Conducting Impact Studies in Community College Settings

A symposium proposal for the Society of Research on Educational Effectiveness

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Symposium Overview: In 2016, approximately 6.1 million students were enrolled in two-year institutions, an amount that is expected to grow 12% over the next ten years (National Center for Education Statistics, 2018a). These institutions are generally open access, enrolling all who seek to further their education and often serving those who are most disadvantaged. At least partially due to their lack of selectivity, community colleges also experience low graduation rates, approximately 30% for first-time, degree-seeking students (National Center for Education Statistics, 2018b). The papers included in this symposium all use experimental designs to examine the impacts of three different approaches to improving outcomes for community college students: 1) encouraging enrollment in summer school; 2) redesigning the delivery of online courses; and 3) redesigning developmental education opportunities. When considered together, these papers provide insight into the kinds of programs that might hold promise for increasing community college graduation rates.

The first paper examines the impact of two variations on an intervention designed to increase students' participation in summer school. The two strategies are an informational campaign operating by itself and an informational campaign coupled with a tuition supplement. Both interventions had a positive impact on summer enrollment with higher results for the informational campaign/tuition supplement combination. However, neither intervention had a significant impact on students' enrollment in the fall semester.

The second two papers examine and explore the impacts for Project COMPASS, an effort to improve success, particularly for minority students, in core online courses. Implemented at Wake Technical Community College in North Carolina, the project sought to implement a collection of "High Tech" and "High Touch" strategies. An experimental study shows positive impacts on students' course completion rates, but also saw variations in impact by course and sub-groups. The second paper describes approaches the project used to explain these variations in impact.

The final paper tests an intervention that replaces immediate matriculation in community college developmental courses with intensive math and English support. The program had a statistically significant and positive impact on students' readiness for credit-bearing courses, although there was a negative impact on credits earned, resulting from the delayed matriculation.

The discussant, a researcher who works regularly with community colleges, will synthesize findings from the three projects, placing them in the context of what we are learning about increasing success in these broad access institutions.

Paper 1: Making Summer Pay Off: Using Behavioral Science to Encourage Postsecondary Enrollment

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Background: Community colleges enroll nearly half of all college students nationwide, providing college access to millions of people. Unfortunately, only 22 percent of entering students graduate within three years (McFarland et al., 2017). Students who enroll in summer courses (after matriculating in the fall or spring) are more likely to persist and graduate (Adelman, 2006; Attewell, Heil, & Reisel, 2012; Attewell & Jang, 2013). Summer enrollees can earn credits towards a degree, reducing the calendar time it takes to earn a degree. Also, the summer term bridges the gap between the fall and spring semester – a transition point when many students drop out of college; summer enrollment may reduce this drop off. Despite potential benefits, only 30 percent of community college students seeking a degree attend during the summer (Attewell & Jang, 2013), leaving much room for improvement. How can community colleges encourage more students to enroll in summer courses?

In partnership with the Ohio Association of Community Colleges and four Ohio community colleges, the research team diagnosed barriers to summer enrollment and developed and evaluated two interventions to encourage summer enrollment: (1) an informational campaign, and (2) an informational campaign plus tuition supplement. Both interventions were designed leveraging insights from behavioral science.

Research Questions: The primary objectives of the study are to determine, for first-year Pell-eligible students:

RQ1: What is the effect of an informational campaign on students' likelihood of enrolling in the summer?

RQ2: What is the effect of an informational campaign plus tuition supplement on students' likelihood of enrolling in the summer?

RQ3: What is the effect of an informational campaign plus tuition supplement compared with an informational campaign alone on students' likelihood of enrolling in the summer?

Setting: This project launched at four community colleges in Ohio (later expanding to 10 community colleges). Table 1 briefly describes the four participating colleges.

Population: All students who met the following criteria were included in the study:

- Students' receiving a Pell Grant in spring 2017,
- Degree- or certificate-seeking,
- In their first-year, and
- Enrolled in the spring 2017 semester.

All analyses include 3,689 students, a census of the target population. Table 2 provides characteristics of the study sample (derived from college administrative records). 62% of sample

members are women and 58% are White. While many students were of traditional college age, 43% were 24 or older. Moreover, 53% were financially independent, an important consideration given the role that financial assistance plays in the interventions. Finally, around 46% of the sample enrolled part-time in spring 2017, an indicator of risk of not graduating.

The measured background characteristics of all three groups were similar at the outset of the study, as is expected in a large scale randomized experiment. There were a few statistically significant differences of fairly small magnitude.

Intervention/Program/Practice:

1. **Informational Campaign:** A series of 10 personalized student communications delivered via e-mail and mail that incorporated various principles from behavioral science (e.g., loss aversion, reciprocity, filling information gaps, and social influence). Messages were designed to address diagnosed barriers to summer enrollment.

2. **Informational Campaign Plus Tuition Supplement:** A similar informational campaign paired with a *last-dollar* tuition supplement that covered the gap remaining after federal or state grant financial aid (such as Pell Grant funding) was applied to tuition and fees for summer courses.

Research Design: This study is three-arm, multi-site, blocked randomized field trial. Colleges provided the researchers with a list of all eligible students and they were randomized, in equal proportions, to one of three research groups: (1) informational campaign, (2) informational campaign and tuition waiver, or (3) control. Students were randomly assigned within eight blocks, determined based on college and prior enrollment type (part-time/full-time).

Data Collection and Analysis: Data came from college administrative records, including student transcript records.

To estimate the average intent-to-treat effects, we implement the following estimation model:

$$Y_i = \beta_1 T1_i + \beta_2 T2_i + \boldsymbol{\gamma RB_i} + \boldsymbol{\delta X_i} + \varepsilon_i, \quad (1)$$

where Y_i is the outcome for student *i;* $T1_i$ equals one if student *i* was assigned to the informational campaign and zero otherwise; $T2_i$ equals one if student *i* was assigned to the informational campaign plus tuition supplement and zero otherwise; $\boldsymbol{RB_i}$ is a vector of eight random assignment block indicators, and $\boldsymbol{X}_i$ is a vector of background characteristics (gender, race, age, and dependency status). Robust (Huber-White) standard errors are used.

Findings/Results: Both interventions increased summer enrollment (see Table 3). The informational campaign increased summer enrollment by an estimated 5.5 percentage points, from 23.5 to 29.1 percent. The informational campaign plus tuition supplement was substantially more effective, increasing enrollment by an estimated 14.6 percentage points, from 23.5 to 38.2 percent. Both interventions also had a positive estimated effect on summer credit accumulation, a

key indicator of progress toward a degree. Neither intervention had a discernable effect on fall enrollment.

