



BECOMING COLLEGE- READY

Early Findings
from a CUNY
Start Evaluation

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BUILDING KNOWLEDGE
TO IMPROVE SOCIAL POLICY

CCRC COMMUNITY COLLEGE
RESEARCH CENTER

TEACHERS COLLEGE, COLUMBIA UNIVERSITY

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**Becoming College-Ready:
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Overview

Many students who enter community college are deemed underprepared for college-level courses and are referred to developmental (remedial) education courses to build their math, reading, or writing skills. These students often struggle in developmental courses and in college more broadly. To help them, the City University of New York (CUNY) developed CUNY Start. CUNY Start targets incoming students who are assessed as needing remediation in math, reading, and writing. The program delays college matriculation (enrollment in a degree program) for one semester and provides intensive instruction in math, reading, and writing during that semester with a prescribed instructional approach. It also provides advising, tutoring, and a weekly seminar that teaches students skills they need to succeed in college. Students pay only \$75 for the program and do not use financial aid.

CUNY Start's underlying theory of change posits that students with substantial developmental course requirements are best served through an intensive model, designed to build academic preparedness and college skills before matriculation. The program's designers hypothesize that compared with students in standard college courses (including standard developmental education courses), a higher proportion of CUNY Start students will complete developmental education and that they will do so more quickly. Because CUNY Start students spend a semester building their basic skills before matriculating, they are expected to earn fewer college credits in the short term. Over the longer term, the expectation is that CUNY Start students will have higher retention rates (that is, more of them will stay in college), higher college-level credit accumulation, and higher graduation rates.

MDRC, CUNY, and the Community College Research Center at Teachers College, Columbia University, are partnering to evaluate CUNY Start using a random assignment research design, supported by a grant from the federal Institute of Education Sciences. Eligible students at four CUNY community colleges were assigned at random to the program group, whose members could participate in CUNY Start, or to the control group, whose members could receive the colleges' standard courses and services, including standard developmental education courses. Findings in this report include:

- CUNY Start was implemented as it was designed, and the contrast between the program and the colleges' standard courses and services was substantial.
- During the first semester in the study, program group students made substantially more progress through developmental education than control group students; effects were especially large in math. In contrast, during that same semester, control group students earned more college credits than program group students, as predicted by CUNY Start's designers.
- During the second semester, program group students enrolled at CUNY colleges (that is, participated in CUNY Start or enrolled in any non-CUNY Start courses as matriculated students) at a higher rate than control group students.

Subsequent follow-up data will be analyzed to assess 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 course requirements.

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Preface

Community colleges play a vital role in postsecondary education and workforce development, enrolling more than one in every three undergraduates in the United States. Unfortunately, many entering community college students are assessed as needing remediation in math, reading, or writing and are placed into noncredit developmental (remedial) education courses. Graduation rates for students who place into developmental education are discouragingly low. Yet seriously tackling the issue of pedagogical reform in remedial education classrooms (and higher education classrooms more broadly) may require rethinking the hiring, promotion, and professional development of instructors — no small undertaking.

In 2009, the City University of New York (CUNY) developed and implemented CUNY Start, an innovative prematriculation program (one that precedes students' entry into degree programs) that redefines students' experiences with developmental education. CUNY Start is time-intensive, changes the pedagogy used in remedial classes, modifies the content of developmental education, and gives students additional academic and nonacademic support. By focusing on developmental education alone, it seeks to eliminate or dramatically reduce students' developmental education requirements in one semester, helping clear their path to a degree.

This report presents important early findings from a partnership among MDRC; the Community College Research Center at Teachers College, Columbia University; and CUNY to evaluate the effectiveness of CUNY Start. The program served students who placed into developmental education in one or more areas, and half of the study sample placed into remediation in math, reading, and writing. CUNY Start's effect on becoming "college-ready" is among the largest any of the partner organizations has found in evaluations of developmental education reforms. However, in line with CUNY Start's theory of change, students offered the program do not take college-level courses, and therefore fall behind in college credits earned before they matriculate. Additional data collection that is planned for the longer term will show whether this short-term trade-off is worthwhile.

CUNY Start shows that it is possible to dramatically change the student experience inside the developmental education classroom — particularly in remedial math. Moreover, with the right combination of reform in the intensity, pedagogy, and content of instruction, many more students can become college-ready within a single semester. As the evaluation tracks these students into the future, much will be learned about this promising model.

Gordon L. Berlin
President, MDRC

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In 2014, MDRC; the Community College Research Center (CCRC) at Teachers College, Columbia University; and the City University of New York (CUNY) received a grant from the federal Institute of Education Sciences at the U.S. Department of Education to conduct a large-scale evaluation of CUNY Start. We greatly appreciate their generous backing and ongoing commitment.

We are grateful to Alexandra Logue, research professor at CUNY and co-principal investigator for this evaluation. Her thoughtful and passionate thoughts on the research have been invaluable, as has her review of earlier drafts of this report.

We are grateful to Donna Linderman, CUNY Associate Vice Chancellor for Academic Affairs, for her partnership and collaboration throughout the study. She and Mia Simon, University Director of CUNY Start, and Zenobia Johnson, Associate Director of CUNY Start, worked closely with MDRC to launch the evaluation at each college and have continued to play a critical role. We are also grateful to Althea Webber, Associate Director of Research and Strategy, who provided data for the report from CUNY and has been instrumental in helping us understand the data and CUNY policies. Ms. Linderman, Ms. Simon, Ms. Johnson, and Ms. Webber also reviewed earlier drafts of this report and provided valuable comments.

We greatly appreciate the assistance and support of administrators and staff members at Borough of Manhattan Community College, Kingsborough Community College, LaGuardia Community College, and Queensborough Community College. Space does not permit us to name everyone who has played a role in CUNY Start and the evaluation, but we want to particularly acknowledge some individuals. The CUNY Start directors, assistant directors, and program coordinators provided invaluable assistance. These include Denise Deagan, Andrea Gabbidon-Levene, LaShallah Osboren, Frank Milano, Julianne Willis, Natalie Bredikhina, Nora Fussner, Dana Aussenberg, Deema Bayrakdar, Thomas Dieter, Diana Befkowitz, Christine Mellone Dooley, and Bonnie Flaherty. We appreciate all that they and the CUNY staff members at the colleges have done to support the evaluation and bring the CUNY Start model to life for participating students.

Many MDRC and CCRC staff members have contributed to the CUNY Start evaluation and to this report. At MDRC, Rashida Welbeck and Elizabeth Calmeyer worked closely with Ms. Linderman, Ms. Simon, Ms. Johnson, and the colleges' CUNY Start directors and staff members to develop and implement the recruitment and sample enrollment procedures for the study. They were assisted by former MDRC staff members Kelsey Patterson and Jonathan Rodriguez. Joel Gordon, Galina Farberova, Alla Chaplygina, Robert Notwicz, and Shirley James and her staff developed and monitored the random assignment and baseline data-collection process. Former

MDRC staff member Lisa Ramadhar led the data acquisition in the first few years of the evaluation. Matthew Feather, Andrew Avitabile, and Alvin Christian processed much of the data for the report. At CCRC, Nikki Edgecombe led the evaluation's implementation research. She, Susan Bickerstaff, and Julia Raufman participated in that research and carefully reviewed earlier drafts of the report. Alexander Mayer, Leigh Parise, Marie-Andrée Somers, and Alice Tufel from MDRC, and Elisabeth Barnett and Amy Mazzariello from CCRC also reviewed earlier drafts of this report and provided helpful comments. Luke Miratrix from Harvard University provided valuable thoughts on methodological issues. Erick Alonzo, Alvin Christian, and Dominique Dukes assisted in fact-checking the report. Joshua Malbin edited the report and Ann Kottner prepared it for publication.

Finally, we would like to thank the students who are participating in the evaluation at Borough of Manhattan Community College, Kingsborough Community College, LaGuardia Community College, and Queensborough Community College. We are especially grateful to the students who completed the student survey or participated in interviews or focus groups. We hope that the findings from the evaluation will be used to improve college programs and services for them and others in the future.

The Authors

Executive Summary

Many students who enter community college are deemed underprepared for college-level courses and are referred to developmental (remedial) education courses to build their math, reading, or writing skills. These students often struggle in the developmental courses and in college more broadly.¹

Hoping to boost the success rates of its least prepared incoming students, the City University of New York (CUNY) developed CUNY Start, which is offered at eight CUNY colleges. CUNY Start's full-time program was designed for and targets incoming students who are assessed as needing remediation in math, reading, and writing. It is also open to students who are assessed as needing remediation in math and either reading or writing. (CUNY Start is also offered part time, as discussed below.) The program's short-term goal is to substantially reduce or eliminate students' developmental education requirements after one semester, while preparing them for college-level courses. Its long-term goal is to improve academic outcomes, including graduation rates. CUNY Start delays college matriculation (that is, when students first enroll in non-CUNY Start courses in degree programs) for one semester and provides intensive instruction in math, reading, and writing during that semester with a prescribed instructional approach. It also provides advising, tutoring, and a weekly seminar that teaches students skills they need to succeed in college. Students pay only \$75 for the program and cannot use financial aid.

Compared with many developmental education reforms, CUNY Start is uncommonly comprehensive. The program's focus on students assessed as needing remediation in math, reading, and writing sets it apart from other reforms that focus on students with remedial requirements in only one or two subject areas, or that focus on students on the cusp of being deemed "college-ready."² Additionally, unlike most other reforms, CUNY Start aims to provide all the developmental education students need in one semester, before they matriculate. Finally, the cost is very low.

¹Thomas Bailey, Dong Wook Jeong, and Sung-Woo Cho, "Referral, Enrollment, and Completion in Developmental Education Sequences in Community Colleges" (*Economics of Education Review* 29, 2: 255-270, 2010).

²Michelle Hodara and Shanna Smith Jaggars, "An Examination of the Impact of Accelerating Community College Students' Progression Through Developmental Education" (*Journal of Higher Education* 85, 2: 246-276, 2014); Nikki Edgecombe, Shanna Smith Jaggars, Di Xu, and Melissa Barragan, "Accelerating the Integrated Instruction of Developmental Reading and Writing at Chabot College" (New York: Community College Research Center, Teachers College, Columbia University, 2014); and Colleen Sommo, Alexander K. Mayer, Timothy Rudd, and Dan Cullinan, *Commencement Day: Six-Year Effects of a Freshman Learning Community Program at Kingsborough Community College* (New York: MDRC, 2012).

CUNY has conducted internal quasi-experimental analyses that provide evidence of CUNY Start’s effectiveness.³ Building on that evidence base, MDRC, CUNY, and the Community College Research Center at Teachers College, Columbia University, are partnering to evaluate CUNY Start at four CUNY community colleges using a random assignment research design, supported by a grant from the federal Institute of Education Sciences. Each eligible student who consented to participate was assigned at random either to the program group, whose members could participate in CUNY Start, or to the control group, whose members could receive standard college courses and services, including standard developmental education courses. The difference between the two groups’ average outcomes provides an unbiased estimate of the effect of the program.

This report is the first to share findings from the evaluation. Overall, the evaluation found that CUNY Start was implemented as it was designed and that there was considerable contrast between the program and the colleges’ standard courses and services. During the first semester of the study, program group students made much more progress through developmental education than control group students, while control group students earned more college credits, as predicted by CUNY Start’s designers. In the second semester, program group students enrolled at CUNY colleges (that is, participated in CUNY Start or enrolled in any non-CUNY Start courses as matriculated students) at a higher rate than control group students.

