on student outcomes from logit model

Outcome Category	Outcome Measure	Estimated Impact
Completion of Associate Degree	Attain associate degree within 2 years	0.8%
	[Primary] Attain associate degree within 3 years	1.8%
Completion of Certificate	Attain certificate within 2 years	-0.3%
	Attain certificate within 3 years	-0.02%
Transfer to Four-Year College	Transfer to a 4-year college within 2 years	0.7%
	Transfer to a 4-year college within 3 years	2.0%
Combined Completion	Combined completion within 2 years	1.7%
	Combined completion within 3 years	3.2%*
Persistence	First semester persistence	-1.4%
	First year persistence	0.2%
	Two-year persistence	-1.2%

Note: * significant at 5%; ** significant at 1%; Full parameter estimates for all logit models are reported in Appendix B1, B2, and B3.

Discussion

Our impact analysis examines the effects of tnAchieves' completion coaching model by using a blocked randomized controlled trial to assign TN Promise students from low-income households (defined by $0 EFC) to be offered either proactive or reactive coaching. Using NSC data, we track outcomes for students in the study sample across three years to measure impacts on a host of student-level success measures, including persistence, degree/certificate completion, and transfer to four-year college.

Results from the impact analysis find limited evidence of positive effects of proactive coaching on student outcomes. For our primary outcome of interest, completion of associate degree in three years, the

estimated impact is positive but not statistically significant, indicating that differences in the rate of three-year associate degree completion between students who were offered proactive coaching and students who were offered reactive coaching are statistically indistinguishable from zero. Further, we do not find evidence of statistically significant impacts on certificate completion, transfer to four-year college, or persistence. We do, however, find that the offer of proactive coaching had a positive impact on students' combined completion, a broader measure of student success that includes associate degree completion, certificate completion, or transfer to four-year college.

We note that our results differ somewhat from prior work on completion coaching (e.g., Bettinger and Baker 2014; Ott et al., 2020). While the use of a randomized controlled trial supports the internal validity of our estimates, programmatic differences and a unique study context likely contribute to our diverging results. First, our analysis measures the effect of proactive coaching relative to reactive coaching, unlike prior work estimating the effects of proactive coaching relative to no coaching at all (Bettinger and Baker, 2014). Our use of a business-as-usual control condition (instead of the absence of treatment) may dilute the observed treatment effects. Second, our study took place from fall 2019 to fall 2021, which overlapped with the onset and height of the COVID-19 pandemic. Disruptions to schooling caused by the COVID-19 pandemic have been well-documented (e.g., Floyd, 2021; Goldhaber et al., 2022) and these widespread economic and public health challenges, which disproportionately affected students from low-income communities, certainly threaten the external validity of our study. To further understand how COVID-19 shaped the nature and use of completion coaching during the study period, we turn to the implementation analysis presented below in Section III.

III. Implementation Analysis: Effects of COVID-19 on Proactive Coaching

To contextualize the impact analysis results presented in Section II, we conducted an extensive implementation analysis using quantitative process data collected through coaching logs and qualitative interview data collected from coaches. Our implementation study spans a two-year period aligned to the 2019-20 and 2020-21 academic years and focuses on how the implementation of proactive coaching was disrupted by COVID-19.

At the onset of the pandemic, college campuses across the country closed as institutions rapidly attempted to digitize every part of the student experience (Garcia Morales et al., 2021). However, the extent to which students utilized and accepted these digitalized changes varied (Aguilera-Hermida, 2020). For students who preferred face-to-face learning, online learning may have felt especially difficult. During the pandemic, students reported lower motivation, self-efficacy, and engagement (Aguilera-Hermida, 2020). This study explores how the COVID-19 pandemic shaped the implementation of a proactive coaching intervention targeted to TN Promise students from low-income households. Because the implementation study is focused specifically on the proactive coaching model, our results speak only to the experiences of students randomized to the treatment condition. Our analysis focuses on the two academic years spanning the COVID-19 pandemic: 2019-20 and 2020-21. We draw on detailed coaches' logs of each meeting in the two-year time frame in addition to ten interviews with coaches conducted in June 2020.

Data and Analytical Strategy

We use data from coaching logs collected during the first two years of the study. Year 1 runs from October 15, 2019 (the beginning date of the randomized controlled trial) through June 30, 2020, and Year 2 runs from July 1, 2020 through June 30, 2021. During these two years, we observed 15,111 student-coach meetings, or "connections," spread across 2,072 students. There are 8,302 connections in Year 1 and 6,809 in Year 2.

We present data in four study phases to capture variations in implementation around the COVID-19 pandemic. The first phase is Year 1 beginning from the start of the randomized controlled trial (October 15, 2019) through the start of lockdowns in the TN education system (March 20, 2020). The second phase refers to the remainder of that academic year (until June 30, 2020). Phases 3 and 4 are the first and second six-month periods in Year 2 with December 31, 2020 as the midpoint. Importantly, Phases 1 and 2 are not equivalent; Phase 1 is five months while Phase 2 is only three months. Analyses will refer to the number of connections per student over the two-year implementation study period and the number of connections per student in each study phase.

Our implementation study draws on coaching log data and interviews with coaches. We analyze the coaching log data using descriptive statistics to explore variation in coaching engagement over the study phases. We supplement the coaching log data with ten coach interviews completed in June 2020. These interviews were intended to capture coaches' experiences implementing the program and their perceptions of student challenges in real time. The interviews covered a range of topics including fidelity of implementation given the pandemic and perceptions of student outcomes given pandemic-related changes. We analyze the interview data using qualitative coding, allowing themes to emerge inductively throughout the coding process.