Conclusions: Improved policies and communication about the summer term can increase summer enrollment and, as a result, credit accumulation. With the reinstatement of the year-round Pell Grant for the 2017-2018 award year, many eligible low-income students will have additional funding available for summer courses. Colleges looking to encourage students to take advantage of this funding may consider sending multi-modal personalized informational campaigns to students about summer enrollment. Providing gap tuition funding may further increase enrollment, and the cost of such gap funding should be even lower than in the past since Pell will cover the full tuition cost for most students.

This project includes a second phase (planned from the start of the project), which launched in spring 2018 at 10 community colleges across Ohio. Phase II continues to test the effectiveness of an informational campaign and an informational campaign paired with a tuition supplement. The interventions were slightly modified to reflect the availability of Year-Round Pell Grant funding. The additional colleges and sample members will create opportunities to explore the extent that program effects varied by context (summer Pell vs. no summer Pell), student types, and colleges. A preliminary look at summer enrollment rates during Phase II is promising – full data and completed analyses will be available for presentation at SREE.

Table 1. Participating Colleges

College	Location	Size	Urbanicity
Columbus State	Columbus, OH	27,000 students	Urban
Marion Technical	Marion, OH	3,000 students	Small City
Southern State	Hillsboro, OH	3,000 students	Rural
Stark State	North Canton, OH	12,000 students	Urban

Table 2. Baseline Characteristics and Balance Tests.

Characteristic	Control Mean	Difference: Info Campaign	Difference: Info & Tuition	Obs.
Female	0.617	0.011	-0.004	3688
		[0.019]	[0.020]	
Race/Ethnicity				
Asian or Pacific Islander	0.037	-0.001	-0.003	3689
		[0.008]	[0.007]	
Black	0.234	0.007	0.011	3689
		[0.017]	[0.017]	
Hispanic	0.042	-0.004	0.007	3689
		[0.008]	[0.008]	
White	0.578	-0.008	-0.028	3689
		[0.019]	[0.019]	
Other[a]	0.042	0.009	0.010	3689
		[0.009]	[0.009]	
Missing	0.067	-0.003	0.003	3689
		[0.010]	[0.010]	
Age				
19 or younger	0.349	0.031 *	-0.003	3689
		[0.018]	[0.018]	
20-23 years	0.213	0.009	0.030 *	3689
		[0.017]	[0.017]	
24 or older	0.438	-0.040 **	-0.027	3689
		[0.019]	[0.019]	
Independent	0.529	-0.039 **	-0.019	3689
		[0.019]	[0.019]	
Highest Degree Completed				
High School	0.860	-0.010	-0.001	3689
		[0.014]	[0.014]	
GED	0.086	-0.003	-0.004	3689
		[0.011]	[0.011]	
Missing	0.055	0.013	0.005	3689
		[0.009]	[0.009]	
College				
College A	0.491	0.000	-0.010	3689
		[0.020]	[0.020]	
College B	0.060	0.001	0.000	3689
		[0.010]	[0.010]	
College C	0.089	-0.004	0.002	3689
		[0.011]	[0.012]	
College D	0.360	0.003	0.007	3689
		[0.019]	[0.019]	
Enrollment Status				
Full time	0.544	0.001	-0.004	3689
		[0.020]	[0.020]	

Notes: Missing values are only included in variable distributions for characteristics with more than 5 percent of the sample missing. Estimated differences are adjusted by random assignment blocks only. Standard errors are reported in brackets below differences.

* Significant at the 10 percent level.

** Significant at the 5 percent level.

*** Significant at the 1 percent level.

Sources: Research team calculations from pre-random assignment data provided by each college.

[a] The "Other" category includes students who self-identified as Native American, Alaskan Native, Two or more races, or Other.

Table 3. Estimated Effects on Outcomes

	Control Mean	Estimated Effects: Info Campaign		Estimated Effects: Info & Tuition		Obs.
Summer 2017						
Registered	0.235	0.055	***	0.146	***	3,689
		[0.017]		[0.018]		
Credits Attempted	1.46	0.29	**	0.90	***	3,689
	(3.02)	[0.12]		[0.13]		
Credits Earned	1.21	0.19	*	0.60	***	3,689
	(2.71)	[0.11]		[0.11]		
Distribution of Credits Earned						
0 credits	0.795	-0.035	**	-0.118	***	3,689
		[0.017]		[0.017]		
0.5-4 credits	0.079	0.019		0.051	***	3,689
		[0.011]		[0.012]		
5-8 credits	0.086	0.015		0.061	***	3,689
		[0.012]		[0.013]		
9 or more credits	0.040	0.001		0.007		3,689
		[0.008]		[0.008]		
Fall 2017						
Registered	0.576	0.002		0.009		3,689
		[0.020]		[0.020]		

Notes: Estimated effects are adjusted by random assignment blocks, race/ethnicity, gender, age, and dependency status. Standard errors are reported in brackets, and standard deviations of control group outcomes for continuous variables are reported in parentheses. Enrollment is based on courses that students are enrolled in at the end of the add/drop period.
***p <0.01, **p <0.05, *p <0.10.

Paper 2: Improving Performance in Online Courses: The Impact of Project COMPASS

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Background: Project COMPASS is a development project funded under the U.S. Department of Education's First in the World competition. The goals of the project are to increase the number of students, particularly students of color, completing online courses and improve the academic performance of those students, with the ultimate goal of increasing the percentage of students who remain in postsecondary education. The project seeks to achieve these outcomes by redesigning the delivery of a core set of online courses so that they incorporate a variety of technologies and strategies that increase the quality of the online learning experience.

Objective: This paper presents results for the following key research questions:

1. What is the impact of students' taking at least one redesigned online course on the percentage of students completing the course when compared to traditional online courses?
2. What is the impact of students' taking at least one redesigned online course on the percentage of students persisting in postsecondary education?
3. To what extent do impacts differ for certain sub-groups of students, including minority students, low-income students, and students with lower academic performance?

Intervention: Project COMPASS is structured around the Community of Inquiry (COI), a conceptual framework for online instruction. The COI framework identifies three core components of the online experience: 1) teaching presence, 2) social presence, and 3) cognitive presence (Arbaugh, 2007; Garrison, Anderson, & Archer, 2001). Project COMPASS hopes to increase these various types of online presence by incorporating a set of "High Tech" and "High Touch" practices. High Tech practices involve the use of a key set of technologies such as web conferencing, web messaging with automated features, video presentations, video chat, and desktop sharing. As part of the project, instructors are trained in the use of these technologies and in the use of High Touch strategies that are designed to improve student-teacher interactions as well as strategies designed specifically to support minority and other at-risk students. Figure 1 provides an overview of the project components and the expected outcomes.

FIGURE 1 HERE

Research Design: The research design utilizes a RCT in which students were randomly assigned to classes taught by treatment instructors or to classes taught by control instructors.

Setting: This project is being implemented at Wake Technical Community College in North Carolina.