CUNY Start’s Theory of Change

CUNY Start’s underlying 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, 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. Because financial aid cannot be used to pay for CUNY Start, students can preserve their financial aid for future courses (developmental education courses and college-level courses).⁴

³Allen and Horenstein compare the outcomes of students in CUNY Start with a matched comparison group of students who did not enroll in CUNY Start but were similar with respect to their measurable characteristics (such as their number of developmental requirements). Such analyses rely on the assumption that after matching on measured characteristics, the students in CUNY Start and the comparison group also were similar with respect to their unmeasured characteristics that are related to the outcomes of interest (for example, tenacity and motivation). See Drew Allen and Aaron Horenstein, *CUNY Start: Analysis of Student Outcomes* (New York: City University of New York, 2013).

⁴Students are eligible to receive federal Pell Grants for only six years and New York State Tuition Assistance Program grants for up to eight semesters, with a maximum of six semesters at the associate’s degree level.

The program's designers hypothesize that compared with students in standard college courses (including standard developmental education courses), a higher proportion of CUNY Start students will complete developmental education and that they will do so more quickly. Because CUNY Start students spend a semester building their basic skills before matriculating, they are expected to earn fewer college credits in the short term. Over the longer term, the expectation is that CUNY Start students will have higher retention rates (that is, more of them will stay in college), will accumulate more college-level credits, and will eventually have higher graduation rates.

Evaluation Sample Members

CUNY Start is available to incoming students who have been assessed as requiring remediation.⁵ It offers a full-time program and a part-time program. The full-time program is only open to students who are assessed as needing remediation in math and at least one other subject area (reading, writing, or both). The part-time program, which provides instruction in math *or* reading and writing, is open to students who are assessed as needing remediation in at least one subject area. Although any student who requires remediation is eligible for CUNY Start (and was eligible for the evaluation), CUNY Start staff members focus on recruiting a narrower population of students: those who have been assessed as needing remediation in all three subject areas.

Students were randomly assigned to the program or control group before each of three semesters: spring 2015, fall 2015, and spring 2016. A total of 3,835 students were assigned. Students completed a questionnaire before they were randomly assigned, and that questionnaire shows that the research sample, like the broader student body at the colleges, is racially diverse, with many students whose native language is not English. Most students in the sample are women. Most reported that they lived with their parents, and very few said they had children. Most of the sample members were assessed as needing remediation in two or three subject areas, reflecting CUNY Start's efforts to recruit such students.

CUNY Start Model and Implementation

From spring 2015 to spring 2016, the evaluation collected information on the implementation of CUNY Start and the standard offerings at the four colleges using several data sources, including interviews with administrators and instructors, observations of classrooms, and surveys of students and instructors. Table ES.1 compares aspects of the program with standard college courses and services. The elements of administration, cost, and structure shown in the table are fixed and

⁵The program also admits a small number of students with some limited college experience (typically fewer than 12 college credits).

Table ES.1

Highlights of CUNY Start and Standard College Courses and Services

Component	CUNY Start	Standard College Courses and Services
<u>Administration, cost, and structure</u>		
Administration	Situated in Continuing Education; managed centrally	Situated in the 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 the full-time program	Up to 3 semesters of developmental math, reading, and writing; students can take selected college-level courses; typically 12-16 hours of instruction per week for a full-time student
<u>Developmental math instructional approach</u>		
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
<u>Developmental reading/writing instructional approach</u>		
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
<u>Student support</u>		
College success seminar	Mandatory; most students take a seminar	Typically not mandatory; some students take 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

(continued)

Table ES.1 (continued)

<u>Instructor hiring and training</u>		
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; continuing professional development was common but less regular and intensive

SOURCES: Community College Research Center field research data; MDRC calculations using data from the instructor and student surveys; www2.cuny.edu/academics/academic-programs/model-programs/cuny-college-transition-programs/cuny-start; discussions with CUNY staff members.

were not explored in the implementation research, but they are included here to provide a comprehensive summary of the program. Overall, CUNY Start was implemented with fidelity to the program model, and there was a substantial contrast between the program and the colleges' standard courses and services, including their standard developmental education courses.

Administration, Cost, and Structure

CUNY Start is situated in each college's Continuing Education division, which offers a range of courses outside the academic departments, including job-skills courses and adult basic education. Administrators in CUNY's Office of Academic Affairs manage the program and professional development staff members provide training to CUNY Start instructors and advisers and develop program curricula. The CUNY Office of Academic Affairs works closely with CUNY Start directors at each college to operate the program, and provides administrative and evaluation support to ensure the program is well implemented and to measure its efficacy. Standard developmental education and college-level courses are situated in the colleges' academic departments, which are part of each college's Office of Academic Affairs.

As noted earlier, CUNY Start students pay only \$75 for the semester, including the course materials. They cannot use financial aid, which allows them to retain the aid for the future. In contrast, tuition and fees for full-time students at the four study colleges in fall 2015 was \$2,400 (for New York State residents), and many students were eligible for financial aid.

The structure of CUNY Start is unique. Its full-time program provides up to 26.5 hours of instruction per week during its one semester: 12 hours of math, 12 hours of integrated reading

and writing, and 1.25 to 2.5 hours in the college success seminar.⁶ CUNY Start’s part-time program provides 12 hours of instruction in either math or reading and writing, and 1.5 hours in the seminar. Students cannot take college-level courses during that semester. In contrast, students who are not in CUNY Start might take multiple developmental education courses over multiple semesters, and each course typically meets 3 to 6 hours per week. Students can take some college courses at the same time, and a full-time student usually receives 12 to 16 hours of instruction per week (including developmental education and college-level courses). CUNY Start’s more intensive instruction is intended to help students satisfy their developmental education requirements in one semester.

Math and Reading/Writing Instructional Approach

CUNY Start math and reading/writing instructors use prescribed curricula that were created by experienced faculty members and CUNY Start professional development staff members for program-wide use. Program curricula are regularly refined by the professional development staff based on comments from the instructors.

CUNY Start’s math instructional approach is markedly different from standard developmental math instruction. CUNY Start integrates arithmetic and algebra and encourages conceptual understanding, real-world learning, and the building of academic skills such as studying and note taking. It relies primarily on “student-centered” instruction: Instructors facilitate meaningful student discussion and engagement with the material, and frequently ask specific, open-ended questions to stimulate student discussion. Instructors in standard remedial math classes tend to use more lecturing.

CUNY Start teaches reading and writing integrated in one class, unlike many developmental courses, to reinforce the relationship between the two and to allow students to move more quickly through their developmental requirements. Unlike standard developmental reading and writing instruction, the CUNY Start instructional approach draws on the “cognitive apprenticeship” model, in which instructors aim to help students learn the habits and techniques of proficient readers and writers.⁷ In both CUNY Start and standard developmental reading and writing, instructors rely on student-centered instruction, so the pedagogical difference between CUNY and non-CUNY Start instruction is less substantial in reading and writing than it is in math.

⁶At most colleges, the college success seminar for full-time students meets for 2.5 hours for the first four sessions, and then 1.25 hours for the remaining sessions; however, some campuses offer a consistent 1.25- to 1.5-hour seminar for all full-time students.

⁷Allan Collins, John Seely Brown, and Susan E. Newman, *Cognitive Apprenticeship: Teaching the Craft of Reading, Writing, and Mathematics* (Champaign, IL: Center for the Study of Reading, University of Illinois at Urbana-Champaign, 1987).

Student Support

CUNY Start's student support is more integrated into the classroom than is typical at community colleges. CUNY Start's mandatory college success seminar, led by a CUNY Start adviser, aims to help students develop skills to balance school and life, solve problems, advocate for themselves, and view themselves as learners. Typically, non-CUNY Start students are not required to participate in a college success seminar. CUNY Start advisers, who are responsible for far fewer students than non-CUNY Start advisers, also meet with students outside the seminar to give them support during the program and to plan for their matriculation. CUNY Start math tutors and writing assistants provide help to students inside and outside of class. When surveyed, program group students were somewhat more likely than control group students to report that they had met with an adviser or a tutor outside of class.

Hiring and Training

Typically, college instructors are hired primarily based on their content knowledge (and of course their academic credentials). CUNY Start hires instructors based on their content and pedagogical knowledge, and their openness to the prescribed curriculum and pedagogy. Once hired, CUNY Start instructors are expected to participate in a semester of apprenticeship before they teach their own classes, during which time they observe and assist experienced instructors. After that semester, instructors continue to receive training. Most CUNY Start instructors surveyed for the study had participated in apprenticeships and almost all reported receiving comments on their instruction. In contrast, most non-CUNY Start developmental education instructors who were interviewed did not report participating in training before teaching a course for the first time. Many reported receiving some kind of professional development, but they participated for fewer hours than CUNY Start instructors.

The Effects of CUNY Start

- **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.**

This finding reflects CUNY Start's focus on reducing or eliminating developmental course requirements before students matriculate and is in line with the program's theory of change. As Table ES.2 shows, before random assignment similar percentages of program group students and control group students were "college-ready" in math, reading, and writing (according to their scores on placement tests, primarily). By the end of their first semester in the study (the "program semester") more program group students than control group students were college-ready in each of the subject areas (as demonstrated by their scores on exit tests or their completion of the highest level developmental education course in that subject area). The difference is largest

Table ES.2
Effects on Educational Achievement

Outcome	Program Group	Control Group	Difference	P-Value
<u>Before random assignment</u>				
College-ready in the 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
<u>End of the program semester</u>				
College-ready in the 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		

SOURCES: MDRC calculations using CUNY Start application data, MDRC random assignment data, data from CUNY's Institutional Research Database, and test data from CUNY's Administrative Data Warehouse.

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.

in math: By the end of the program semester, 57 percent of program group students were college-ready in math, compared with 25 percent of control group students. By the end of the program semester, 38 percent of program group students were college-ready in all three subject areas, compared with 13 percent of control group students. Using transcript data from CUNY, Table ES.2 also shows that program group students earned fewer college credits than control group students in the program semester. This result 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.⁸

- **During the second semester, program group students enrolled at CUNY colleges (that is, participated in CUNY Start or enrolled in any non-CUNY Start courses as matriculated students) at a higher rate than control group students.**

Sixty-nine percent of the program group enrolled at CUNY colleges during the second semester of the study, compared with 64 percent of the control group. This difference mostly reflects the fact that program group students participated in CUNY Start at a higher rate than control group students. Similar percentages of the two groups enrolled in any non-CUNY Start courses. (These findings are not shown in a table.)

- **In each of the subgroups of students examined, the program group made more progress in developmental education and earned fewer college credits in the program semester than the control group.**

The findings for the full research sample represent the program's effects on average. Different types of students, however, may respond differently to CUNY Start or the services available to the control group, and thus, the effects may vary among different groups of students. Several different subgroups of students were examined, including: those who intended to participate in CUNY Start full time or part time; those who required remediation in all three subjects and those who required remediation in only one or two; those at each of the four colleges in the study; those of various races/ethnicities; and men and women. Analyses show that CUNY Start had positive effects on progress through developmental education and negative effects on college credits earned in the program semester for all groups examined.