Findings

We find that the onset of the pandemic was associated with changes in the mode of student-coach connections when the intervention became largely text-based. The shift to text-based communication persisted into the following school year, even as campuses began to reopen. We find significant variation in the degree of student-coach engagement – the number or frequency of student-coach connections – over the study period. Students who had relatively high initial engagement tended to maintain their engagement throughout the two-year implementation study period. Students who had low initial engagement, however, experienced lasting pandemic-related changes such as unenrollment, loss of Promise eligibility, and/or continued lack of coaching engagement.

Characteristics of engagement with coaches. Table 7 below presents characteristics of coaching engagements across the four phases of the implementation study. We find that the method of communication evolved from in-person meetings and phone calls to phone calls and text messages. In-person meetings, which accounted for a third of coaching connections during Phase 1, disappeared with the onset of the pandemic in Phase 2. In-person meetings were not always replaced with virtual meetings. Text messages and phone calls accounted for a greater share of meetings in Phase 2, and in Phases 3 and 4, text messages and phone calls grew to account for almost all coaching sessions. By the end of the implementation study period, nearly two-thirds (62%) of coaching meetings occurred over text messages, compared to less than 20% of connections in the pre-pandemic period.

In Table 7, we find that the most common topics discussed in communications with coaches were advising and enrollment, campus or class discussions, catching up, and personal. Catching up and personal topics were the most discussed topics overall, and most prominent in Phase 1 when, perhaps, students and coaches were getting to know each other. Discussions about campus or classes became more frequent to account for about half of the coaching sessions in Phase 4. There also appear to be some seasonal patterns in coaching engagements. Grades, for example, were more likely to be discussed in the spring than the fall. About 90% of all coaching sessions were initiated by coaches. Student-initiated contact was slightly more common in the second year of the intervention, suggesting students become more comfortable accessing coaches or were more likely to view them as a resource. Table 8, below, also shows that, across the four

most common connection topics, most connections were made through text messages or phone calls after the pandemic.

Table 7. Characteristics of coaching connections across the study phases

Category	Phase 1 October 15, 2019 – March 20, 2020	Phase 2 March 21, 2020 – June 30, 2020	Phase 3 July 1, 2020 – Dec. 31, 2020	Phase 4 Jan. 1, 2021 – June 30, 2021	Total
Method	**(n = 4,902)**	**(n = 3,344)**	**(n = 4,075)**	**(n = 2,693)**	**(n = 15,014)**
Email	0.22	0.75	0.93	0.78	0.63
In-Person	33.44	0.00	0.02	0.00	10.92
Phone call	46.57	48.65	40.42	32.57	42.85
Text message	19.77	38.19	49.72	62.16	39.60
Virtual Meeting	0.00	12.41	8.71	4.08	5.86
Social	0.00	0.00	0.20	0.41	0.13
Topic	**(n=3,947)**	**(n=2,870)**	**(n=3,646)**	**(n=2,491)**	**(n=12,954)**
Advising and Enrollment	11.33	37.53	30.69	27.42	25.54
Campus/Class Discussion	30.35	30.31	36.81	44.12	34.60
Career choice	0.81	1.43	1.87	2.01	1.48
Catching up	44.31	33.24	24.66	23.60	32.46
Community service	2.00	2.68	0.74	2.33	1.86
Financial aid	3.19	4.04	9.11	6.54	5.75
Grades	5.40	12.47	3.78	7.11	6.81
Other	0.20	0.73	0.33	1.61	0.61
Personal	22.98	17.07	14.56	13.65	17.67
Professor	0.48	0.77	1.34	0.48	0.78
Resources	1.04	0.87	1.04	0.96	0.97
Time Management	2.00	1.57	1.29	1.08	1.50
Direction	**(n = 4,936)**	**(n = 3,366)**	**(n = 4,092)**	**(n = 2,717)**	**(n = 15,111)**
Initiated by student	8.93	9.63	12.68	11.19	10.51
Initiated by coach	91.07	90.37	87.32	88.81	89.49

Note: Source is coaching log data. Each cell shows the percentage of connections by category and phase. For example, .22% of connections in Phase 1 occurred over email. N sizes refer to the total number of connections by each category and phase and thus serve as the denominator in our calculations. 2,157 connections do not list a topic discussed. 97 connections do not list a method of communication. Connection topics do not sum to 100 as more than one topic may be discussed per session.

Table 8. Method of coaching connections across study phases, by the four most common connection topics

Category	Phase 1 October 15, 2019 – March 20, 2020	Phase 2 March 21, 2020 – June 30, 2020	Phase 3 July 1, 2020 – Dec. 31, 2020	Phase 4 Jan. 1, 2021 – June 30, 2021	Total
Advising and Enrollment	**(n = 446)**	**(n = 1,077)**	**(n = 1,119)**	**(n = 683)**	**(n = 3,325)**
Email	0.45	1.39	0.89	1.17	1.05
In-Person	31.84	0.00	0.09	0.00	4.30
Phone call	48.65	54.32	38.96	39.53	45.35
Text message	19.06	36.77	47.45	54.47	41.62
Virtual Meeting	0.00	7.52	12.33	4.25	7.46
Social	0.00	0.00	0.27	0.59	0.21
Campus/class discussion	**(n = 1,197)**	**(n = 870)**	**(n = 1,342)**	**(n = 1,098)**	**(n = 4,507)**
Email	0.25	0.69	0.97	0.46	0.60
In-Person	34.92	0.00	0.00	0.00	9.27
Phone call	46.78	56.67	41.95	34.61	44.29
Text message	18.05	25.98	50.97	60.29	39.67
Virtual Meeting	0.00	16.67	5.96	4.28	6.04
Social	0.00	0.00	0.15	0.36	0.13
Catching up	**(n = 1,748)**	**(n = 952)**	**(n = 898)**	**(n = 585)**	**(n = 4,183)**
Email	0.17	0.21	0.33	0.51	0.26
In-Person	33.75	0.00	0.00	0.00	14.10
Phone call	54.58	59.35	57.91	33.85	53.85
Text message	11.50	24.68	28.51	57.95	24.65
Virtual Meeting	0.00	15.76	13.14	7.69	7.48
Social	0.00	0.00	0.11	0.00	0.02
Personal	**(n = 3,039)**	**(n = 2,378)**	**(n = 3,114)**	**(n = 2,149)**	**(n = 10,680)**
Email	0.23	0.84	1.06	0.93	0.75
In-Person	31.69	0.00	0.03	0.00	9.03
Phone call	49.88	51.85	41.17	33.55	44.49
Text message	18.20	36.29	48.01	60.59	39.45
Virtual Meeting	0.00	11.02	9.57	4.56	6.16
Social	0.00	0.00	0.16	0.37	0.12