Sample: The sample for the main impact questions includes a total of 2,301 students who were randomly assigned to sections taught by treatment or control instructors (1,049 in the treatment and 1,252 in the control) in Business 110 or Psychology 150 over the course of three semesters: the fall of 2017, and the spring and summer of 2018. Table 1 presents the demographic characteristics of the sample.

Data Collection and Analysis: Data were collected by Wake Tech as part of their normal processes. The specific outcomes examined relative to course completion included:

- Successful completion of the targeted course. This was defined as completion of the course with a grade of an A, B, or C.
- Withdrawal from the course. This measure captured students not completing the course at all and was defined as students never attending, withdrawing, or dropping the course after enrollment.

Data for the second research question on persistence will come from the National Student Clearinghouse and will be collected in November 2018. Results from these analyses will be incorporated into the final presentation.

The impact analyses were conducted using a multi-level model with students clustered by section. At the student-level, we incorporated the following covariates: 1) indicators for gender, race, and ethnicity; 2) age and age squared; 3) indicator for disability; 4) an indicator for PELL eligibility; 5) an achievement measure we constructed, including its imputed values; 6) an indicator for concurrent enrollment in Psychology 150 and Business 110; and, 7) an indicator for having taken the same course in a previous semester; and 8) weights to account for differing probabilities of selection. We also included indicators for subject (psychology or business) and semester when analyzing pooled samples. At the instructor level, we included baseline successful completion rates. We also included an indicator for whether a given instructor had taught online sections of these courses in the two semesters prior to the pilot implementation. We incorporated random effects at the section-level to account for the joint variation in the error terms at the section level.

Finally, we also repeated the main impact analyses by course and for the following specific sub-groups: 1) minority students (who were a focus for the intervention); 2) PELL-eligible students; and 2) lower performing students, defined as those who had a pre-test achievement measure below the median.

Results: Under the Intent-to-Treat analyses, the treatment group had significantly fewer drops/withdrawals. There was also a descriptively positive impact on successful completion, although the differences were not statistically significant (Table 3). The results also showed different patterns by sub-group and by course. Impacts were higher for groups that could be considered as more at-risk. Impacts were also higher in Psychology with null/descriptively negative results for Business.

Conclusions: Results show that the model could be considered a promising approach to improving outcomes, particularly for at-risk students. However, there were variations in impact that are explored in the next paper.

Figure 1: Project COMPASS Logic Model

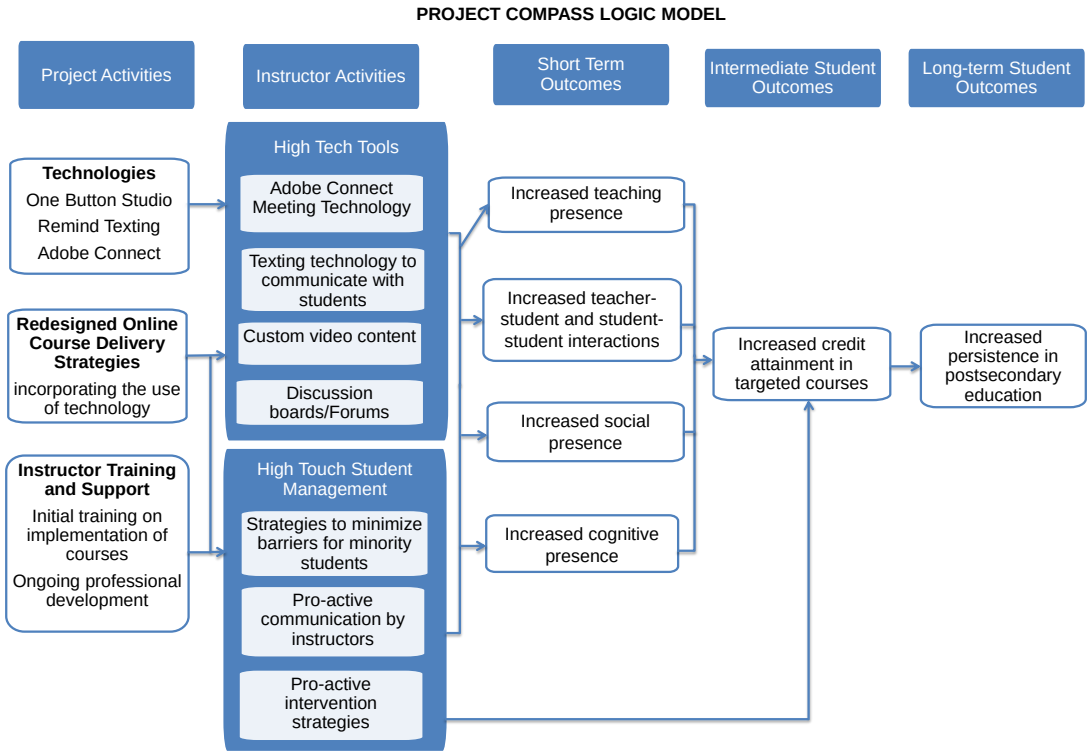

Table1: Baseline Characteristics for Impact Analyses

Characteristic	Overall			Psychology 150			Business 110		
	Treatment Mean (N = 1049)	Control Mean (N=1252)	Effect Size (SD)	Treatment Mean (N=484)	Control Mean (N=714)	Effect Size (SD)	Treatment Mean (N=565)	Control Mean (N=538)	Effect Size (SD)
% Female	59.1%	61.0%	-0.04 (0.49)	66.9%	66.0%	0.02 (0.473)	52.4%	54.5%	-0.04 (0.499)
% Hispanic	9.1%	11.4%	-0.08 (0.305)	8.5%	12.9%	-0.14 (0.314)	9.6%	9.5%	0.00 (0.294)
% Black	30.0%	31.0%	-0.02 (0.461)	29.5%	30.1%	-0.01 (0.458)	30.4%	32.2%	-0.04 (0.464)
% White or Asian	54.6%	52.1%	0.05 (0.499)	56.0%	52.1%	0.08 (0.499)	53.5%	52.0%	0.03 (0.499)
Age	25.4	25.8	-0.05 (9.171)	25.3	25.9	-0.08 (9.14)	25.4	25.7	-0.03 (9.207)
% Identified as disabled	2.0%	1.6%	0.03 (0.132)	1.9%	1.5%	0.03 (0.128)	2.1%	1.7%	0.03 (0.137)
% Pell Eligible	46.7%	49.5%	-0.06 (0.5)	46.9%	51.8%	-0.10 (0.5)	46.5%	46.5%	0.00 (0.499)
GPA at start of semester	2.46	2.55	-0.10 (0.978)	2.56	2.63	-0.08 (0.977)	2.36	2.43	-0.07 (0.97)
Has GPA data	0.58	0.57	0.03 (0.495)	0.60	0.58	0.04 (0.492)	0.56	0.55	0.03 (0.497)
Achievement measure (excludes imputed)	0.04	0.07	-0.04 (0.974)	0.06	0.10	-0.04 (0.968)	0.02	0.04	-0.03 (0.981)
Has achievement data	0.74	0.71	0.07 (0.448)	0.79	0.74	0.13 (0.427)	0.69	0.67	0.05 (0.467)