Discussion of Findings and Looking Forward

Within one semester, CUNY Start enabled students to make substantial progress through developmental education — more progress than has been seen in most other developmental education reforms that have been evaluated in random assignment studies.⁹ The program is meeting

⁸The report includes findings on enrolling at CUNY colleges in the program semester, defined as participating in CUNY Start or enrolling in any non-CUNY Start courses as a matriculated student. A higher proportion of program group students than control group students enrolled at CUNY colleges in that semester. An analysis described in the report strongly suggests that the effects reported here on completing developmental education and accumulating college credits in the program semester are not simply the result of this enrollment effect.

⁹See, for example, A.W. Logue, Mari Watanabe-Rose, and Daniel Douglas, "Should Students Assessed as Needing Remedial Mathematics Take College-Level Quantitative Courses Instead? A Randomized Controlled Trial" (*Educational Evaluation and Policy Analysis* 38, 3: 578-598, 2016); Susan Scrivener, Michael J. Weiss,

its goal of helping students substantially reduce or complete their developmental education requirements within a semester. The effects in math are especially striking, since developmental math is a barrier that prevents many students from earning a degree.¹⁰ CUNY Start’s short-term success is also striking given that the program targets students with substantial developmental course requirements, in contrast to many other reforms.¹¹ By enabling students to make substantial progress in or complete their developmental education requirements, CUNY Start can help students maintain their future financial aid eligibility — repeating developmental courses, which is a common occurrence for students taking standard developmental education courses, can affect students’ ability to make “satisfactory academic progress” for continued aid eligibility.¹² The greater progress students make through developmental education can also help them avoid reaching the limits on their aid.

The positive early results in this report 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. A report on longer-term effects and cost-effectiveness is scheduled to be published by MDRC in 2020. In addition, the Community College Research Center will publish two papers focused on CUNY Start’s math curriculum and pedagogy and its staffing and professional development model. Finally, CUNY will develop a tool kit on CUNY Start implementation and best practices, focusing on CUNY’s use of data to inform program management and refinement.

Alyssa Ratledge, Timothy Rudd, Colleen Sommo, and Hannah Fresques, *Doubling Graduation Rates: Three-Year Effects of CUNY’s Accelerated Study in Associate Programs (ASAP) for Developmental Education Students* (New York: MDRC, 2015); and Elizabeth Zachry Rutschow and Emily Schneider, *Unlocking the Gate: What We Know About Improving Developmental Education* (New York: MDRC, 2011).

¹⁰Paul Attewell, David Lavin, Thurston Domina, and Tania Levey, “New Evidence on College Remediation” (*Journal of Higher Education* 77, 5: 886-924, 2006).

¹¹Logue, Watanabe-Rose, and Douglas (2016).

¹²Satisfactory academic progress requirements vary from college to college and can include not attempting too many credits (generally more than 150 percent of the credits required for a degree), maintaining a cumulative grade point average of 2.0 or higher, completing at least two-thirds of credits attempted, and, at some colleges, completing a certain number of credits by the end of each year. See Judith Scott-Clayton and Lauren Schudde, “Performance Requirements in Need-Based Aid: What Roles Do They Serve, and Do They Work?” (New York: Center for Analysis of Postsecondary Education and Employment, Teachers College, Columbia University, 2017); <https://studentaid.ed.gov/sa/eligibility/staying-eligible>.

Chapter 1

Introduction

Many students who enter community college are deemed academically underprepared for college-level courses and are referred to developmental (remedial) education courses to build their math, reading, or writing skills.¹ These students often struggle in the developmental courses and in college more broadly. Graduation rates for such students are low, especially among those who are assessed as needing remediation in multiple subjects.²

Hoping to boost the success rates of its least prepared incoming students, the City University of New York (CUNY) developed CUNY Start, an innovative developmental education program. CUNY Start's full-time program was designed for and targets incoming students who are assessed as needing remediation in math, reading, and writing (based on their scores on the CUNY Assessment Tests, or "placement tests").³ It is also open to students who are assessed as needing remediation in math and either reading or writing.⁴ The program's short-term goal is to substantially reduce or eliminate students' developmental education course requirements after one semester, while preparing them for college-level courses. Its long-term goal is to improve academic outcomes, including graduation rates. CUNY Start delays college matriculation for one semester and provides instruction in math, reading, and writing over a compressed period with a prescribed curriculum and instructional approach.⁵ It also provides advising and tutoring and a weekly seminar that teaches students skills they need to succeed in college. Students pay only \$75 for the program, including the course materials.

MDRC, CUNY, and the Community College Research Center at Teachers College, Columbia University, are partnering to evaluate CUNY Start, supported by the federal Institute of Education Sciences. The evaluation examines how CUNY Start is implemented, its costs, and its effects on academic outcomes. To estimate the program's effects on students' academic outcomes, the evaluation uses a random assignment design to compare students in a program group, whose members had access to CUNY Start, with students in a control group, whose members had

¹Bailey, Jeong, and Cho (2010).

²See, for example, Attewell, Lavin, Domina, and Levey (2006); Bailey, Jeong, and Cho (2010); and Figure 1.1.

³As is described in Appendix B, CUNY community colleges require incoming students to take the CUNY Assessment Tests if they have not demonstrated college-level proficiency in math, reading, or writing through their scores on the SAT or New York State Regents exams (statewide standardized tests in core high school subjects).

⁴As is described later in the chapter, CUNY Start also has a part-time program for students with one or more developmental education requirements.

⁵In this report "matriculation" is when a student first enrolls in non-CUNY Start courses in a degree program.

access to the standard courses and services at CUNY’s community colleges, including the standard developmental education courses (everything other than CUNY Start).

This report is the first to share findings from the evaluation; it includes implementation findings and effects on early academic outcomes. As the report discusses in detail, the colleges in the study generally implemented CUNY Start as it was designed, and there were substantial differences between CUNY Start and the colleges’ standard courses and services. After a semester, program group students made much more progress through their developmental education requirements than control group students, while control group students earned more college credits — in line with CUNY Start’s theory of change, which is described below. During sample members’ second semester in the study, program group students enrolled at CUNY colleges (that is, participated in CUNY Start as nonmatriculated students or enrolled in non-CUNY Start courses as matriculated students) at a higher rate than control group students. Additional semesters of follow-up data, which will be presented in a future report, will determine the degree to which CUNY Start’s short-term focus on reducing or eliminating developmental education requirements yields greater longer-term academic success.

Developmental Education Nationally and at CUNY

Nearly half of all undergraduates in the United States attend community colleges. A disproportionate number of them are low-income students, underrepresented minorities, nontraditional students, and first-generation college students.⁶ Community colleges have increased access to higher education not just because they are affordable but because they are open-access, meaning that anyone with a high school diploma or equivalency can matriculate.

For as long as community colleges have been open-access, they have faced the challenge of students who arrive and are assessed as being underprepared for college-level work. Typically, these students are referred to developmental education, where they are required to complete one or more noncredit math, reading, or writing courses before enrolling in college-level, credit-bearing math and English courses, and sometimes other college-level courses. (For example, students who require developmental math are often prohibited from enrolling in college-level science courses.)

⁶Berkner and Choy (2008); Provasnik and Planty (2008); Shapiro et al. (2017). First-generation students are those whose parents did not attend college. Nontraditional students include those who have delayed their enrollment in college (that is, who did not enter college in the same calendar year as they finished high school), who are attending part time, who are working full time, who are financially independent from their parents, who have dependents, and who are single parents.

Today, many students entering community colleges are referred to some developmental education.⁷ But taking noncredit course sequences slows down students' progress toward graduation and leads them to incur additional tuition costs, and in the process, expend a portion of their financial aid.⁸ Furthermore, taking (and often repeating) noncredit course sequences can put students at risk of failing to meet satisfactory academic progress (SAP) requirements for maintaining federal aid eligibility.⁹ Federal aid also has time limits: Students are only eligible to receive the equivalent of six years of Pell Grant funding.¹⁰ The additional time and aid required to complete developmental education requirements are clearly a high cost, since many students do not finish their assigned developmental course sequences, let alone graduate.¹¹

Graduation rates from community colleges are quite low overall, but they are even lower among students who are referred to developmental education. Figure 1.1 shows graduation rates for full-time, first-time students.¹² Nationwide, 31 percent of those students graduated (that is, earned associate's degrees) within three years. However, the three-year graduation rate among the subset of students who took at least one developmental course is less than half that: 13 percent.¹³ Like other urban community colleges, CUNY's community colleges have a lower overall graduation rate than the national average: 17 percent of first-time, full-time students graduated within three years. At CUNY, 14 percent of students who were assessed as needing at least one developmental course graduated within three years. Not surprisingly, graduation rates are even lower among students who require remediation in all three subjects (math, reading, and writing). At CUNY's community colleges, only 7 percent of the students who entered in fall 2011 and who were assessed as needing remediation in math, reading, and writing ("triple remedial" in Figure 1.1) graduated within three years.

⁷Bailey, Jeong, and Cho (2010).

⁸CUNY Task Force on Developmental Education (2016).

⁹SAP requirements vary from college to college and can include not attempting too many credits (generally more than 150 percent of the credits required for a degree), maintaining a cumulative grade point average of 2.0 or higher, completing at least two-thirds of credits attempted, and, at some colleges, completing a certain number of credits by the end of each year. See Scott-Clayton and Schudde (2017); City University of New York (2018c); and U.S. Department of Education, Office of Federal Student Aid, "Staying Eligible" (n.d.).

¹⁰See U.S. Department of Education, Office of Federal Student Aid, "Calculating Pell Grant Lifetime Eligibility Used" (n.d.).

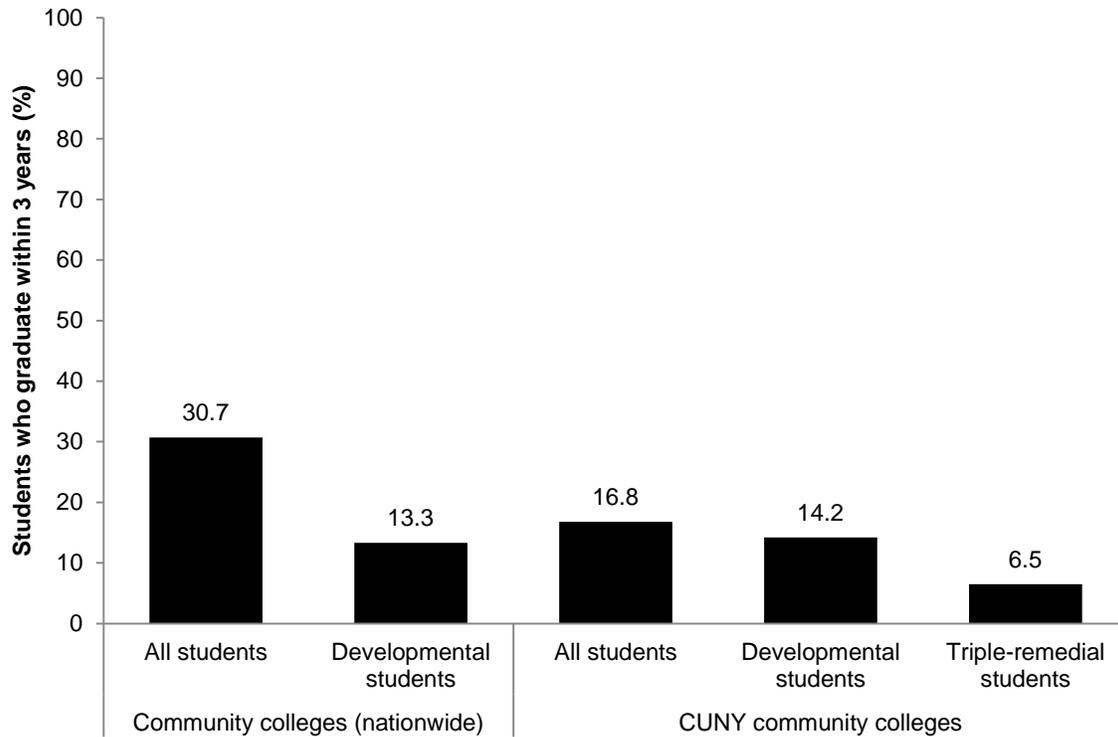
¹¹Fewer than 30 percent of students who place into the lowest levels of reading and math ever complete their required course sequences. See Bailey, Jeong, and Cho (2010) and Scott-Clayton, Crosta, and Belfield (2014).