Note: Source is coaching log data. Each cell shows the percentage of connections within category and phase. For example, .45% of Advising and Enrollment connections in Phase 1 occurred over email. N sizes refer to the total number of connections in each category and phase and thus serve as the denominator in our calculations. 2,157 connections do not list a topic discussed and 97 connections do not list a method of communication; they are not included in this table.

Coaching engagement by student status. Our analysis also examines variation in coach engagement by student's fall 2020 status, which corresponds with the beginning of study Year 2 and the height of the COVID-19 pandemic. In Table 8, we characterize students into four groups based on their fall 2020 enrollment status: (1) enrolled, eligible, and engaged; (2) enrolled, eligible, but disengaged; (3) enrolled, no longer eligible; and (4) no longer enrolled. Note that enrolled refers to college enrollment status, eligible refers to Promise eligibility, and engaged refers to the degree of coach engagement in Year 1. For each of these four groups, we examine average rates of coaching engagement throughout the duration of the implementation study.

Table 9 presents differences in average connections per student by students' fall 2020 status. Means represent the average number of connections over the two-year implementation study, though students in groups characterized by disengagement, loss of Promise eligibility, or dropped enrollment definitionally lost access to their coach, thus means for these groups are derived from the first year of the study.

Table 9 shows substantial differences in the average number of connections across the four student groups. Students who were enrolled and Promise-eligible in fall 2020 received an average of 13.5 coaching sessions over the two-year period. Students who were enrolled and Promise-eligible in fall 2020 but had low levels of initial coach engagement continued to have a very low level of engagement throughout the study duration. The average student in this group received fewer than one coaching session per person over the first year. Students who enrolled in fall 2020 but lost Promise eligibility received an average of 4 coaching sessions. Finally, students who did not enroll for fall 2020, regardless of their eligibility, received an average of 2.8 coaching sessions throughout the study period.

Table 9. Average number of coaching sessions per student across study period, by fall 2020 enrollment status

	N	Mean	SD
All			
Total	2,072 (100%)	7.3	7.0
By Fall 2020 Student Enrollment Status			
Enrolled, eligible, and engaged	868 (41.9%)	13.5	5.8
Enrolled, eligible but disengaged	78 (3.8%)	0.6	1.4
Enrolled, no longer eligible	192 (9.3%)	4.0	4.2
No longer enrolled	934 (45.1%)	2.8	3.2

Note: Source is coaching log data. N sizes refer to the number of students with any coaching sessions in that period. For now, these numbers are also the denominator for coaching sessions per student as it is difficult to determine when exactly students drop out or lose their Promise eligibility. 14 coaches saw students in Year 1 and 12 coaches saw students in Year 2.

In Table 10, we further disaggregate these data by study phases. Overall, the average number of connections per student was higher in Year 2 (Phases 3 and 4) than in Year 1 (Phases 1 and 2). In addition to students and coaches possibly being more invested in the coaching relationship, there may have been more time available in Year 2 as fewer students were enrolled and Promise-eligible. And of course, student selection may be involved in these patterns as more disengaged students dropped enrollment or lost Promise eligibility, resulting in a sample of more engaged students in Year 2. We reiterate that these phases are not exactly equivalent due to the second phase starting on March 20 and being shorter than phase one.

Table 10. Average (SD) number of coaching sessions per student by study phase and enrollment status

	Phase 1	Phase 2	Phase 3	Phase 4
	October 15, 2019 - March 20, 2020 (n=2,072)	March 21, 2020 – June 30, 2020 (n=1,322)	July 1, 2020 – Dec. 31, 2020 (n=1,171)	Jan. 1, 2021 – June 30, 2021 (n=808)
All				
	2.4 (1.8)	2.5 (1.5)	3.5 (2.5)	3.4 (2.4)
By Fall 2020 Student Status				
Enrolled, eligible, and engaged	3.3 (1.5)	2.9 (1.3)	4.2 (2.3)	3.3 (2.4)
Enrolled, eligible but disengaged	0.5 (0.9)	0.8 (1.2)	NA	NA
Enrolled, no longer eligible	2.0 (1.7)	2.4 (1.5)	2.1 (1.7)	NA
No longer enrolled	1.8 (1.7)	1.9 (1.6)	1.2 (1.2)	NA

Note: Source is coaching log data. N sizes refer to the number of students with any coaching sessions in that period. For now, these numbers are also the denominator for coaching sessions per student as it is difficult to determine when exactly students drop out or lose their Promise eligibility. 14 coaches saw students in Year 1 and 12 coaches saw students in Year 2.

The pandemic was associated with changes in engagement with coaching for many, but not all students. The enrolled, eligible, and engaged students continued to participate consistently over the two-year period and even increased their connections in the second year. Despite the transition to remote learning, each student from this group participated in at least one coaching session in spring 2020. For those students who enrolled and maintained Promise eligibility in fall 2020 but had low levels of initial coaching engagement, the onset of the pandemic was associated with a drop-off in their participation. Among those who lost Promise eligibility or did not enroll in Fall 2020, their coaching engagement dropped off in Phase 4 as they were no longer able to access coaching services.