Table 3: Program Impacts, Intent-to-Treat

Population	Outcome	Treatment group		Control group		ITT Estimated effects	
		Adjusted Mean	Standard Deviation	Mean	Standard Deviation	Adjusted Mean Difference	p-value
All Students	% Drop or Withdraw	**28.42%**	0.456	**35.22%**	0.478	**-6.80%**	[0.0010]
N(T) = 1049 N(C) = 1252	% Completing the course with C or higher	**55.48%**	0.495	**55.51%**	0.497	**-0.03%**	[0.9900]
PSY 150	% Drop or Withdraw	**31.73%**	0.464	**41.60%**	0.493	**-9.87%**	[0.0002]
N(T) = 484 N(C) = 714	% Completing the course with C or higher	**53.23%**	0.500	**49.02%**	0.500	**4.21%**	[0.2318]
BUS 110	% Drop or Withdraw	**31.49%**	0.450	**26.77%**	0.443	**4.72%**	[0.4416]
N(T) = 565 N(C) = 538	% Completing the course with C or higher	**55.84%**	0.487	**64.13%**	0.480	**-8.29%**	[0.0852]
Minority Students	% Drop or Withdraw	**32.52%**	0.482	**42.38%**	0.495	**-9.86%**	[0.0060]
N(T) = 451 N(C) = 564	% Completing the course with C or higher	**48.79%**	0.499	**44.86%**	0.498	**3.93%**	[0.4233]
Non-Minority Students	% Drop or Withdraw	**23.59%**	0.428	**29.60%**	0.457	**-6.01%**	[0.0143]
N(T) = 573 N(C) = 652	% Completing the course with C or higher	**63.74%**	0.474	**64.57%**	0.479	**-0.83%**	[0.7556]
PELL-Eligible	% Drop or Withdraw	**30.50%**	0.476	**38.87%**	0.488	**-8.37%**	[0.0184]
N(T) = 490 N(C) = 620	% Completing the course with C or higher	**50.03%**	0.500	**48.23%**	0.500	**1.80%**	[0.6954]
Non-PELL Eligible	% Drop or Withdraw	**26.53%**	0.435	**31.65%**	0.465	**-5.12%**	[0.0941]
N(T) = 559 N(C) = 632	% Completing the course with C or higher	**61.25%**	0.478	**62.66%**	0.484	**-1.41%**	[0.6296]
Incoming performance below median	% Drop or Withdraw	**35.18%**	0.477	**40.30%**	0.491	**-5.12%**	[0.0941]
N(T) = 484 N(C) = 714	% Completing the course with C or higher	**45.52%**	0.500	**46.93%**	0.499	**-1.41%**	[0.6296]
Incoming performance above median	% Drop or Withdraw	**25.58%**	0.427	**30.51%**	0.461	**-4.93%**	[0.0639]
N(T) = 565 N(C) = 538	% Completing the course with C or higher	**64.63%**	0.469	**63.48%**	0.482	**1.15%**	[0.6852]

Note: The adjusted treatment mean is calculated by adding the impact estimate to the unadjusted control mean.

Table 4: Impact Estimates by Sub-group and Course

Population	Outcome	Business		Psychology	
		Impact Estimate	P-value	Impact Estimate	P-value
Minority Students	% Drop or Withdraw	**1.26%**	**[0.7512]**	**-14.30%**	**[0.0007]**
	% Completing the course with C or higher	**-1.99%**	**[0.6749]**	**11.19%**	**[0.0535]**
Non-Minority Students	% Drop or Withdraw	**-1.88%**	**[0.5384]**	**-9.15%**	**[0.0025]**
	% Completing the course with C or higher	**1.58%**	**[0.6156]**	**0.97%**	**[0.7846]**
PELL Eligible	% Drop or Withdraw	**8.54%**	**[0.0128]**	**-14.74%**	**[0.0001]**
	% Completing the course with C or higher	**-8.24%**	**[0.0969]**	**9.36%**	**[0.0674]**
Non-PELL Eligible	% Drop or Withdraw	**-8.64%**	**[0.0239]**	**-5.37%**	**[0.1740]**
	% Completing the course with C or higher	**7.03%**	**[0.0773]**	**-1.47%**	**[0.6977]**
Incoming performance below median	% Drop or Withdraw	**2.27%**	**[0.4727]**	**-10.92%**	**[0.0067]**
	% Completing the course with C or higher	**-4.11%**	**[0.1849]**	**4.35%**	**[0.3837]**
Incoming performance above median	% Drop or Withdraw	**-3.15%**	**[0.4573]**	**-7.61%**	**[0.0297]**
	% Completing the course with C or higher	**4.27%**	**[0.3356]**	**3.65%**	**[0.3235]**

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Paper 2: Identifying Factors Influencing Impact Estimates in Project COMPASS

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Background: As shown in the previous paper, Project COMPASS has resulted in a statistically significantly lower number of students dropping or withdrawing from the course. The percentage of students successfully completing the course is descriptively higher but not statistically significant. However, the study also found variations in impact driven primarily by differing results between the two courses (Psychology vs. Business). Results were in the desired direction for Psychology, while the results were null or trending negatively for Business.

Objective: This paper describes the different exploratory analyses we conducted to understand the variations in impact, including 1) examining differences in instructional practices between treatment and control groups; and 2) exploring the influence of instructor quality.

Setting: This project is being implemented at Wake Technical Community College in North Carolina.

Program: As described under the previous paper, Project COMPASS involves the redesign of online courses to incorporate a set of "High Tech" and "High Touch" strategies.

Research Design: The core impact study uses a randomized controlled trial in which students are randomly assigned to sections taught by treatment or control instructors. To explore what might be causing the variation in impacts, the evaluation conducted a variety of qualitative and quantitative analyses, including observations of instructional practices, and follow-up exploratory analyses of the data. We explored instructor quality by conducting analyses that excluded the sections taught by the lead instructors and by descriptively summarizing the baseline performance of the previous instructor.

Sample: In the fall of 2017, the team conducted a set of detailed observations for three sampled weeks for a subset of treatment and control classrooms (2 treatment and 1 control each in Business and Psychology) to describe the frequency and type of implementation of the High Tech and High Touch strategies. In the fall of 2018, we are conducting additional retrospective observations of the courses of all treatment and control teachers (n=55 sections) in Business and Psychology of fall 2017 and spring and summer of 2018.