¹²Due to the availability of data, these data represent students entering college in fall 2011.

¹³This percentage does not include students who were assessed as needing developmental courses but never took them, and thus never graduated.

Figure 1.1

Community College Three-Year Graduation Rates



SOURCES: MDRC calculations based on data from CUNY; Ginder, Kelly-Reid, and Mann (2015); U.S. Department of Education, National Center for Data Statistics (n.d.); and City University of New York Office of Institutional Research and Assessment (2015).

NOTES: These statistics represent full-time, first-time students who entered two-year institutions in fall 2011. For community colleges (nationwide), "developmental students" are those who took a developmental course. "Developmental students" at CUNY community colleges are those who were assessed as needing at least one developmental course based on their initial skills proficiency scores on the CUNY Assessment Tests in math, reading, and writing. "Triple-remedial students" are CUNY students who did not pass any of the CUNY Assessment Tests in math, reading, and writing.

The low rate of success for students assessed as needing developmental education has prompted many colleges and states to redesign their developmental offerings. Most commonly, reform approaches have focused on changing developmental courses' structure or timing (or both), changing their curricula, changing how they are taught, changing how students are assessed and placed into courses, and providing additional support for developmental education students.

Many reforms have been tried. Some have yielded improved outcomes for students in the short term, but most have not substantially affected their long-term outcomes.¹⁴

As at most community colleges, developmental education at CUNY has typically comprised multilevel, multise­mester, noncredit course sequences in math, reading, and writing. But as reforms have been explored nationwide, CUNY’s leaders have also focused on rethinking the university’s approaches, and CUNY and its colleges have implemented many different changes. As this report was being written, CUNY was working to revamp its developmental education, introducing alterations in how students are assessed and placed in courses, how students qualify to move out of developmental education, and the content and pedagogy of the courses themselves. The shifts draw on previous reforms tried at individual CUNY institutions and across CUNY as a whole.¹⁵ CUNY Start is continuing to operate in the midst of these other reforms.

CUNY Start incorporates most of the reform approaches mentioned above — including changes to structure and timing, curriculum, pedagogy, and student support — and is uncommonly multifaceted. CUNY Start targets students who require remediation in math, reading, and writing. This focus on “triple-remedial” students makes the program and its evaluation unique among the existing body of work on developmental education reform, much of which has focused on students who have developmental requirements in only one or two subject areas, or those who are on the cusp of being deemed “college-ready.”¹⁶ Additionally, unlike most other developmental reform approaches, CUNY Start aims to provide all the developmental education students need before they matriculate. There are other prematriculation initiatives designed to support academically underprepared students, such as bridge programs, “boot camps,” and some Massive Open Online Courses, but programs that postpone matriculation — like CUNY Start — are uncommon.¹⁷ CUNY Start also costs students very little: Students pay \$75 to participate, a sum that includes the cost of materials. CUNY has conducted internal analyses that provide evidence of CUNY Start’s effectiveness, and has expanded the program in part based on those results.¹⁸ The

¹⁴Zachry Rutschow and Schneider (2011); Adelman (2004); Attewell, Lavin, Domina, and Levey (2006); Jenkins, Jaggars, and Roksa (2009); Bailey, Jeong, and Cho (2010). CUNY’s Accelerated Study in Associate Programs (ASAP) is an exception. The unusually comprehensive program, which provides up to three years of financial and academic support and other forms of support for students, almost doubles three-year graduation rates. ASAP targets students with up to two developmental education requirements. For more information, see Scrivener et al. (2015) and Strumbos and Kolenovic (2016).

¹⁵See CUNY Task Force on Developmental Education (2016).

¹⁶Hodara and Jaggars (2014); Edgecombe, Jaggars, Xu, and Barragan (2014); and Sommo, Mayer, Rudd, and Cullinan (2012).

¹⁷Students in summer bridge programs and developmental education “boot camps” receive accelerated developmental education instruction before their first semester in college. Using Massive Open Online Courses, students can receive accelerated developmental education instruction online before they matriculate. For examples of other prematriculation programs, see California State University (2011) and City University of New York (2018b).

¹⁸Allen and Horenstein (2013).

present study builds on the existing empirical evidence base, offering an independent random assignment evaluation of the program's effects.

The CUNY Start Model

CUNY Start began in 2009 as a small, intensive program that targeted students with General Educational Development (GED) certificates (now high school equivalency diplomas) who had been assessed as having very weak math, reading, and writing skills. It expanded in 2010 to serve high school graduates also. It currently operates at six of CUNY's seven community colleges, the College of Staten Island, and Medgar Evers College. Program enrollment has grown greatly over time. In 2009, CUNY Start served about 150 students; by fall 2017, it had served a total of 18,000 students with an annual enrollment of 3,500.

The program is situated in each college's Continuing Education division, which offers a range of courses outside the academic departments, including job-skills courses and adult basic education. Administrators in CUNY's central Office of Academic Affairs manage the program and a group of professional development staff members provides training and support to CUNY Start instructors and advisers, and develops program curricula. The Office of Academic Affairs works closely with CUNY Start directors and program coordinators at each college to oversee and implement the program, and provides evaluation support to measure the program's efficacy. The colleges' CUNY Start teams also include math and reading/writing instructors, advisers, math tutors, and writing assistants.

CUNY Start's underlying theory of change posits that students with substantial developmental education requirements are best served through an intensive, cohort-based model (in which a group of students who join at the same time take all of their classes together) designed to build academic preparedness and college skills *before* matriculation. The program's components are designed to make students more engaged in their course work, help them view themselves as learners, help them make greater connections with peers, 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. It also allows them to preserve their financial aid for future courses, since they do not tap those funds for CUNY Start.

The program's designers hypothesize that compared with students in standard college courses, a higher proportion of CUNY Start students will build their basic skills and complete developmental education, and that they will do so more quickly. Because CUNY Start students spend a semester building their basic skills before matriculating, they are expected to earn fewer college credits in the short term. The hypothesis, however, is that over the longer term (beginning in students' fourth semester), CUNY Start students will have higher retention rates (that is, more

of them will stay in college), will accumulate more college-level credits, and will eventually have higher graduation rates.

The rest of this section describes CUNY Start's components and provides more information on why the program might improve students' outcomes. The section describes the CUNY Start model as it was designed; Chapter 2 describes how the model was implemented in practice at the colleges in the evaluation.

Structure

Typically, as described above, students who are referred to developmental education are required to complete one or more noncredit math, reading, or writing courses before they can enroll in college-level math or English courses for which they can earn college credits. Each developmental course typically meets three to six hours per week. Completing these courses may take several semesters, and students can take some college-level courses at the same time. Students pay regular undergraduate tuition for both their developmental and college-level courses (which was, for example, \$2,400 for a New York State resident attending a CUNY community college full time in the fall 2015 semester),¹⁹ and they may be eligible for financial aid.

CUNY Start attempts to prepare students for college-level math and English in one semester. In CUNY Start's full-time program, students take classes in math and integrated reading/writing for 24 hours each week. In the part-time program, students take either math or reading/writing for 12 hours each week. All CUNY Start students also spend time each week in a college success seminar.²⁰ CUNY Start students spend considerably more time per week in math and reading/writing courses than students in traditional developmental courses typically do.²¹ This instructional intensity is intended to increase the amount of time that students spend actively engaged with learning activities and facilitates the use of the CUNY Start curriculum and pedagogy discussed below. Evaluations of both community college and high school programs and of policies that significantly increase the time spent in targeted subject areas have shown that

¹⁹Alexandra Logue and CUNY Office of Institutional Research and Assessment, email to author, February 6, 2018.

²⁰At most colleges, the seminar for full-time students meets for 2.5 hours for the first four sessions, and then 1.25 hours for the remaining sessions. Some campuses, however, offer a consistent 1.25- to 1.5-hour seminar for all full-time students. The seminar for part-time students meets for 1.5 hours.

²¹Across semesters, the total time students spend in standard developmental courses varies depending on the number of courses they need to take, how many hours each of those courses meet, and whether the students pass the courses or need to retake them.

this approach can help students succeed in those subject areas.²² As noted earlier, during their time in CUNY Start, students do not matriculate at college or take any college-level courses.

CUNY Start uses a cohort model, in which students participate as a group in math, reading/writing, and the college success seminar. Such grouping is hypothesized to foster stronger connections among students and between students and instructors,²³ and those connections are positively associated with persistence in college.²⁴ Past experimental research provides evidence that “learning communities” that enroll groups of students in clusters of classes can have a small positive effect on students’ academic outcomes.²⁵

After 12 weeks of CUNY Start — Phase I of the program — students take exit tests in the subject areas they have been studying.²⁶ Students who pass are eligible to take college-level courses the next semester. Students who do not pass receive an additional three to six weeks of CUNY Start instruction — Phase II — before being reassessed. If students are assessed as needing more remediation after Phase II, they cannot repeat CUNY Start, but they can matriculate at the college and take the standard developmental education courses (or free “immersion” courses in the summer or between terms to build math, reading, or writing skills), and they can take some college-level courses. If students take CUNY’s part-time program and still have developmental requirements when they are done, they can participate for an additional semester in the CUNY Start subject area(s) they did not take previously. For example, a student who participated in the part-time program in math could later participate in the part-time program in reading/writing.

As mentioned above, CUNY Start students pay a flat fee of \$75 for their courses and course materials.²⁷ They cannot use financial aid for the program, which ensures that they retain all aid for future courses, when they may be better prepared for college-level work and may be taking more credit-bearing courses.

²²Jenkins et al. (2010); Kemple, Herlihy, and Smith (2005).

²³Visher, Wathington, Richburg-Hayes, and Schneider (2008).

²⁴Tinto (1993); Astin (1993).

²⁵Richburg-Hayes, Visher, and Bloom (2008); Weiss, Visher, Weissman, and Wathington (2015).

²⁶As is described in Appendix B, during the period covered in this report, the CUNY Assessment Tests were used for both placement into developmental education in all subject areas and as the exit tests for developmental reading and writing. The CUNY Elementary Algebra Final Exam was used as the exit test for developmental math.

²⁷CUNY is able to charge only \$75 because of some differences between CUNY Start and standard developmental education. Both result in reimbursement from New York State based on the number of students enrolled and the number of hours of class time. However, hourly instructional expenses are somewhat lower for CUNY Start. The student fees and the reimbursement from the state cover close to 70 percent of the total cost per CUNY Start student, with the balance coming from CUNY’s general funds.