Pandemic-related challenges for student engagement. Interviews with coaches offer insight into pandemic-related drop-offs in student use of coaching services. Interview data shed light on the challenges and changes students navigated at the onset of the pandemic, both in terms of widespread economic changes and the switch to virtual learning following campus closures. Students, especially in rural areas, faced challenges accessing technology and the internet at the onset of the pandemic when instruction transitioned online. When asked to reflect on the disproportionate impacts of COVID-19, one coach discussed internet and technology access, saying:

> *Some students really can't afford to get a laptop or anything, and they did rely on going to the campus and using their resources to get things done, and they're not able to do that anymore. Whereas other areas, maybe their family doesn't have wifi, but they did have access to free wifi because they live in a more populated area or closer to a city.*

But, the coach added, the access to free wifi for more rural students was not ideal, *"Some of them would have to drive to a McDonald's parking lot and just sit in their car and do their homework to get things done."* Other coaches echoed these issues saying, "*…sometimes their cell phones maybe cut off, because of lack of payment, or they don't have internet access at home and things like that.*"

In response to these challenges, coaches assembled an "internet resource guide" for some students to qualify for free or reduced-price internet service. One coach reported, *"I've had a couple students who have been able to get those free or reduced-price internet services, and it helped them out through the semester."*

The pandemic also shifted many students' financial concerns. At the start of the pandemic, many students experienced changes to their financial situations, related to changing work conditions or the need to support family members. Most students were already employed either full-time or part-time before the pandemic, and the economic effects of the pandemic brought dramatic changes for them. As one coach explained, *"A lot of them are… essential workers. So, they work in a warehouse or a grocery store, and they had to pick up a lot more hours, or they were just completely laid off from their job."*

The chaos of this time was amplified in the family context and students' priorities shifted accordingly:

> *I think because they are frontline essential workers and a lot of them are caretakers for their families if let's say their parents are essential workers. So, I think it's kind of their role within their families have shifted quite a bit. The financial burden for a lot of them I think is a big stressor…. obviously, you need to make sure you're putting food on the table before anything else so sometimes school and things like that are going to fall to the wayside.*

School took a back seat for many because, in addition to technology access, it became hard to find a quiet space to study: *"I think a lot of students really relied on being on campus away from everyone to actually focus on school because they do have so much going on, even in the midst of a pandemic."*

Coaches described students' financial and mental health challenges as intertwined. One coach noticed a *"lack of motivation,"* saying, *"they're not used to sitting at home. They feel kind of defeated."* Other coaches described the challenges of connecting with students dealing with depression:

> *Some of my students are dealing with depression. It's hard for them to even answer the phone, and they don't have any motivation or hope that this mess is going to end. It's just day by day. So, it can be hard to navigate that and try to relate to them and still motivate them to do well.*

Despite coaches' best efforts to connect students to the internet, offer support, or suggest workarounds for delayed progress toward graduation, the pandemic presented many barriers to student-coach relationships and student success. It grew increasingly difficult for coaches to reach students and provide the necessary support, particularly the students who perhaps could have benefitted the most from coaching support. Unfortunately, students who disengaged with coaches at the start of the pandemic, whether due to technology issues or other struggles, did not reconnect.

Discussion

The onset of the COVID-19 pandemic was widely disruptive to education at all levels (Floyd, 2021; Goldhaber et al., 2022; Harper, 2020; McKenzie, 2021). Happenings inside and outside of the classroom were shifted online to virtual formats. Outside of this general shift away from in-person interactions, less is known about how educational interventions were adapted to meet pandemic restrictions, especially interventions that primarily serve students with limited access to technology. This implementation study explores the ways in which the COVID-19 pandemic shaped the implementation of a proactive coaching intervention targeted to low-income TN Promise students, both initially and through the following academic year. We draw on program data that logged student-coach interactions as well as interviews with coaches about their experiences working with students in the first few months of the pandemic.

We found short- and long-term changes in student-coach communication at the heart of the intervention. In-person connections, which initially comprised a third of all communications, disappeared. They were replaced with text messages and phone calls. Over time, text messages grew to account for nearly two-thirds of student-coach interactions. We also find that students with high initial coach engagement maintained this engagement through the onset of the pandemic and the next academic year. Students without the initial foundation of frequent coaching interactions before the pandemic did not appear to develop these relationships during the pandemic or in the subsequent academic year.

Among our study population of community college students from low-income households, the pandemic revealed structural inequalities that made it difficult or impossible for students and coaches to connect meaningfully or at all. Though some educational interventions are designed to occur over text messages or phone calls (Avery et al., 2021; Castleman & Page, 2015), it may be more difficult for student-coach relationship-building to occur without in-person connections, especially in the absence of technology and high-speed internet. To support relationship-building and a strong student-coach connection, our findings suggest prioritizing a strong foundation of in-person relationship-building at least initially, followed with other modes of communication.

IV. Exploratory Analysis of Dosage Effects

As discussed in Section III, COVID-19 affected both the mode and frequency of student-coach connections in the proactive coaching model. Results from the implementation study show that students' pre-pandemic levels of coaching engagement were exacerbated by the shift to virtual coaching during COVID-19. Students with low levels of coaching engagement during the early phase of intervention were more likely to disengage with coaches in the pandemic period, whereas students with higher levels of pre-pandemic coaching engagement were more likely to sustain engagement throughout the pandemic.