Instruction was also explored through the Community of Inquiry survey and analysis of Blackboard log-ins. The survey sample was 540 treatment students and 246 control students who responded to a survey (see measures) and provided a valid email address that allowed us to link to their administrative data. Because attrition rates exceeded WWC guidance, we examined the baseline equivalence of these two groups on demographic characteristics and PELL eligibility. The groups were shown to be equivalent (see Table 1). The sample for Blackboard log-ins was the same as the main impact sample described earlier.

Data Collection and Analysis: Instructional practices were examined using three different data sources: observations, the Community of Inquiry Survey, and an analysis of Blackboard log-in data. The observations were conducted retrospectively using data housed in the online Blackboard platform. The observer used a structured observation protocol that included objective

measures of strategy implementation (ex. # of videos shared with students, announcement of sign up for texting). These strategies were summarized descriptively by condition and by subject.

We administered the Community of Inquiry Survey (Arbaugh et al., 2008) to all students in treatment and control classes. The survey included scales related to social, cognitive, and teaching presence. Results for the Community of Inquiry Survey were analyzed by course using the survey and sample described in the previous paper, broken out by course.

We also analyzed the number of student log-ins to Blackboard using the full sample of students and analytic techniques described in the previous paper.

To explore the influence of instructor quality on the outcomes, we conducted descriptive analyses that looked at the academic history of the treatment and control instructors, broken out by course. We also conducted exploratory impact analyses in which we repeated our main impact analyses but removed the lead instructors' sections, assuming that the lead instructors had more experience with the model and could be influencing the results.

Results: Results showed that there were differences in instructional practices between treatment and comparison groups in the Psychology courses but not in the Business courses. Preliminary observations conducted on a small group of instructors showed that treatment faculty in Psychology were more likely to implement targeted instructional practices while the treatment and comparison faculty in Business had similar practices (Table 2). Results from the COI survey (Table 3) showed increased teaching, social, and cognitive presence in Business and Psychology. The analysis of the number of times students logged into Blackboard showed that there were significant differences in log-ins for Psychology classes but not for Business (Table 4). These three sets of results combine to suggest that instructional practices were different between treatment and control groups in Psychology, but not in Business. In interviews, the instructors noted that Business uses a common course shell developed by the treatment instructor, which includes many of the COMPASS strategies, and can be used by any instructor teaching Business; Psychology had no such shell and course content was developed by individual instructors. The fall observations will determine whether instructors are using the course shell.

Another possible explanation for differences between the impacts in Psychology and Business could be due to the quality of instructors. Given the relatively low levels numbers of instructors, it is possible that there were some systematic differences between treatment and control instructors. Table 5 shows the baseline performance for instructors for the online course (note that an instructor who had not taught the introductory online course in the best was considered "new"). The results do show some systematic differences; however, these results would suggest a positive bias for impacts in Business, which we do not see. We also excluded the lead instructors from the analysis, which did reduce the size of the overall impact estimates but still kept similar patterns. Figure 1 shows how successful course completion rates during the study period varied by instructor. The graph depicts estimates and 95% confidence intervals for instructor-specific intercepts in a linear model of successful course completion with student-level controls and semester indicators. While the confidence intervals overlap to a large extent, the graph suggests that in Psychology, the share of relatively high-performing instructors was higher in the treatment group than in the control group, but there is not enough information to tell if this is due to the treatment or to inherent instructor characteristics. Average success rates were more balanced among instructors in Business once student characteristics were taken into account.

Conclusions: Based on the analyses, the most reasonable explanation for the stronger impact in Psychology than in Business appears to be due to a higher level of contrast in instructional practices found between treatment and control groups in Psychology than in Business. This finding actually supports the theory of change for the model. It also suggests that a possible strategy for scaling up the model might be the creation of course shells that include core COMPASS strategies.

Table 1: Baseline Characteristics, Survey Sample

Characteristic	Combined		
	Treatment Mean (N=541)	Control Mean (N=241)	Effect Size (SD)
% Female	60.6%	70.9%	-0.21 (0.481)
% Hispanic	10.7%	9.3%	0.05 (0.304)
% Black	23.5%	27.5%	-0.09 (0.432)
% White or Asian	58.2%	58.3%	0.00 (0.493)
% Identified as disabled	2.0%	0.8%	0.09 (0.127)
% Pell Eligible	46.2%	51.8%	-0.11 (0.5)
Achievement measure (excludes imputed)	2.67	2.81	-0.15 (0.932)
Has achievement data	64.3%	59%	0.12 (0.484)

Table 2: Frequency of Use of Targeted High Tech Tools

High Tech Tools	**BUS 110 Treatment n=2**	**BUS 110 Control n=1**	**PSY 150 Treatment n=2**	**PSY 150 Control n=1**
Orientation/Getting started video	3	3	6	0
Instructor-developed video(s) (separate from orientation)	9	0	4	0
Other video(s)	7	11	41	7
Synchronous streamed student gathering (seminar, webinar)	1	0	3	1
Live stream office hours	1*	1*	2*	0
Texting	2*	0	2*	0
Discussion Forum(s)	4	3	6	3
Images reflecting cultural diversity	0	0	3	0

Table 3: Community of Inquiry Scales

Course	Scale	Intervention Group		Comparison Group		Estimated Effects		
		Adjusted Mean	Standard Deviation	Mean	Standard Deviation	Adjusted Mean Difference	Effect Size	p-value
Combined N (Treatment) = 541; N(Control) = 247	Teaching presence	4.51	0.72	4.31	0.86	0.20	**0.22**	[0.0033]
	Social presence	4.16	0.76	3.96	0.85	0.20	**0.23**	[0.0026]
	Cognitive presence	4.29	0.71	4.05	0.8	0.24	**0.26**	[0.0010]
PSY150 N (Treatment) = 252; N(Control) = 141	Teaching presence	4.49	0.73	4.33	0.82	0.16	**0.23**	[0.0914]
	Social presence	4.14	0.78	3.94	0.82	0.20	**0.21**	[0.0162]
	Cognitive presence	4.24	0.75	4	0.84	0.24	**0.28**	[0.0178]
BUS110 N (Treatment) = 289; N(Control) = 106	Teaching presence	4.53	0.71	4.29	0.92	0.24	**0.22**	[0.0010]
	Social presence	4.16	0.74	3.98	0.88	0.18	**0.23**	[0.0284]
	Cognitive presence	4.27	0.66	4.12	0.76	0.15	**0.22**	[0.0368]