Curriculum

The curricula in developmental education courses vary greatly. Traditional developmental courses sometimes seek to cover a broad range of topics, and competencies are sometimes taught in isolation, without clear connections to college-level performance requirements.²⁸

CUNY Start’s prescriptive math and reading/writing curricula were originally developed by experienced faculty members and professional development staff members from CUNY’s Adult Literacy and Education programs. They emphasize a number of research-based practices. For example, national college-readiness math standards and research on math instruction for adults and older adolescents both suggest that math courses should focus on developing students’ math proficiencies (such as problem solving and adaptive reasoning) and conceptual understanding (that is, their comprehension of math concepts, operations, and relations).²⁹ The CUNY Start math curriculum therefore focuses on math concepts in depth, rather than on memorization and mechanical repetition, and asks students to apply their newly gained skills in real-life situations. Such features are intended to show students how the subject matter is relevant to them.³⁰ Doing so has been found to have positive effects on students’ learning.³¹

Similarly, the CUNY Start reading/writing curriculum draws on research suggesting that students should receive explicit instruction in reading comprehension and writing strategies that are modeled and “scaffolded” by instructors: Students are coached as they practice and internalize these strategies, taking on more and more responsibility for the strategies as the semester progresses.³² These practices also reflect national K-12 language arts standards that say teaching should help students develop their understanding of concepts, their ability to think critically, and their ability to apply what they learn in the real world.³³

Pedagogy

Although pedagogical approaches vary greatly across standard developmental education courses and instructors, these courses often rely on lectures to teach students. This traditional

²⁸Grubb (2010); Barragan and Cormier (2013); Hern (2010).

²⁹U.S. Department of Education, Office of Vocational and Adult Education (2011); National Governors Association Center for Best Practices, Council of Chief State School Officers (2010); National Mathematics Advisory Panel (2008); National Council for Teachers of Mathematics (2000).

³⁰Perin (2013).

³¹Stein, Smith, Henningsen, and Silver (2009); Hiebert et al. (2003).

³²Graham and Perin (2007a, 2007b); Graham and Hebert (2010); National Institute of Child Health and Human Development (2000).

³³National Governors Association Center for Best Practices, Council of Chief State School Officers (2010).

“remedial pedagogy,” characterized by lecture, rote, and procedural learning, positions students primarily as recipients of information.³⁴

CUNY Start, in contrast, intentionally positions students as active learners by having instructors guide the learning process rather than lecture. As advocated in recent K-12 math and language arts standards,³⁵ CUNY Start instructors pose questions that prompt students to explore, explain, and discuss ideas with each other. This approach encourages students to apply the knowledge and skills modeled by instructors, and allows them to develop their own conclusions about the material presented. CUNY Start expects that students will be more engaged than they would be in classrooms with traditional pedagogy, and that they will develop knowledge they can use in future courses, stronger academic identities, and increased commitment to college. Indeed, past research suggests these teaching approaches play an important role in improving students’ achievement, and has found correlations between such engagement and academic success.³⁶

Student Support

Except in specialized programs, students in developmental education courses are not generally required to avail themselves of any specific academic and nonacademic support services, nor are those services integrated with students’ course work.³⁷

In contrast, CUNY Start includes a set of coordinated academic and nonacademic support services. A mandatory college success seminar is designed to help students develop skills and dispositions to help them balance school and life commitments, solve problems, advocate for themselves, and view themselves as learners. The seminar is led by an adviser who also provides one-on-one advising to participating students. CUNY Start typically has student-to-adviser ratios of approximately 75 to 1, substantially smaller than the ratios usually found at community colleges. The relatively small caseload allows CUNY Start advisers to provide more intensive assistance to students with the most needs.³⁸ In addition, advisers regularly meet with math and reading/writing instructors to discuss students’ successes and challenges. As part of this team approach, advisers and instructors meet with individual students mid-semester to discuss their progress. Past experimental evidence indicates that increased advising can modestly improve

³⁴Grubb (2010); Hodara (2011).

³⁵See, for example, National Governors Association Center for Best Practices, Council of Chief State School Officers (2010).

³⁶Zachry Rutschow and Schneider (2011); McClenney, Marti, and Adkins (2012).

³⁷Bailey, Jaggars, and Jenkins (2015).

³⁸Karp (2013).

student outcomes.³⁹ Finally, CUNY Start math tutors and writing assistants provide academic support both inside and outside the classroom.

Instructor Hiring and Training

Typically, community colleges hire developmental education instructors based on their expertise in the subject matter they will be teaching (and of course their academic credentials). These instructors may have little experience working with students who require significant academic and nonacademic support. Even though most have had some pedagogical training, community colleges typically offer limited and optional professional development activities, few of which focus explicitly on instruction. In addition, college instructors are usually given a great deal of autonomy in how they instruct and support students.

In contrast, CUNY Start administrators recruit potential math and reading/writing instructors based on their content *and* pedagogical knowledge and their openness to the CUNY Start instructional approach. Once hired, CUNY Start instructors are expected to spend a paid apprenticeship semester observing and assisting lead instructors before they begin teaching their own classes. After the apprenticeship period, CUNY Start professional development staff members provide continuing training and support. Because CUNY Start is housed in Continuing Education, where instructors typically do not have the same degree of autonomy as college instructors, it can more easily use a standardized curriculum and pedagogical approach, and can require certain types of instructor training. (New CUNY Start advisers are also expected to participate in a semester-long apprenticeship and receive additional training from experienced CUNY Start advisers and professional development staff members.)

A growing body of evidence on faculty development suggests that faculty members are more likely to adopt teaching methods if their professional learning opportunities are embedded in their work and are closely tied to their everyday practice.⁴⁰ These approaches to recruitment and professional development are intended to ensure that CUNY Start students receive support from skilled instructors who understand the program's curriculum and pedagogy and can implement them.

³⁹Scrivener and Weiss (2009).

⁴⁰Bragg and Barnett (2008); Edgecombe, Jaggars, Baker, and Bailey (2013); Bickerstaff and Edgecombe (2012).

Previous Research on CUNY Start’s Effects

Before this evaluation began, CUNY conducted an internal, quasi-experimental analysis to estimate CUNY Start’s effects.⁴¹ The analysis compared the outcomes of students who participated in CUNY Start with the first-semester outcomes of a matched comparison group of students who did not participate in CUNY Start and who had similar measured demographic characteristics and levels of developmental requirements (requirements in math plus requirements in either reading or writing, or both).

The analysis found that among CUNY Start students who required remediation in math, 53 percent reached college-level proficiency in math by the end of the program, compared with 10 percent (within a similar time period) of a comparison group of students who entered CUNY without first participating in CUNY Start. Fifty-seven percent of CUNY Start students who required remediation in reading reached college-level proficiency in reading compared with 33 percent of a comparison group, and 62 percent of CUNY Start students who required remediation in writing reached college-level proficiency in writing compared with 26 percent of a comparison group. Further, once students who completed CUNY Start began degree programs, they attempted and earned more credits than comparison group students. Finally, by their fourth semester, students who completed CUNY Start were more likely to still be in college than the comparison group students.⁴²

This Evaluation

Given the very positive findings from CUNY’s own research on CUNY Start, the program’s substantial enrollment, and its potential for significant growth, CUNY’s leaders wanted to obtain the most accurate evidence possible regarding CUNY Start’s effectiveness. They decided, therefore, to enter into a partnership with MDRC and the Community College Research Center to

⁴¹Quasi-experimental research methods estimate effects without randomly assigning participants to a program group or control group. CUNY’s internal quasi-experimental analyses used a technique called “propensity-score matching.” Such an analysis compares the outcomes of a group of students in a program (in this case, CUNY Start) with a comparison group of students with similar *measured* background characteristics. As in an experiment, the comparison group is intended to represent what would have happened to the program group had they not been in the program. The differences between the two groups are thus an estimate of the effect of the program. In an experiment where students are randomly assigned, the program group and control group are initially expected to be similar even in their *unmeasured* characteristics (for example, grit, motivation, or ability). When propensity-score matching is used, there is a risk that initially the program group and comparison group may not have similar unmeasured characteristics. Consequently, the differences in outcomes between program group and comparison group members found using propensity-score matching may be a result of the program, the result of the unmeasured initial differences between the two groups, or both.

⁴²Allen and Horenstein (2013).

conduct a random assignment evaluation, widely considered the “gold standard” of evaluation design.

Colleges in the Evaluation

The CUNY system consists of 24 institutions, including community colleges, four-year colleges, and freestanding graduate and professional institutions; it serves over a quarter of a million matriculated students each semester.⁴³ In spring 2015, when the study began, CUNY Start was operating on seven CUNY campuses. (At the time this report was written, it was operating on eight.) Of those seven, the CUNY Start evaluation is taking place at four: Borough of Manhattan Community College, Kingsborough Community College, LaGuardia Community College, and Queensborough Community College. These four colleges were chosen because each had operated the program for at least two years, had sufficient program infrastructure to continue operating it, and was willing and able to participate in a random assignment evaluation. These are also the four largest CUNY community colleges by total enrollment.

Borough of Manhattan Community College is located in lower Manhattan. It served about 29,000 students when the study started, including students in credit programs leading to a degree and Continuing Education programs. Kingsborough Community College is located in Brooklyn. It served about 25,000 students at the start of the study. LaGuardia and Queensborough Community Colleges are both located in Queens and served about 36,500 and 19,000 students, respectively, at the start of the study.⁴⁴ At Borough of Manhattan and Queensborough Community Colleges, most students take full-time course loads, whereas about half of Kingsborough and LaGuardia students do. All four colleges offer a wide range of associate’s degree programs that prepare students to transfer to four-year colleges or enter professional careers. As mentioned above, CUNY Start is housed in each college’s Continuing Education division.

Research Questions and Design

The evaluation will answer the following questions:

- What is the effect of the option to participate in CUNY Start on students’ academic outcomes, compared with the colleges’ standard courses and services (including the colleges’ standard developmental education courses)? Do the effects vary among student populations (for example, full-time and part-time students, or students with different degrees of developmental education requirements) and settings (individual colleges)?

⁴³See City University of New York (2018a).

⁴⁴City University of New York Office of Institutional Research and Assessment email to author, January 3, 2018; City University of New York Office of Institutional Research and Assessment (2018).

- How is CUNY Start implemented? To what degree is it implemented with fidelity to the CUNY Start model? To what degree are there differences between the program and the colleges' standard courses and services, including the colleges' standard developmental education courses?
- What are the costs associated with CUNY Start? How do the costs compare with the costs of the standard courses and services, including the colleges' standard developmental education courses? Is CUNY Start cost-effective?

To measure the effects of CUNY Start relative to CUNY's standard courses and services, the evaluation is using a random assignment research design. As is described below, eligible, interested individuals were randomly assigned either to a program group, whose members had the opportunity to participate in CUNY Start, or to a control group, whose members could not participate in CUNY Start but had the opportunity to participate in all of their colleges' standard courses and services. The evaluation is comparing the academic outcomes of the program group and control group over time to determine the effect of CUNY Start. Because assignment to the two groups was random, the two groups were similar at the start of the study.⁴⁵ Therefore, differences between the average future outcomes of program group members and control group members yield an unbiased estimate of the effect of CUNY Start. Both groups of students are being tracked for at least two years to determine CUNY Start's effects on persistence in college, college credit accumulation, and graduation.

The Random Assignment Process and the Sample Members

CUNY Start is available to incoming students whose scores on placement tests in math, reading, and writing show that they require remediation.⁴⁶ CUNY Start's full-time program, which covers math, reading, and writing, is only open to students who are assessed as needing remediation in math and at least one other subject area. CUNY Start's part-time program, which covers math *or* reading and writing, is open to students who are assessed as needing remediation in at least one subject area. Students who are eligible for the full-time program can also choose to participate in the part-time program. Data from CUNY show that about two-thirds of the students who had participated in the part-time program through fall 2016 had had two or three developmental requirements.⁴⁷ Although any student who requires remediation is eligible for CUNY Start

⁴⁵As is described in Appendix A, the program group and control group had similar measured characteristics when they were randomly assigned.