Differences in student-coach engagement among treatment group students raise questions about the extent to which the effects of offering proactive coaching may vary according to how students respond to the coaching offer. To explore how the effect of offering proactive coaching varies across students with different levels of coaching engagement, we divided the treatment group into the following three dosage groups based on the number of student-coach connections during the first two years of the intervention (fall 2019 through spring 2021):

- No engagement (N=427; 20.3%): Offered proactive coaching but did not connect with a coach.
- Low engagement (N=365; 17.4%): Had only one or two connections.
- High engagement (N=1,309; 62.3%): Had three or more connections.

Table 11 reports separate impact estimates for these three dosage groups, where outcomes for each group are estimated relative to the control group of students who were offered reactive coaching. When we disaggregate the treatment group by dosage level, we find significant differences across almost all outcome measures between treatment and control group students. Among treatment group students who had a high-level of engagement with their coach, the effects of proactive coaching were positive and generally statistically significant across a range of outcome measures. And while these effects are not causal – as treatment students were not randomly assigned into dosage groups – they shed light on how variation in coaching engagement may have diluted the intent-to-treat impact estimates reported in Table 5 above.

Table 11. Estimated dosage-based impacts on student outcomes

Outcome Category	Outcome Measure	No Engagement	Low Engagement	High Engagement
Completion of Associate Degree	Attain associate degree within 2 years	-6.4%**	-8.7%**	5.7%**
	[Primary] Attain associate degree within 3 years	-10.4%**	-14.1%**	10.3%**
Completion of Certificate	Attain certificate within 2 years	-2.2%*	-0.7%	0.4%
	Attain certificate within 3 years	-2.7%*	-1.7%	1.3%
Transfer to Four-Year College	Transfer to a 4-year college within 2 years	-3.8%*	-6.3%**	4.2%**
	Transfer to a 4-year college within 3 years	-5.8%**	-7.2%**	7.1%**
Combined Completion	Combined success within 2 years	-7.6%**	-9.6%**	8.0%**
	Combined success within 3 years	-12.2%**	-13.3%**	12.8%**
Persistence	First semester persistence	-33.9%**	-31.6%**	17.7%**
	First year persistence	-24.1%**	-30.0%**	16.3%**
	First two-year persistence	-11.0%**	-14.4%**	5.7%**

Note: * significant at 5%; ** significant at 1%; Full parameter estimates for all dosage models are reported in Appendix C1, C2, and C3.

Focusing first on associate degree attainment in three years, our primary outcome of interest, we find that students who had at least three coaching contacts (high engagement) were 10.3 percentage points more likely to attain an associate degree in three years relative to students who were offered reactive coaching. On the other hand, students who were assigned to proactive coaching but did not use it (no engagement) or had only one or two contacts (low engagement) were 10.4 to 14.1 percentage points less likely to attain an associate degree in three years relative to students who were assigned to reactive coaching.

This pattern of positive effects for high engagement students and negative effects for no or low engagement students is consistent across all outcome measures. Among treatment group students who had at least three coaching contacts, estimated impacts were positive and statistically significant for all outcome measures except for certificate completion. For the no and low engagement groups, estimated impacts were generally negative and statistically significant across all outcomes, except for certificate completion for the low engagement group. These findings suggest that for students who responded to the offer, proactive coaching can be an effective intervention to improve postsecondary outcomes.

A likely explanation for the consistent negative effects for the no and low engagement groups is that these groups largely consist of students who faced pandemic-associated barriers to schooling that contributed not only to disengagement from coaching services but also to disengagement from academic involvement more broadly. In fact, our data show that among the 792 students in the no and low dosage groups, 709 (or 89.5%) either lost Promise eligibility or dropped enrollment within one academic year, both of which are

requirements to receive proactive coaching services. The reported negative effects among these students thus reflect outcomes relative to the control group for treatment group students who were unable to access proactive coaching due to changes in enrollment or eligibility status stemming from various challenges including those brought on by the COVID-19 pandemic.

V. Cost-Effectiveness Analysis

In this section, we present the costs associated with the proactive coaching model and estimate its cost-effectiveness compared to the reactive coaching model. First, we report the total cost of tnAchieves' completion coaching program (including both proactive and reactive coaching), followed by the cost difference between the two coaching models over the three-year study period. We then present the cost-effectiveness (CE) ratios for the proactive coaching model. The effectiveness estimates used in the CE analysis are drawn from our intent-to-treat impact analysis in Section II, and we use 2019 cost data provided by tnAchieves to project program costs for 2021 and 2022 based on implementation factors such as the number of students served in each year.

Table 12 shows the adjusted three-year total program costs by cost category. These costs reflect total expenses from the proactive and reactive coaching model (i.e., the treatment and control group). The majority of costs were spent on salary and benefits, followed by indirect costs and external expenses.

Table 12. Adjusted three-year total costs of reactive and proactive coaching to eligible students in the study sample

Cost Category	Adjusted Total Cost (Fall 2019 – Summer 2022)
Salary + Benefits	$698,054
Phone	$16,360
Supplies	$10,603
Travel	$42,323
Rent/Utilities/Parking	$45,443
Internal Expenses	$56,804
External Expenses	$83,312
Indirect	$109,037
Total Cost	**$1,061,936**

Note: Source is tnAchieves 2019 financial data; cost data estimates were calculated for 2021 and 2022.

1. The 2021 and 2022 costs were estimated based on the following factors:
   - The salary and benefits cost estimates were adjusted based on a 10% annual pay increase rate.
   - In 2020, due to the impact of COVID, all coaching activities were conducted virtually so no travel costs were incurred.
   - All other cost categories were adjusted by a discount rate of 3%.
   - Total annual costs were also adjusted based on the number of students served in each year, which consistently decreased throughout the 3-year period.
2. Cost estimates were not adjusted for regional price differences.