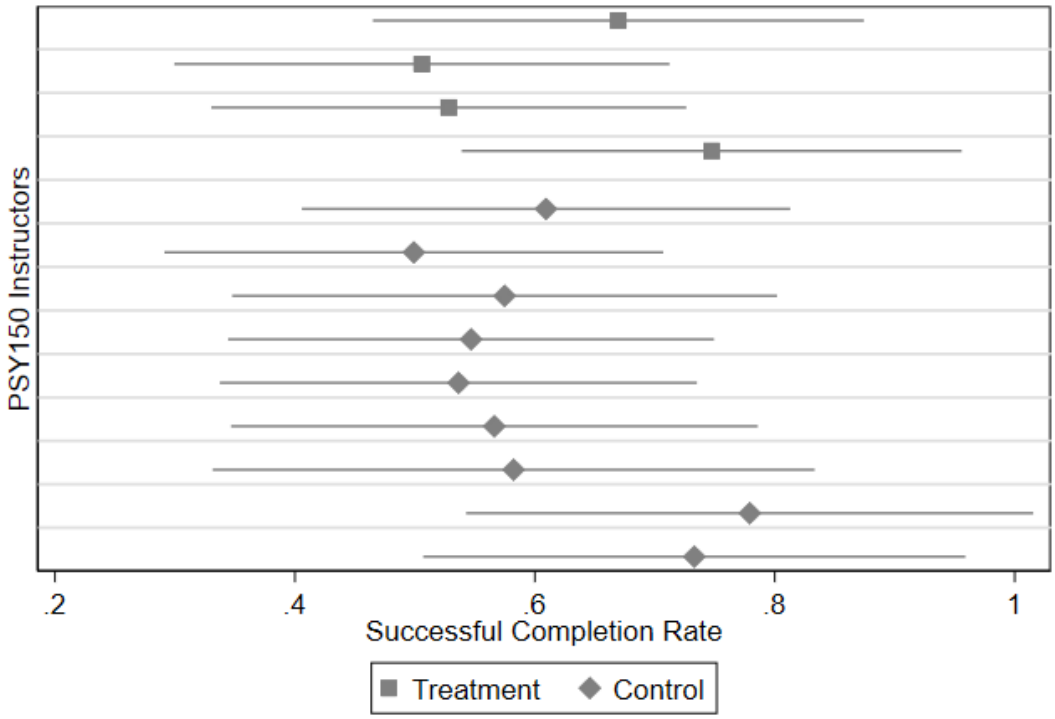
Table 4: Percentage of Students Logging into Blackboard, Fall 2017 & Spring 2018

Population	Treatment group		Control group		ITT Estimated effects	
	Adjusted Mean	Standard Deviation	Mean	Standard Deviation	Adjusted Mean Difference	p-value
Full	**51.54**	37.11	**42.85**	34.23	**8.69**	**[0.0035]**
Minority	**51.45**	42.41	**40.28**	34.44	**11.17**	**[0.0063]**
White or Asian	**52.21**	32.71	**45.18**	34.26	**7.03**	**[0.0219]**
PSY150	**59.72**	43.91	**46.78**	37.78	**12.94**	**[0.0006]**
BUS110	**36.25**	25.26	**37.43**	27.76	**-1.18**	**[0.6538]**

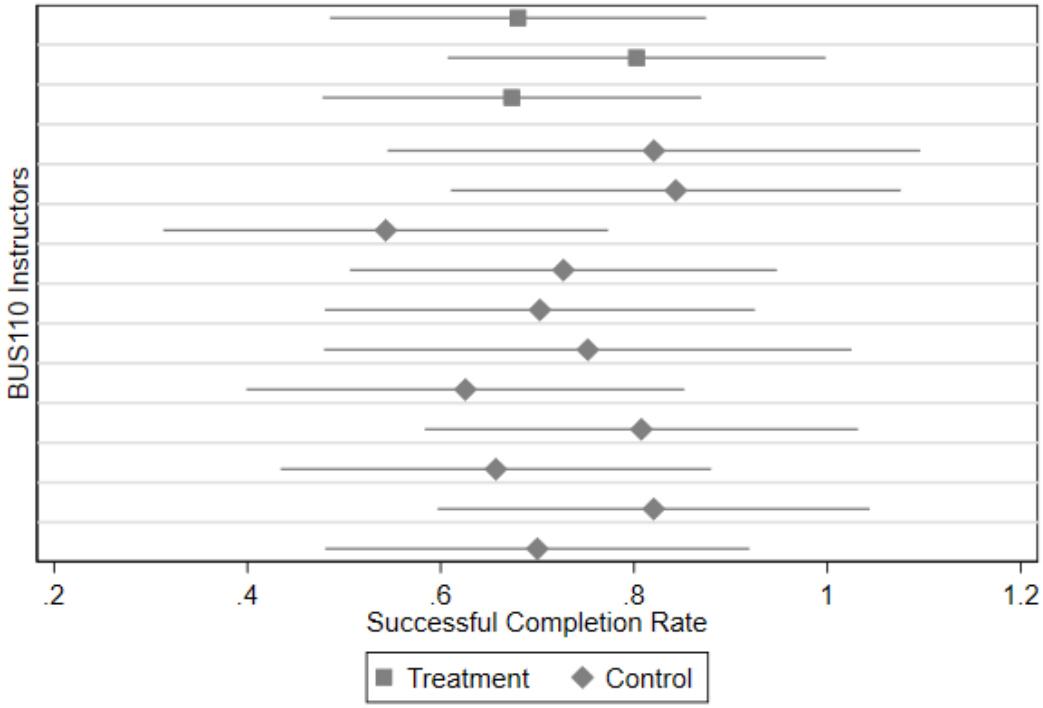
Table 5: Baseline Instructor Performance

	Business		Psychology	
	Treatment (N=3)	Control (N=9)	Treatment (N=4)	Control (N=11)
Average baseline performance--target class only	71.2%	56.9%	52.5%	49.9%
Range baseline performance--target class only	65.0%-77.6%	48.9-70.0%	50.2-66.4%	32.7-66.0%
# new instructors--target class only	0	3	1	5

Figure 1: Success Rates by Instructor



Means and 95% confidence intervals by instructor



Means and 95% confidence intervals by instructor

Paper 4: Becoming College-Ready: Early Findings from a CUNY Start Evaluation

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Background: Most students who enter community college are deemed underprepared for college-level courses and are referred to developmental (remedial) education courses. These students often struggle in the developmental courses and in college more broadly (Bailey, Jeong, & Cho, 2010). Their low rate of success has prompted many colleges and states to redesign their developmental offerings. Many reforms to developmental education have been tried. Some have yielded improved outcomes for students in the short term, but most have not substantially affected their long-term outcomes (Adelman, 2004; Attewell, Lavin, Domina, & Levey, 2006; Bailey et al., 2010; Jenkins, Jaggars, & Roksa, 2009; Scrivener et al., 2015; Zachry Rutschow & Schneider, 2011).

Hoping to boost the success rates of its least prepared incoming students, the City University of New York (CUNY) developed CUNY Start.

Research Questions: We examine the following questions:

RQ4: What is the effect of the option to participate in CUNY Start on students' academic outcomes? Do the effects vary among student populations and settings?

RQ5: How is CUNY Start implemented? To what degree is their fidelity to the CUNY Start model? To what degree are there differences between the program and the colleges' standard courses and services?