⁴⁶Although CUNY Start targets first-time students, the program admits a small number of students with limited college experience (fewer than 12 credits) — for example, students who have taken and failed developmental courses in the past or students who are continuing their education after having stopped for some time.

⁴⁷City University of New York Office of the Senior University Dean for Academic Affairs (2017).

(and the evaluation), CUNY Start staff members make a priority of recruiting a narrower population of students: incoming students who have been assessed as needing remediation in all three subject areas (sometimes referred to as “triple remedial” students).

For this evaluation, students were randomly assigned in three cohorts, before each of three consecutive semesters: spring 2015, fall 2015, and spring 2016.⁴⁸ Before each of these semesters, CUNY Start staff members at the colleges made contact with eligible students by mail and phone to describe the program and the evaluation. Interested students attended information sessions at the colleges to learn more. Students who agreed to participate in the study signed informed consent forms and participated in one-on-one interviews with CUNY Start staff members to confirm that they were eligible and did not have substantial barriers to participation, such as full-time jobs or extensive family care demands. Then students were randomly assigned to either the program group or the control group (using a secure internet link to a computer program at MDRC).⁴⁹ Roughly four of every five eligible, consenting students were assigned to the program group and roughly one of every five was assigned to the control group. This division maximized the number of students who could participate in CUNY Start while ensuring a large enough control group for analysis purposes.

A total of 3,835 students are in the evaluation sample — 2,997 in the program group and 838 in the control group. Table 1.1 shows the sample size by research group and college (with the college names masked).⁵⁰ It also shows the proportion of sample members who said — just before random assignment — that if they were randomly assigned to the program group they intended to participate in the full-time CUNY Start program and the proportion who said they intended to participate in the part-time program. As the table shows, most sample members intended to participate in the full-time program. (As Chapter 3 discusses, about three-fourths of the program group students participated in their intended CUNY Start program.)⁵¹

⁴⁸Study enrollment began in spring 2015 and includes two spring semesters and one fall semester because of the timing of the grant.

⁴⁹The research design allowed colleges to exempt some students from random assignment; 558 exempted students were admitted directly into CUNY Start and are not part of the research sample. Some students who were exempted from random assignment had previously participated in CUNY Start, some attempted to sign up for CUNY Start after sample enrollment had ended for a given semester, some were admitted on “discretionary” exemptions defined by each college, and some were previously in the CUNY Start part-time program and returning to complete the other subject area.

⁵⁰The college names are masked in the tables in this report because it is not important to link outcomes with specific colleges, even though it can be useful to know whether impacts vary from college to college.

⁵¹As Chapter 3 also discusses, the pre-random assignment intent to participate in the full-time or part-time CUNY Start program did not necessarily correspond to enrolling in college full time or part time among control group members.

Table 1.1
The Evaluation Sample by College and Enrollment Type

College	Program Group	Control Group	Total
All colleges			
Full-time program	1,841	514	2,355
Part-time program	1,156	324	1,480
College A			
Full-time program	519	146	665
Part-time program	391	111	502
College B			
Full-time program	339	101	440
Part-time program	0	0	0
College C			
Full-time program	283	82	365
Part-time program	214	53	267
College D			
Full-time program	700	185	885
Part-time program	551	160	711
Sample size	2,997	838	3,835

SOURCE: MDRC random assignment database.

NOTES: Of the total sample, 38 students withdrew from the study or did not have the correct consent forms, and are not included in analyses or tables in this report. Five hundred and fifty-eight students received "exemptions" and were offered the possibility of participating in CUNY Start without going through the random assignment process; these students are also excluded from analyses and tables.

The college names are masked in the tables in this report because it is not important to link outcomes with specific colleges, even though it can be useful to know whether impacts vary from college to college.

Students assigned to the program group were immediately provided a checklist of the steps they needed to complete to sign up for CUNY Start, which typically included registering for CUNY Start and making the \$75 payment. Students assigned to the control group were directed to someone at the college who could provide information about the different courses and programs available and information about how to register. Control group students could take their

colleges' regular developmental education and other courses and could participate in special programs for which they were eligible. On a survey administered during sample members' first semester in the study, most control group members (more than two-thirds) reported that they did not participate in any special programs.⁵²

Table 1.2 presents some baseline characteristics of the evaluation sample, drawn primarily from the CUNY Start application that students completed just before random assignment. Over half of the sample members are women and just under half were 19 years old or younger when they entered the study. The sample is racially diverse and a substantial proportion reported that their native language was not English. Over three-fourths of the sample members reported that they lived with their parents and few reported that they had any children. Just over one-third said they were the first in their family to attend college. Virtually all of the sample members reported that they intended to earn at least an associate's degree, and most planned to earn a bachelor's degree or higher. Appendix Table A.1 presents more information on sample members' baseline characteristics.⁵³

Compared with all first-time students entering the four colleges in the study in the fall 2015 semester, a higher proportion of students in the research sample are 19 or younger. This disparity probably reflects the fact that many in the research sample are recent high school graduates. Also, compared with all first-time students at the study colleges, a smaller proportion of students in the research sample identified themselves as white or Asian/Pacific Islander.⁵⁴ At

⁵²Among control group members who said they were in special programs, the most common were ASAP, which is described in footnote 14 of this chapter; College Discovery, which provides academic support to students whose educational or financial circumstances might otherwise prevent them from attending college; the CUNY Language Immersion Program, in which English as a Second Language students receive English language instruction in context in specific content areas such as American history or environmental studies; learning communities, in which students enroll together in clusters of courses, and course readings and topics are linked by common themes; and immersion, in which students receive free intensive instruction to build their math, reading, or writing skills during the summer or between terms. All incoming students at Queensborough Community College participate in one of five "Academies," organized by major, that provide advising and learning activities such as collaborative projects and undergraduate research opportunities. Because all incoming students participate in Academies, they were not considered a "special program" on the student survey.

⁵³Most sample members completed the CUNY Start application before random assignment. Fourteen percent of sample members, however, completed the application after random assignment. These sample members are included in the measures in Table 1.2 to provide descriptive information about the full research sample. Students who did not answer particular questions or who never completed applications are excluded from the calculations shown in Table 1.2. In contrast, Appendix Table A.1 includes all sample members in the calculations but excludes data drawn from applications that were completed after random assignment. As a result, the two tables present somewhat different numbers.

⁵⁴Statistics for first-time students at CUNY's community colleges in the fall 2015 semester are from the Integrated Postsecondary Education Data System.

Table 1.2
Baseline Characteristics of the Evaluation Sample

Characteristic	Percentage of the Full Sample
Female	56.2
Age	
19 or younger	47.8
20 to 23	30.1
24 or older	22.1
Race/ethnicity ^a	
Hispanic	43.7
White	6.9
Black	31.6
Asian or Pacific Islander	10.2
Other ^b	7.6
Native language	
English	56.3
Spanish	21.6
Other	22.1
Lives with parents	77.6
Has one or more children under the age of 18	11.4
Is currently employed	49.1
Is the first person in the family to attend college	34.6
Developmental subject areas required	
Zero (fully college-ready)	0.2
One	15.2
Two	33.4
Three	51.2

(continued)

Table 1.2 (continued)

Characteristic	Percentage of the Full Sample
Highest level of education student hopes to achieve	
Some college (without degree)	0.5
Associate's degree	13.5
Bachelor's degree	59.0
Postgraduate or professional degree	27.1
Sample size	3,835

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

NOTES: The overall sample size shown is for the full research sample, but different measures may have different sample sizes. Data on age and developmental subjects needed are available for the full sample. Missing data rates for other measures range from 14.5 percent to 23.0 percent. For full details see Appendix Table A.1.

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 ($p = 0.885$).

^aRespondents 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 racial category are included in the Other category.

^bOther includes "multiracial," "Native American/Alaskan Native," and other racial/ethnic categories.

CUNY, white and Asian students are approximately half as likely to be assigned to developmental education as are black and Hispanic students.⁵⁵

Table 1.2 also shows in how many subject areas sample members required remediation when they entered the study. Based on their scores on placement tests, the vast majority of the research sample required remediation in multiple subject areas: 51 percent required remediation in math, reading, and writing, and 33 percent required remediation in two of the three subject areas. Reflecting CUNY Start's target population, the proportion of sample members assessed as having multiple developmental education requirements is much higher than the proportion in the incoming student population at the four study colleges. Only 15 percent of first-time freshmen in fall 2015 at the four study colleges were assessed as needing remediation in math, reading, and

⁵⁵CUNY Task Force on Developmental Education (2016).

writing, and 21 percent were assessed as needing remediation in two subject areas (not shown in the table).

Within the research sample, sample members who intended to participate in CUNY Start's full-time program required remediation in more subject areas than those who intended to participate in the part-time program (not shown in the table). Among sample members who intended to participate in the full-time program, about two-thirds required remediation in three subject areas and one-third required remediation in two subject areas. Among those who intended to participate in the part-time program, roughly one-third required remediation in three subject areas, one-third required remediation in two, and one-third required remediation in one.

The research team also examined how far behind "college level" sample members were when they entered the study, as indicated by their scores on the placement tests. Sample members who were assessed as needing remediation in math had very low test scores; the vast majority had test scores far below the cutoff used to determine readiness for college-level math.⁵⁶ Compared with the broader student population who required remediation at the four study colleges, sample members were about twice as likely to have very low math scores. In reading and writing, on the other hand, roughly half of the sample members who were assessed as needing remediation scored near those cutoffs.⁵⁷ These proportions are similar to the proportions among the broader population of incoming students at the four colleges who required remediation in reading or writing.

Data Sources

The analyses in this report rely on multiple data sources. The data on sample members' characteristics, described above, were collected using the CUNY Start application. The implementation research discussed in Chapter 2, draws from a range of qualitative and quantitative data sources: interviews and focus groups, classroom observations, observations of CUNY Start professional development sessions, CUNY Start's written descriptions of its curricula and other documents, course syllabi, a student survey, and an instructor survey. The impact analysis, described in Chapter 3, relies on CUNY student transcript data and test data. See Appendix B for a description of all the data sources.

⁵⁶Only 9 percent of the sample members who were assessed as needing remediation in math scored within 10 points of the college-ready score of 40. Fifty-four percent scored only 15 to 19, the lowest observed scores on the test.

⁵⁷Forty-three percent of the sample members who were assessed as needing remediation in reading scored within 10 points of the cutoff, and 53 percent of the sample members assessed as needing remediation in writing scored within 8 points of the cutoff.

The Rest of This Report

The remainder of this report presents findings from the evaluation and some preliminary conclusions. Chapter 2 discusses how the colleges in the study implemented CUNY Start and the extent to which they implemented the program with fidelity to the model. It also highlights important differences between the experiences of program group members and the experiences of control group members — the service contrast. Chapter 3 discusses the early impact findings, including CUNY Start’s effects on progress through developmental education and earning college-level credits in the first semester after random assignment, its effects on enrolling at a CUNY college in the second semester, and its effects among certain subgroups of students. Chapter 4 provides some conclusions based on the implementation and early impact findings.