To estimate model-specific costs, we allocated the total cost shown in the bottom row of Table 12 between the two coaching models based on the number of student-coach connections that occurred during the three-year study period. This decision was based on implementation data showing that the primary cost difference between the reactive and proactive coaching models was the frequency of student-coach connections. Table 13 below presents the adjusted total costs for providing proactive and reactive coaching, along with the adjusted total costs per student, respectively.

Table 13. Adjusted three-year total costs by coaching model

Coaching Model	Adjusted Total Cost	Number of Students	Adjusted Total Cost per Student
Proactive Coaching	$1,012,507	2,101	$482
Reactive Coaching	$49,429	1,154	$43

Note: Source is tnAchieves 2019 financial data; cost data estimates were calculated for 2021 and 2022.

Most of the tnAchieves' completion coaching program expenditures were allocated to proactive coaching. On average, the total cost per student for proactive coaching was about $482, compared to about $43 for each student who was offered reactive coaching. The cost of proactive coaching is relatively lower compared to the costs associated with a similar program, InsideTrack, which amounted to about $781 per student per year in 2017 dollars (WWC, 2019).

To calculate the cost-effectiveness ratio, we relied on two measures from the ITT estimates (see Table 5): the percentage difference in three-year associate degree completion rates and three-year combined completion rates between students who were offered proactive versus reactive coaching. We then computed the number of students whose associate degree or combined completion was attributed to the proactive coaching model.

Table 14 below presents the cost-effectiveness ratios and yields for the proactive coaching model. We find a cost-effectiveness ratio of $26,773 per additional associate degree completion and $15,060 per additional combined completion. Additionally, there was a yield of 3.7 and 6.6 respectively. The means that for every $100,000 spent, offering proactive coaching to students results in 3.7 additional students completing an associate degree within three years, or 6.6 additional students with any completion within three years.

Table 14. Cost-effectiveness (CE) results for the proactive coaching model

Effectiveness Measure	Number of Students in Proactive Coaching	% Point Gain in Completion Rate	Yield of Extra Completion	CE Ratio: Cost per Extra Completion	Yield of Extra Completion per $100,000
Associate degree completion within 3 years	2,101	1.8	37	$26,773	3.7
Combined completion within 3 years		3.2	67	$15,060	6.6

Discussion

The evidence on the cost-effectiveness of similar successful coaching programs varies greatly due to differences in delivery of coaching components. For example, a success coach program implemented at one California university reported a CE ratio of $3,626 per bachelor graduate in 2019 dollars (Canaan et al., 2022); Bettinger and Baker (2014) reported a CE ratio of $25,000 per graduation in 2014 dollars for the InsideTrack program; while the Bottom Line advising program reported a CE ratio of $80,000 per additional degree completion in 2018 dollars (Barr & Castleman, 2018). While more evidence is needed to make a meaningful comparison, the CE ratios of $26,773 and $15,060 reported in Table 13 indicate that proactive coaching has the potential to be a cost-effective solution for improving student success in community colleges.

It is important to acknowledge that this cost-effectiveness analysis comes with two main limitations. First, the cost data were not itemized and separately tracked for each coaching model throughout program implementation and were only available for the first year of implementation. To derive more accurate cost estimates for each coaching model in subsequent years, we had to make assumptions about program delivery and implementation differences between the two models. Second, due to the limited granularity of the cost data, we were unable to conduct a comprehensive cost analysis accounting for factors such as regional pricing variations.

VI. Conclusion

This study examined the impact, implementation, and cost-effectiveness of tnAchieves' completion coaching program that serves community college students from low-income backgrounds. tnAchieves' completion coaching program provides proactive coaching – frequent, individualized, coach-initiated contact with students – for the purpose of supporting postsecondary success among TN Promise students. In partnership with tnAchieves, RFA conducted a three-year mixed methods study to evaluate the effects of tnAchieves' completion coaching program on participating students' two- and three-year college outcomes. The study included four parts: an impact study measuring the causal effects of offering proactive coaching on student persistence, degree/certificate completion, and transfer rates to four-year colleges; an implementation study drawing on coaching log data and interviews with coaches to understand program implementation and pandemic-related implementation shifts; an exploratory study examining variation in treatment effects by degree of student-coach engagement; and a cost analysis informing program efficiency and sustainability.

Overall, our intent-to-treat impact estimates based on random assignment to proactive coaching (treatment condition) versus reactive coaching (control condition) show limited impact on student outcomes, likely due to the significant challenges brought on by the COVID-19 pandemic that disproportionately burdened students from low-income communities and created barriers to sustained academic involvement. We find no significant differences in three-year associate degree completion - our primary outcome of interest - between students who were offered proactive coaching and students who were offered reactive coaching. We find similarly null results across other outcome measures, including certificate completion, transfer to four-year college, or persistence. We do, however, find that proactive coaching had a positive impact on students' combined completion, a broader measure of student success that includes associate degree completion, certificate completion, and transfer to four-year college within three years.

Results from our implementation study offer some useful context for interpreting these results. With the onset of the COVID-19 pandemic in spring 2020, student-coach interaction rapidly shifted to the virtual environment, with text messages ultimately comprising the majority of student-coach interactions. Many students – and especially those who had limited pre-pandemic coach contact – lost engagement with their coach for the duration of the study period, largely because they lost Promise eligibility or dropped enrollment which prevented them from accessing coaching services. Differences in coach engagement, with many students engaged at low levels or not at all, likely explain the null results from our impact study. This interpretation is supported by dosage-based estimates from exploratory analyses revealing that treatment students who had at least three contacts with their coach (i.e., engaged students) saw significantly greater rates of success across outcome measures relative to control group students who were offered reactive coaching. Additionally, our cost analysis revealed that proactive coaching can be a promising, cost-efficient approach to bolster student success in community colleges, though we acknowledge that more evidence is

needed to fully understand the cost-effectiveness of tnAchieves' completion coaching program in relation to other similar programs.