Setting: Four of CUNY's seven community colleges. Table 1 briefly describes the four participating colleges.

Population: CUNY Start is available to students requiring remediation. CUNY Start prioritizes recruiting students referred to remediation in math, reading and writing.

The evaluation (and all analyses) include 3,835 students who agreed to participate (a subset of the eligible population). Table 2 provides characteristics of the study sample (derived from college administrative records). A few highlights include:

- 56% women

- 44% Hispanic
- 48% are 19 or younger
- 51 percent required remediation in math, reading, and writing
- 33 percent required remediation in two of the three subject areas.

The measured background characteristics of the two groups were very similar at the outset of the study.

Intervention/Program/Practice: CUNY Start's theory of change posits that students with substantial developmental course requirements are best served through an intensive model designed to build their academic preparedness and college skills before they matriculate. The program is designed to make students more engaged in their course work (through a student-centered pedagogical approach), help them view themselves as competent learners, give them the support they need to succeed, and prepare them for college-level work. The program's low cost to students is expected to make it easier for them to participate. Table 3 compares aspects of the program with standard college courses and services. The core components of CUNY Start include:

- Delay matriculation for one-semester; do not earn college credits
- Pay a minimum fee of $75; do not use financial aid
- Study multiple subject areas (math, reading/writing, or both math and reading/writing), intensively 12-25 hours a week
- Engage as part of a cohort model
- Use a structured curriculum/pedagogical approach, led by highly-trained teachers and advisors

Research Design: To estimate the program's effects on academic outcomes, we use a random assignment design. Three cohorts of students were randomly assigned at four colleges.

Data Collection and Analysis: Academic outcome data came from college administrative records, including student transcript records and test data. Implementation research drew from a range of qualitative and quantitative data sources (e.g., surveys, focus groups, classroom observations).

To estimate the average intent-to-treat effects, we implement the following estimation model:

$$Y_i = \sum_{j=1}^{J} \alpha_j Block_{ji} + \beta_1 P_i + \sum_{k=1}^{K} \gamma_k X_{ki} + \varepsilon_i \qquad (1)$$

Here, Y_i represents a target outcome (e.g., college-ready in math or not). $Block_{ji}$ is a vector of J random assignment block indicators. P_i is a binary program assignment indicator. X_{ki} is a vector of K student baseline characteristics. The ε_i are the residual variances. Robust standard errors are used. Inverse probability of treatment weights were used to account for a non-constant random assignment ratio. The parameter of interest is β_1, the average effect of program assignment on Y_i.

Findings/Results: CUNY Start is implemented largely as designed. The service contrast is substantial, particularly in mathematics.

Table 4 summarizes the program's effects on educational achievement. During the first semester in the study, program group students made substantially more progress through developmental education than control group students, while control group students earned more college credits. By the end of the program semester, a few highlights include:

- 57 percent of program group students were college-ready in math, compared with 25 percent of control group students.
- 38 percent of program group students were college-ready in all three subject areas, compared with 13 percent of control group students.
- Program group students earned 1.9 *fewer* college credits than control group students. This is expected, since CUNY Start students had not matriculated and therefore could not earn college-level credits, while control group students had matriculated and did enroll in some college-level courses.

Conclusions:

The positive early results are only part of the story. It is essential to learn how the trade-off of making a short-term priority of developmental education rather than college-level credit accumulation will play out in the longer term. Additional follow-up data in this evaluation will provide information about sample members' persistence in college, college credit accumulation, and graduation rates. If CUNY Start's short-term trade-off results in the hypothesized longer-term gains, the program will serve as an important model for serving students with substantial developmental education requirements. The research team will track the academic progress of students in the study for at least two years after they were randomly assigned and will examine the program's costs.

Table 1. Participating Colleges

College	Location	Size
Borough of Manhattan Community College	New York, NY	29,000 students
Kingsborough Community College	Brooklyn, NY	25,000 students
Laguardia Community College	Queens, NY	36,500 students
Queensborough Community College	Queens, NY	19,000 students

NOTE: The college names are masked in subsequent tables because we do not currently link outcomes with specific colleges.

Table 2. Baseline Characteristics

Characteristic (%)	Program Group	Control Group	Difference	P-value
Gender				0.216
Female	48.3	46.2	2.1	
Male	36.7	40.0	-3.3	
Missing	15.0	13.8	1.2	
Age				0.691
19 or younger	47.6	48.6	-1.0	
20 to 23	30.4	28.9	1.5	
24 or older	22.0	22.5	-0.5	
Race/ethnicity[a]				0.278
Hispanic	35.9	36.9	-1.0	
White	5.9	5.7	0.2	
Black	25.3	27.4	-2.1	
Asian or Pacific Islander	9.1	6.8	2.3	
Other[b]	6.4	7.0	-0.6	
Missing	17.5	16.3	1.1	
Native language				0.620
English	46.5	49.0	-2.6	
Spanish	18.6	17.9	0.7	
Other	19.6	18.7	0.8	
Missing	15.4	14.4	1.0	
Marital and household status				0.246
Married, living with spouse	4.9	4.7	0.2	
Married, apart from spouse	1.6	2.6	-1.0	
Unmarried, living with partner	10.7	9.0	1.7	
Unmarried, not living with partner	50.0	50.6	-0.6	
Missing	32.9	33.2	-0.3	

(continued)

Table 2.(CONTINUED)

Characteristic (%)	Program Group	Control Group	Difference	P-value
Household status				0.480
Lives with parents	65.3	64.2	1.1	
Lives away from parents	18.6	20.4	-1.8	
Missing	16.1	15.4	0.7	
Expenses				0.634
Parents pay more than half	32.6	31.0	1.5	
Parents do not pay more than half	33.2	33.2	0.0	
Missing	34.2	35.7	-1.5	
Children under the age of 18				0.880
Has one or more children under the age of 18	9.5	10.1	-0.6	
Does not have any children under the age of 18	74.6	74.4	0.3	
Missing	15.8	15.5	0.3	
Dependents				0.740
Has any children or adults dependent on student for financial support	12.1	13.1	-1.0	
Does not have any children or adults dependent on student for financial support	69.3	68.7	0.6	
Missing	18.5	18.1	0.4	
Financial aid				0.156
Applied for financial aid	65.6	68.9	-3.3	
Did not apply for financial aid	17.3	14.9	2.4	
Missing	17.1	16.2	0.9	
Employment				0.770
Currently employed	41.7	42.6	-0.9	
Not currently employed	43.6	43.6	0.0	
Missing	14.7	13.7	0.9	

(continued)

Table 2.(CONTINUED)