Chapter 2

Implementation Findings

As described in Chapter 1, the CUNY Start model is intended to prepare students for college-level courses within a single semester, and it differs substantially from typical developmental education programs. Whereas typical developmental education courses run between 3 and 6 hours a week, full-time students attend CUNY Start for up to 26.5 hours a week — approximately 12 hours for math, 12 for an integrated reading and writing class, and 1.25 to 1.5 for a college success seminar. In addition to its unique structure and time intensity, the CUNY Start model offers a different experience for both students and staff members with its distinct curricula and pedagogical practices, comprehensive student support, and robust staff recruitment and training. This chapter examines whether these elements of the CUNY Start model were delivered as intended during the study period and compares them with what students and staff members experienced in standard developmental course offerings and services.¹

CUNY Start’s curricula stress conceptual understanding through activities that emphasize real-world learning, academic skill building, and mastery in the disciplinary content areas. Both reading/writing and math use instructional approaches that shift responsibility for teaching and learning from the instructor to the student, although exactly what that means in practice is a little different in reading/writing than it is in math. In addition to preparing students for college academically, CUNY Start aims to build their confidence and general college know-how through individual advising, a college success seminar, tutoring, and in-class academic assistance. The program’s staffing strategy allows CUNY Start to hire instructors and advisers who are open to the program’s distinct instructional and advising approach, and then gives them training and support to help them implement that approach. In all these ways, CUNY Start seeks to build students’ foundational knowledge and conceptual understanding in math, reading, and writing and help them acquire the academic habits and confidence needed to persevere in college.

The implementation research was designed to measure *fidelity* to the program design (or the extent to which CUNY Start’s offered services matched what was planned) and to measure *service contrast* (or the difference between the services experienced by the program group and control group) — both of which can potentially determine the program’s measurable effects. The implementation analysis draws on 134 interviews and focus groups with instructors, CUNY Central Office staff members, advisers, and students in both the CUNY Start (program) and non-CUNY Start (control) conditions. Complementing these data are 46 observations of CUNY Start classrooms and non-CUNY Start developmental math, reading, and writing classrooms; student

¹The evaluation compares CUNY Start with other courses and services available at the colleges, including standard developmental education and several reformed courses at some of the colleges.

and instructor survey responses; and a review of curricular documents from CUNY Start and non-CUNY Start courses. (See Appendix C for a complete discussion of the implementation research methods.)

Summary of Findings and Organization of This Chapter

The implementation research found that the CUNY Start model was implemented as intended across the four colleges and that the experiences of CUNY Start students were different from those of non-CUNY Start students. Main findings include the following:

- CUNY Start math instructors mostly followed the teaching methods they were expected to use.
- The CUNY Start math curriculum's focus on concepts distinguishes it from the usual developmental math courses, as does its focus on study skills.
- Teaching methods in CUNY Start and non-CUNY Start math courses were starkly different. Non-CUNY Start instructors were more likely to rely on lecturing.
- CUNY Start reading/writing instructors implemented the program's teaching techniques as intended.
- The integrated nature of the CUNY Start reading/writing curriculum distinguishes the course from the usual developmental reading and writing courses, as does the use of writing exercises that position students as apprentices learning to be proficient readers and writers.
- In some instances, the instruction in non-CUNY Start reading and writing courses appeared similar to the instruction in CUNY Start reading/writing classes, particularly when it came to student-led discussions.
- CUNY Start students experienced the multipronged student support model to varying degrees; however, non-CUNY Start students received less support overall.
- The vast majority of CUNY Start instructors participated in CUNY Start's training and continuing professional development, which proved distinct from what was offered to non-CUNY Start developmental faculty members. Most notably, non-CUNY Start instructors were far less likely to participate in an apprenticeship before teaching a course for the first time.

Table 2.1 summarizes the service contrast between CUNY Start and non-CUNY Start.

The following sections describe the program's instructional approaches (its curriculum and pedagogy) in math and reading/writing, the student support it offers, and its staffing and training components. They also describe whether these parts of the model were implemented as intended and the differences between CUNY Start and non-CUNY Start services.

Instructional Approach to Math

The CUNY Start math class teaches arithmetic and elementary algebra skills in one semester to help students prepare for college-level work more quickly than they could in a typical developmental sequence of classes. It aims to help students develop a deep understanding of mathematical concepts, and the academic skills they will need for college success. The curriculum advances toward these goals by using real-world examples and word problems that foreground fundamental mathematical concepts and numeracy skills without relying on formulas and memorization. To further build students' academic skills, the class includes directions for taking notes and has instructors review these notes. It relies primarily on "student-centered" instruction: Instructors promote meaningful student discussion and engagement with the material, and frequently ask specific, open-ended questions to stimulate student discussion. Implementation research found that CUNY Start instructors employed the curriculum and pedagogy as expected, and that the CUNY Start instructional approach differs substantially from non-CUNY Start developmental math course offerings.

Curriculum

The CUNY Start math curriculum consists of 47 prescribed lessons in Phase I that incorporate arithmetic, functions, and elementary algebra. During this phase, instructors are expected to adhere to the curriculum strictly, teaching the same activities and materials in the same sequence, with the same approaches to topics. The curriculum includes explicit guidance for instructors, and worksheets and extra practice problems for students to complete in class and for homework.

The curriculum often uses examples related to finance to illustrate concepts that can otherwise seem abstract. In one assignment designed to reinforce students' understanding of positive and negative numbers, for example, instructors ask students to figure out how much change they would receive if they had \$10 and owed a clerk \$7. This assignment is one component of a more involved unit where financial examples are used to help students make use of their everyday understanding of concepts that can otherwise seem abstract. In addition to providing problems like these designed to improve conceptual understanding, the curriculum also includes assignments

Table 2.1
Summary of Service Contrast

Component	CUNY Start	Non-CUNY Start
<u>College-level course enrollment</u>	Students cannot take college-level courses while participating in the program	Students can take college-level courses while enrolled in developmental education
<u>Developmental math instructional approach</u>		
Time in class	12 hours per week	3-6 hours per week
Curriculum	Integrated arithmetic and algebra; 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	Some student-centered instruction; mostly lecture-based techniques
<u>Developmental reading/writing instructional approach</u>		
Time in class	12 hours per week	3-6 hours per week
Curriculum	Integrated reading/writing; nonfiction articles or essays and short stories; metacognitive logs and discussion journals	Reading and writing content are not integrated at three of the four colleges; full-length works of fiction and textbooks on reading comprehension, grammar, or rhetoric; and upper-level developmental writing assignments include a research synthesis paper
Pedagogy	Mostly student-centered instruction	Mostly student-centered instruction
<u>Student support</u>		
Success seminar	Mandatory; taught by adviser	Not mandatory for many students; taught by an instructor
Individual advising	Student-to-adviser ratio 75:1; advising embedded in the program; focuses on academic and nonacademic topics and challenges; most surveyed students had at least one one-on-one advising session in the past semester	Student-to-adviser ratio approximately 600:1; advising offered by colleges; focuses on course registration; many surveyed students reported meeting with an adviser at least once in the past semester
Academic resources	Almost half of students received any tutoring; of those, 75 percent received math tutoring	About a third of students received any tutoring; of those, 43 percent received math tutoring

(continued)

Table 2.1 (continued)

<u>Staffing and training</u>		
Staff recruitment	Most instructors had master's degrees; 7 years of teaching experience, on average, 3 of which were at the college level	Most instructors had master's degrees, but were also more likely than CUNY Start instructors to have doctorates; 20 years of teaching experience, on average, 13 of which were at the college level
New instructor training	89 percent of surveyed instructors participated in a semester-long apprenticeship	Most interviewed instructors did not participate in training before teaching a course for the first time
Continuing instructor training	Surveyed instructors reported participating in professional development offerings during the semester and received extensive comments on their instruction	Surveyed instructors reported participating in professional development during the semester

SOURCE: Community College Research Center field research data; MDRC calculations using data from the instructor and student surveys.

meant to develop students' study skills. Instead of using a textbook, students receive an empty binder during orientation, which they are required to fill with notes taken in class and course handouts. Instructors collect and review the binders before each test and comment on students' organization and note taking, and on whether students corrected mistakes on assignments.

Classroom observations and survey data show that CUNY Start math instructors implemented the curriculum as directed, teaching the content at the prescribed pace and using the assignments and assessments provided. In interviews, instructors reacted positively to the curriculum and said they rarely deviated from it. When asked about their experiences with the curriculum, most CUNY Start instructors supported the curriculum's focus on concepts and noted that they adhered closely to its materials. When they did deviate, it tended to be by moving through the material faster or slower than prescribed. Several instructors said it could be difficult to cover all the material in the allotted time. Others reported adjusting the rate at which they moved through some activities or topics depending on students' understanding of the material.

Survey responses indicate that most CUNY Start math instructors used real-world problems. Eighty-three percent of instructors said they incorporated real-world examples when introducing content, and 76 percent of program group student survey respondents who said they attended a math class reported that their instructor used such examples (see Tables 2.2 and 2.3).²

²See Box 2.1 for an explanation of how to read these tables.

Table 2.2
Math Curriculum and Pedagogy
Instructor Survey Results

Measure (%)	Sample Size	CUNY Start	Non-CUNY Start	Difference
<i>When introducing content, instructor often or always uses examples from the real world</i>	119	83.3	71.9	11.4
<i>When asking students to practice or apply new content, instructor often or always</i>				
<i>Applies mathematical concepts to real-world problems</i>	120	53.3	54.4	-1.1
<i>Asks students to explain out loud how they solved problems</i>	120	96.7	64.4	32.2
<i>Asks students to discuss ideas and answers with fellow students</i>	121	96.7	63.7	32.9
Sample size (total = 186)		34	152	

SOURCE: MDRC calculations using data from the instructor survey.

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

Italic type indicates nonexperimental data. Significance tests are generally not calculated for nonexperimental data.

Seventy-two percent of program group student survey respondents also reported applying mathematical concepts to real-world problems when practicing or applying new concepts (see Table 2.3).

The curriculum differed substantially from that used in non-CUNY Start developmental math courses in several ways. First, non-CUNY Start courses were less likely to incorporate real-world problems; only 72 percent of instructors and 46 percent of students in non-CUNY Start courses reported using them. Second, the curriculum in non-CUNY Start developmental math courses was less standardized within and across colleges. Non-CUNY Start instructors typically followed a department-wide syllabus and used a recommended textbook; however, many included supplemental or alternative materials and revised the curriculum from semester to semester based on students' responses and performance. Third, non-CUNY Start math courses were more likely to

Table 2.3
Math Curriculum and Pedagogy
Student Survey Results

Measure (%)	Sample Size	Program Group	Control Group	Difference	P-Value
Attended any math class	2,098	76.2	58.1	18.2 ***	<0.001
<i>Among those who attended a math class</i>					
<i>When introducing content the instructor often or always</i>					
<i>Uses examples from the real world</i>	1,485	76.0	52.8	23.2	
<i>Encourages student-led discussion</i>	1,483	87.1	64.2	22.9	
<i>When asked to practice or apply new concepts, student often or always</i>					
<i>Applies mathematical concepts to real-world problems</i>	1,481	71.6	46.4	25.2	
<i>Explains his or her reasoning or thinking in solving a problem orally or in writing</i>	1,485	84.1	60.2	23.9	
<i>Works in groups of two or more to practice mathematical concepts</i>	1,483	71.9	33.3	38.6	
<i>Discusses mathematical concepts or procedures with other students in groups of two or more</i>	1,484	73.3	33.9	39.4	
Sample size (total = 2,098)		1,480	618		

SOURCE: MDRC calculations using data from the student survey.