Our study contributes to the literature on college coaching, providing additional evidence on the use of coaching programs to support students from low-income communities in obtaining a postsecondary credential. Our results suggest that proactive coaching is effective to the extent that it is used, such that for students with adequate or regular engagement with coaches, proactive coaching is a useful support to promote postsecondary completion. Yet even in the context of proactive coaching – where coaches are responsible for initiating frequent student contact – students can still lose contact with coaches, almost nullifying the opportunity for students to benefit from coaching services. While our intent-to-treat estimates differ from prior work on completion coaching that has generally found more positive evidence (e.g., Bettinger and Baker, 2014; Ott et al., 2020), our results are consistent with more recent work examining coaching in the COVID-19 context that found no overall impact on college re-enrollment or completion (Turner and Gurantz, 2023). We encourage future work to continue to evaluate completion coaching in other settings in pursuit of a robust body of knowledge around supporting students from low-income communities in achieving postsecondary success.

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Appendix A
Parameter Estimates of the Intent-To-Treat (ITT) Impact Model
Linear Probability Model Estimates

Appendix A1. ITT model parameter estimates for two-year outcomes

Variable	Completion of Associate Degree	Completion of Certificate	Transfer to 4-Year College	Combined Completion
COMPLETE	0.0078	-0.0035	0.0076	0.0176
	(0.0113)	(0.0060)	(0.0112)	(0.0138)
Black	-0.0708**	-0.0194*	-0.0238	-0.0735**
	(0.0157)	(0.0083)	(0.0156)	(0.0191)
Hispanic	0.0110	-0.0193*	0.0258	0.0133
	(0.0184)	(0.0097)	(0.0182)	(0.0224)
Other Race/Ethnicity	-0.0136	-0.0138	0.0325	-0.0042
	(0.0188)	(0.0099)	(0.0186)	(0.0229)
Constant	0.1240**	0.0476**	0.0946**	0.1720**
	(0.0195)	(0.0103)	(0.0193)	(0.0236)
Observations	3,255	3,255	3,255	3,255
Institution FE	Yes	Yes	Yes	Yes

Note: * significant at 5%; ** significant at 1%; Models also include institution fixed effects terms.

Appendix A2. ITT model parameter estimates for three-year outcomes

Variable	Completion of Associate Degree	Completion of Certificate	Transfer to 4-Year College	Combined Completion
COMPLETE	0.0181	-0.0004	0.0199	0.0319*
	(0.0146)	(0.0073)	(0.0145)	(0.0160)
Black	-0.0811**	-0.0279**	-0.0454*	-0.0997**
	(0.0202)	(0.0102)	(0.0202)	(0.0232)
Hispanic	0.0011	-0.0263*	0.0255	0.0155
	(0.0236)	(0.0119)	(0.0236)	(0.0271)
Other Race/Ethnicity	-0.0193	-0.0231	0.0489*	-0.0043
	(0.0242)	(0.0122)	(0.0241)	(0.0277)
Constant	0.2070**	0.0677**	0.1480**	0.2940**
	(0.0250)	(0.0126)	(0.0250)	(0.0287)
Observations	3,255	3,255	3,255	3,255
Institution FE	Yes	Yes	Yes	Yes

Note: * significant at 5%; ** significant at 1%; Models also include institution fixed effects terms.

Appendix A3. ITT model parameter estimates for persistence outcomes

Variable	First Semester Persistence	First Year Persistence	First 2-Year Persistence
COMPLETE	-0.0136	0.0002	-0.0122
	(0.0153)	(0.0182)	(0.0162)
Black	0.0089	-0.0892**	-0.0217
	(0.0212)	(0.0252)	(0.0224)
Hispanic	0.0967**	0.0948**	0.0149
	(0.0249)	(0.0295)	(0.0263)
Other Race/Ethnicity	0.0071	-0.0064	-0.0073
	(0.0254)	(0.0302)	(0.0268)
Constant	0.7340**	0.5100**	0.3550**
	(0.0263)	(0.0312)	(0.0278)
Observations	3,255	3,255	3,255
Institution FE	Yes	Yes	Yes

Note: * significant at 5%; ** significant at 1%; Models also include institution fixed effects terms.

Appendix B
Parameter Estimates of the Intent-To-Treat (ITT) Impact Model
Logit Model Estimates

Appendix B1. ITT model parameter estimates for two-year outcomes

Variable	Completion of Associate Degree	Completion of Certificate	Transfer to 4-Year College	Combined Completion
COMPLETE	0.081	-0.125	0.081	0.125
	(0.120)	(0.221)	(0.121)	(0.099)
Black	-0.922**	-0.744*	-0.285	-0.583**
	(0.199)	(0.357)	(0.176)	(0.148)
Hispanic	0.104	-0.737	0.249	0.089
	(0.175)	(0.441)	(0.180)	(0.149)
Other Race/Ethnicity	-0.124	-0.456	0.308	-0.024
	(0.191)	(0.412)	(0.181)	(0.157)
Constant	-1.953**	-2.919**	-2.255**	-1.577**
	(0.199)	(0.335)	(0.209)	(0.168)
Observations	3,255	3,255	3,255	3,255
Institution FE	Yes	Yes	Yes	Yes

Note: * significant at 5%; ** significant at 1%; Coefficients represent log odds ratios estimated from logit models. Standard errors reported in parentheses; Models also include institution fixed effects terms.