Characteristic (%)	Program Group	Control Group	Difference	P-value
Among those currently employed:				
Number of hours worked per week in current job				0.101
1-10 hours	9.6	10.2	-0.6	
11-20 hours	20.8	14.4	6.4	
21-30 hours	23.2	27.1	-3.9	
31-40 hours	28.6	28.0	0.6	
More than 40 hours	4.3	4.1	0.2	
Missing	13.5	16.2	-2.7	
Family education				0.992
First person in family to attend college	29.0	28.8	0.2	
Not first person in family to attend college	53.6	53.8	-0.3	
Missing	17.5	17.4	0.1	
Highest diploma or degree earned by parent with the most education				0.492
Not a high school graduate	14.2	12.5	1.7	
High school diploma or GED	22.3	20.7	1.6	
Some college (without degree)	9.3	9.9	-0.6	
College degree (AA, BA, MA, PhD)	20.4	21.9	-1.5	
Missing	33.9	35.1	-1.2	
Diplomas and degrees earned[c]				
High school diploma	68.6	69.0	-0.4	0.771
GED	13.5	13.5	0.0	0.787
Occupational or technical certificate	2.6	3.4	-0.7	0.434
Other	3.4	4.1	-0.7	0.533
None of the above	1.4	1.5	-0.1	0.785
Missing	14.7	13.7	0.9	0.495
Date of high school graduation or GED receipt				0.937
During the past year	61.8	62.3	-0.5	
Between one and two years ago	3.7	4.2	-0.5	
Between two and five years ago	3.9	3.6	0.3	
More than five years ago	5.9	5.9	0.0	
Missing	24.6	24.0	0.7	

(continued)

Table 2.(CONTINUED)

Characteristic (%)	Program Group	Control Group	Difference	P-value
Student risk[d]				0.512
Traditional student	50.4	52.0	-1.6	
Nontraditional student	37.9	37.6	0.3	
Missing	11.7	10.3	1.3	
College attendance				0.231
Previously attended college	7.2	8.9	-1.7	
Has not attended college previously	78.1	77.4	0.7	
Missing	14.7	13.7	1.0	
College enrolled				1.000
College A	30.4	30.4	0.0	
College B	11.5	11.5	0.0	
College C	16.5	16.5	0.0	
College D	41.6	41.6	0.0	
Expected enrollment in coming semester				1.000
Full time	61.4	61.4	0.0	
Part time	38.6	38.6	0.0	
Number of subject areas requiring developmental education				0.777
Zero (fully college-ready)	0.2	0.4	-0.2	
One	15.2	15.4	-0.2	
Two	33.4	33.2	0.2	
Three	51.2	51.0	0.2	
Highest degree planning to attain				0.844
Some college (without degree)	0.4	0.3	0.1	
Associate's	10.3	10.9	-0.6	
Bachelor's	45.7	45.2	0.5	
Postgraduate or professional	20.4	21.6	-1.2	
Missing	23.2	22.1	1.1	
Sample size (total = 3,835)	2,997	838		

SOURCES: CUNY Start application data, MDRC random assignment data, and test data from CUNY's Administrative Data Warehouse.

NOTES: All values are weighted to account for random assignment ratios that vary across random assignment blocks.

An omnibus F-test was conducted to see whether students' baseline characteristics were jointly predictive of students' random assignment status. The results were not statistically significant (p = 0.885).

[a]Respondents who selected Hispanic for their ethnicity and chose another race category are included only in the Hispanic category. Respondents who did not select Hispanic for their ethnicity and chose more than one race category are included in the Other category.

[b]Other includes multiracial, Native American/Alaskan Native, and other race/ethnicities.

[c]Distributions do not add to 100 percent because categories are not mutually exclusive.

[d]Nontraditional students are defined as those who were 24 or older; worked 35 or more hours per week; had children; or did not receive a high school diploma and were not enrolled in high school at the time of random assignment. Students are listed as nontraditional if they fit any of these characteristics. Students are considered to be missing in the nontraditional category if they were missing data on two or more of these characteristics and have no other nontraditional characteristic.

Table 3. Highlights of CUNY Start and Standard College Courses and Services

Component	CUNY Start	Standard College Courses and Services
Administration, cost, and structure		
Administration	Situated in Continuing Education; managed centrally	Situated in Academic Affairs division; managed within academic departments
Cost to student	$75; students not eligible for financial aid	Full-time tuition $2,400; students may be eligible for financial aid
Structure	1 semester of developmental math, reading, and writing; students cannot take college-level courses that semester; up to 26.5 hours of instruction per week in full-time program	Up to 3 semesters of developmental math, reading, and writing; students can take select college-level courses; typically 12-16 hours of instruction per week for a full-time student
Developmental math instructional approach		
Curriculum	Arithmetic and algebra integrated; problems emphasize conceptual understanding; assignments include activities that develop students' academic skills	Arithmetic and algebra taught separately; academic skill-building activities not prevalent
Pedagogy	Mostly student-centered instruction	Mostly lecture-based instruction
Developmental reading/writing instructional approach		
Curriculum	Reading/writing content integrated; writing assignments designed to help students process and respond to reading material	Reading/writing content typically not integrated; writing assignments in upper-level courses include research synthesis papers
Pedagogy	Mostly student-centered instruction	Mostly student-centered instruction
Student support		
College success seminar	Mandatory; most students took a seminar	Typically not mandatory; some students took a seminar
Advising	Student-to-adviser ratio 75:1; most surveyed students reported at least one one-on-one advising session in the past semester	Student-to-adviser ratio 600:1; many surveyed students reported at least one one-on-one advising session in the past semester
Tutoring	Almost half of surveyed students reported receiving tutoring	Approximately one-third of surveyed students reported receiving tutoring
Instructor hiring and training		
Hiring	Instructors hired based on content and pedagogical knowledge and openness to CUNY Start instructional approach	Instructors typically hired based on content knowledge
Training	Most instructors participated in an apprenticeship; continuing professional development was regular and common	Most instructors did not participate in training before teaching a course; ongoing professional development was common but less regular and intensive

Table 4. Effects on Educational Achievement

Outcome	Program Group	Control Group	Difference		P-Value
Before random assignment					
College-ready subject area (%)					
Math	5.4	5.8	-0.3		0.704
Reading	36.6	35.7	0.9		0.642
Writing	22.3	23.6	-1.3		0.428
End of the program semester					
College-ready subject area (%)					
Math	56.8	24.7	32.1	***	<0.001
Reading	69.7	61.6	8.0	***	<0.001
Writing	61.0	51.6	9.4	***	<0.001
College ready in all three subject areas (%)	37.9	13.0	24.9	***	<0.001
College-level credits earned	0.6	2.4	-1.9	***	<0.001
Sample size (total = 3,835)	2,997	838			

Notes: Rounding may cause slight discrepancies in sums and differences.

All values are weighted to account for random assignment ratios that vary across random assignment blocks.

Statistical significance levels are indicated as: *** = 1 percent; ** = 5 percent; * = 10 percent. See Appendix E for details on the impact estimation model.

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