Appendix B2. ITT model parameter estimates for three-year outcomes

Variable	Completion of Associate Degree	Completion of Certificate	Transfer to 4-Year College	Combined Completion
COMPLETE	0.116	-0.006	0.128	0.155*
	(0.094)	(0.184)	(0.094)	(0.071)
Black	-0.554**	-0.688*	-0.307*	-0.504**
	(0.137)	(0.281)	(0.134)	(0.116)
Hispanic	0.009	-0.657	0.154	0.073
	(0.144)	(0.349)	(0.145)	(0.127)
Other Race/Ethnicity	-0.114	-0.552	0.284*	-0.019
	(0.151)	(0.348)	(0.144)	(0.131)
Constant	-1.349**	-2.579**	-1.740**	-0.884**
	(0.158)	(0.279)	(0.170)	(0.139)
Observations	3,255	3,255	3,255	3,255
Institution FE	Yes	Yes	Yes	Yes

Note: * significant at 5%; ** significant at 1%; Coefficients represent log odds ratios estimated from logit models. Standard errors reported in parentheses; Models also include institution fixed effects terms.

Appendix B3. ITT model parameter estimates for persistence outcomes

Variable	First Semester Persistence	First Year Persistence	First 2-Year Persistence
COMPLETE	-0.079	0.001	-0.063
	(0.089)	(0.074)	(0.083)
Black	0.040	-0.362**	-0.108
	(0.122)	(0.103)	(0.114)
Hispanic	0.629**	0.390**	0.075
	(0.163)	(0.122)	(0.133)
Other Race/Ethnicity	0.035	-0.026	-0.039
	(0.143)	(0.122)	(0.139)
Constant	1.013**	0.040	-0.589**
	(0.146)	(0.127)	(0.135)
Observations	3,255	3,255	3,255
Institution FE	Yes	Yes	Yes

Note: * significant at 5%; ** significant at 1%; Coefficients represent log odds ratios estimated from logit models. Standard errors reported in parentheses; Models also include institution fixed effects terms.

Appendix C
Parameter Estimates of the Dosage Effect Model
Linear Probability Model Estimates

Appendix C1. Dosage model parameter estimates for two-year outcomes

Variable	Completion of Associate Degree	Completion of Certificate	Transfer to 4-Year College	Combined Completion
No Engagement	-0.0639**	-0.0221*	-0.0383*	-0.0760**
	(0.0173)	(0.0093)	(0.0173)	(0.0211)
Low Engagement	-0.0874**	-0.00743	-0.0630**	-0.0956**
	(0.0184)	(0.0098)	(0.0183)	(0.0223)
High Engagement	0.0578**	0.0036	0.0422**	0.0797**
	(0.0123)	(0.0066)	(0.0123)	(0.0150)
Black	-0.0722**	-0.0197*	-0.0248	-0.0752**
	(0.0155)	(0.0083)	(0.0155)	(0.0188)
Hispanic	0.0019	-0.0206*	0.0195	0.0019
	(0.0182)	(0.0097)	(0.0181)	(0.0221)
Other Race/Ethnicity	-0.0142	-0.0138	0.0321	-0.0049
	(0.0185)	(0.0099)	(0.0185)	(0.0225)
Constant	0.1290**	0.0476**	0.0978**	0.1770**
	(0.0192)	(0.0103)	(0.0192)	(0.0233)
Observations	3,255	3,255	3,255	3,255
Institution FE	Yes	Yes	Yes	Yes

Note: * significant at 5%; ** significant at 1%; Models also include institution fixed effects terms.

Appendix C2. Dosage model parameter estimates for three-year outcomes

Variable	Completion of Associate Degree	Completion of Certificate	Transfer to 4-Year College	Combined Completion
No Engagement	-0.1040**	-0.0271*	-0.0584**	-0.1220**
	(0.0220)	(0.0114)	(0.0224)	(0.0253)
Low Engagement	-0.1410**	-0.0170	-0.0722**	-0.1330**
	(0.0233)	(0.0120)	(0.0237)	(0.0268)
High Engagement	0.1030**	0.0129	0.0711**	0.1280**
	(0.0157)	(0.0081)	(0.0159)	(0.0180)
Black	-0.0835**	-0.0283**	-0.0468*	-0.1020**
	(0.0197)	(0.0101)	(0.0200)	(0.0226)
Hispanic	-0.0144	-0.0287*	0.0161	-0.0022
	(0.0231)	(0.0119)	(0.0234)	(0.0265)
Other Race/Ethnicity	-0.0203	-0.0232	0.0483*	-0.0055
	(0.0236)	(0.0121)	(0.0239)	(0.0271)
Constant	0.2140**	0.0683**	0.1520**	0.3001**
	(0.0244)	(0.0126)	(0.0248)	(0.0280)
Observations	3,255	3,255	3,255	3,255
Institution FE	Yes	Yes	Yes	Yes

Note: * significant at 5%; ** significant at 1%; Models also include institution fixed effects terms.

Appendix C3. Dosage model parameter estimates for persistence outcomes

Variable	First Semester Persistence	First Year Persistence	First 2-Year Persistence
No Engagement	-0.3386**	-0.2409**	-0.1103**
	(0.0210)	(0.0265)	(0.0248)
Low Engagement	-0.3160**	-0.3002**	-0.1441**
	(0.0223)	(0.0281)	(0.0262)
High Engagement	0.1769**	0.1625**	0.0565**
	(0.0149)	(0.0189)	(0.0176)
Black	0.0034	-0.0938**	-0.0237
	(0.0188)	(0.0237)	(0.0221)
Hispanic	0.0617**	0.0650*	0.0023
	(0.0220)	(0.0278)	(0.0260)
Other Race/Ethnicity	0.0049	-0.0084	-0.0082
	(0.0225)	(0.0284)	(0.0265)
Constant	0.7460**	0.5234**	0.3611**
	(0.0233)	(0.0294)	(0.0274)
Observations	3,255	3,255	3,255
Institution FE	Yes	Yes	Yes

Note: * significant at 5%; ** significant at 1%; Models also include institution fixed effects terms.