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 and survey sample selection.

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

Italic type indicates nonexperimental data. Significance tests are generally not calculated for nonexperimental data.

Box 2.1

How to Read the Survey Tables in This Report

Two types of surveys are discussed in this report — one that was given to students in the study and one that was given to instructors. The tables showing their findings appear in this chapter.

The **student survey** was given to nearly all control group members and to a random sample of program group members. The student survey tables use the format excerpted below. The first row shows that 2,098 students responded to the question about attending math class. Because both the program and control groups had a high and nearly identical overall response rate, the student survey results that include all survey respondents can be treated as true experimental findings from a randomized controlled trial. Differences in responses between program and control group members can be considered an estimate of the effect of the program.

For example, as shown in the first row of the table excerpt below, the rates of attending a math class were different in the program and control groups by 18.2 percentage points, which means that CUNY Start caused an estimated 18.2 percentage points more students to attend a math class compared with the attendance rate had they not been offered CUNY Start. That difference is the estimated *effect* of CUNY Start. It is *estimated* rather than *true* because it is not knowable what would have happened in the absence of CUNY Start. The control group is an excellent proxy for what would have happened, but uncertainty remains.

Estimated effects marked with one or more asterisks are *statistically significant*. The number of asterisks corresponds with the p-value, which indicates the likelihood that an estimated effect at least as large as the one observed would have occurred by chance, if the true effect were zero (that is, if there were no true effect). One asterisk corresponds to a probability of 10 percent or less; two asterisks, 5 percent or less; three asterisks, 1 percent or less. In other words, asterisks (and thus statistical significance) indicate that it is likely that CUNY Start had an effect (positive or negative) on that outcome.

The question in the second row was answered by 1,485 survey respondents — a subset of respondents who said they attended a math class. The italics indicate that these findings are non-experimental. Although random assignment ensures that the *entire* program group and the *entire* control group were similar at the outset of the study, it is possible that the *subset* of math class attendees in the program group were systematically different from the *subset* of math class attendees in the control group. Consequently, differences in their outcomes may be caused by the program or they may be caused by differences in the types of students who responded to this question. Nonexperimental findings present and contrast math class attendees' descriptions of what happened, but the differences they reveal cannot necessarily be attributed to the program.

In this case, among program group survey respondents who attended a math class, 76.0 percent reported that their math instructors often or always used examples from the real world, compared with 52.8 percent among control group survey respondents, a 23.2 percentage point difference.

(continued)

Box 2.1 (continued)

Student Survey Responses, All Respondents and a Subset of Respondents

Measure (%)	Sample Size	Program Group	Control Group	Difference	P-value
Attended any math class	2,098	76.2	58.1	18.2	*** < 0.001
<i>Among those who attended a math class</i>					
<i>When introducing content the instructor often or always: Uses examples from the real world</i>	1,485	76.0	52.8	23.2	
Sample size (total = 2,098)		1,480	618		

The **instructor survey** was given to all CUNY Start instructors and a random sample of non-CUNY Start developmental math, reading, and writing instructors. Unlike the student survey, the instructor survey had a low response rate among the non-CUNY Start instructors, which means that the non-CUNY Start instructor survey results must be interpreted cautiously. It is quite possible that non-CUNY Start instructor survey respondents do not represent all non-CUNY Start instructors.

introduce arithmetic and algebraic concepts sequentially rather than integrating them. For example, in one non-CUNY Start developmental math class, the first 10 weeks of the semester were devoted to performing operations with fractions, decimals, and percentages — teaching arithmetic as a discrete topic. At three of the four colleges, arithmetic was taught in a separate developmental math course. Finally, note taking and other academic skill-building activities were present but less prevalent in non-CUNY Start math curricula and performance requirements.

Pedagogy

CUNY Start’s teaching methods are designed to give students a deep understanding of math concepts through *student-centered instruction* and *questioning*. Student-centered instruction requires instructors to limit their use of lectures and instead promote student discussion. Students are positioned as active participants in their own learning, given time to think and struggle, and encouraged to speak and respond to each other. Questioning is one technique used to enact a student-centered pedagogy; it requires the instructors to ask specific open-ended questions and pose well-conceived problems to stimulate student discussion and thinking. The questioning technique is a way to help students arrive at the correct answer while building their conceptual understanding, and it also gives students the opportunity to respond to each other and identify misunderstandings. This approach depends on the instructor’s ability to be nimble, because it relies on extemporaneous responses and varied questions.

In the four CUNY Start programs in the study, math instructors mostly used the teaching methods as expected. Instructor interviews and classroom observations revealed that many instructors implemented student-centered instruction by asking students to discuss and explain their ideas and answers, both in response to the instructor’s questions and with their peers. According to one CUNY Start math instructor, “The CUNY Start approach is student-centered: The students are the ones doing all the talking. It is not lecture-based. Instead of demonstrating or telling them what to do, we ask questions to make them discover what they need to know.” Instructors were also observed asking questions that encouraged students to think about underlying math concepts and justify their answers.

In a few instances, math instructors said they had run into trouble with CUNY Start’s pedagogy. In particular, instructors reported that it could be challenging to continue using the questioning technique when students reacted negatively to it — for example, when students seemed frustrated by the questions. Several instructors also noted that because the pedagogy relies on student participation, it is important to have classes of the right size. One instructor explained that when a class includes only a few students, it can be difficult to generate robust discussion; however, when a class is too large, discussion can become unmanageable.

CUNY Start instructors appeared to use student-centered instruction and questioning more than non-CUNY Start instructors did. In interviews, most non-CUNY Start instructors did not mention employing student-centered instruction. Instructor surveys found the same thing (see Table 2.4): 97 percent of CUNY Start math instructors reported that they asked students to explain their thinking and to discuss ideas and answers with fellow students, compared with 64 percent of non-CUNY Start math instructors. Time series data collected during classroom observations also suggest that CUNY Start instructors spent more of their class time engaged in interactive discussion rather than lecturing.³ In the classes observed, CUNY Start instructors spent 68 percent of class time leading discussions or facilitating interactive learning and 2 percent of class time lecturing. Non-CUNY Start instructors spent 18 percent of class time leading discussions or facilitating interactive learning and 62 percent of class time lecturing. Table 2.4 summarizes the time series data.

On the student survey, control group students also reported less use of student-centered techniques than program group students. Program group survey respondents were more likely to say that when they were asked to practice or apply new concepts, they often or always explained their thinking, discussed math concepts with other students in groups, and worked in pairs or groups to practice math concepts. A higher percentage of program group survey respondents also reported that classes often or always included student-led discussion (see Table 2.3).

³Time series data were collected using a structured protocol to record course format, pedagogical approaches, curricular components, and student engagement at five-minute intervals.

Table 2.4

Math Observation Time Series Pedagogical Breakdown

Measure (%)	CUNY Start	Non-CUNY Start
Instructor initiates individual work	13.5	2.9
Instructor initiates small-group work	0.0	0.0
Instructor leads interactive discussion	49.7	18.3
Instructor leads lecture	2.2	61.5
Instructor provides support to individuals	9.4	11.5
Instructor provides support to small group	0.3	1.0
Instructor facilitates interactive learning	17.9	0.0
Students present prepared work	0.0	4.8
Other	6.9	0.0
Sample size (total = 23)	15	8

SOURCE: Community College Research Center field research data.

Instructional Approach to Reading/Writing

Non-CUNY Start developmental education has historically offered separate reading and writing courses. CUNY Start integrates the subjects into one class that meets 12 hours per week to reinforce the relationship between the two and allow students to move more quickly through their developmental requirements. The reading/writing instructional approach, based on the *cognitive apprenticeship model*,⁴ is designed to have students “apprentice” as proficient readers and writers; the instructor helps students tap into the ways of thinking and techniques of expert readers and writers. The curriculum engages students in reading and writing using culturally relevant texts, metacognitive logs, and discussion journals (described below). The pedagogy relies on modeling and coaching strategies to encourage students to employ the techniques and thought processes of proficient writers and readers in their work. Implementation research found that CUNY Start instructors employed the reading/writing curriculum and pedagogy as expected, and that the CUNY Start curriculum is somewhat different from that of non-CUNY Start developmental education courses, while the pedagogy is relatively similar.

⁴Collins, Brown, and Newman (1987).

Curriculum

The CUNY Start curriculum integrates reading and writing practices through as many as 34 lessons designed to prepare students for college-level literacy tasks.⁵ The curriculum specifies a set of readings and accompanying materials designed to help students identify important ideas, analyze texts, paraphrase authors' points of view, and respond with their thoughts. To engage students as readers, the curriculum uses a range of culturally relevant texts, including nonfiction articles and essays in the beginning of the semester, and literature, particularly short stories and fiction, later in the semester. The curriculum gives instructors some choice and flexibility regarding which texts to teach by including a packet of materials (readings, activities, and assignments) that can be used in place of the main lesson or in addition to it.

To develop expert readers and writers, the curriculum relies on two types of writing exercises: *metacognitive logs* and *discussion journals*. Metacognitive logs are used to help students process what they read and formalize the way they interpret and respond to texts. Metacognition is the practice of thinking about one's thinking; by engaging in metacognition, students can identify their thought processes and practices in service of becoming more effective readers and writers. For instance, one metacognitive worksheet asked students to explain their reading thought processes and how those processes influenced their reading experiences. Discussion journals are also frequently used in CUNY Start reading/writing classes to give students practice reading, synthesizing, and responding to texts. The curriculum provides instructors with writing prompts for the discussion journals; these prompts typically ask students to elaborate on or support their answers at home or in class. For example, one prompt reads: "Describe the three main characters using adjectives. For each character, you must support your description with at least three pieces of evidence and analyze each piece of evidence (9 quotations total)." Instructors use the discussion journals as the basis for in-class discussion of the text. In addition to these writing activities, the curriculum includes opportunities for students to complete short analysis papers that compare multiple texts.

CUNY Start instructors implemented the reading/writing curriculum as intended. On the student survey, most program group students said that they often or always read books, short stories, or articles in class; practiced finding the main idea and supporting details in a reading; and

⁵The CUNY Start reading/writing curriculum provides a "scaffolded" approach to preparing students for college-level literacy tasks, meaning that students are coached as they practice and internalize new strategies, taking on more and more responsibility for those strategies as the semester progresses. During the study, CUNY Start implemented a curriculum called "Psychology and Literature" in addition to the regular content. Including this curriculum, the total number of CUNY Start reading/writing lessons ranges from 25 to 34.

drafted and revised essays in class (see Table 2.5).⁶ Instructors reported during interviews that the curriculum engaged students in the reading and writing process through culturally relevant readings such as *The Narrative of the Life of Frederick Douglass* and *The Immortal Life of Henrietta Lacks*. When they diverged from the official CUNY Start curriculum, instructors said they did so intentionally, by choosing assignments to supplement the main instructional activities.

The CUNY Start reading/writing curriculum was similar in some ways to non-CUNY Start developmental reading and writing course curricula, and was notably different in others. The CUNY Start and non-CUNY Start curricula had similar learning objectives (including learning to write academic essays and reading fiction and nonfiction texts) and both targeted particular competencies, such as annotation of class texts; vocabulary development; and summarizing, analyzing, and responding to texts. Unlike in CUNY Start, however, reading and writing are offered as separate courses in three of the four colleges' non-CUNY Start developmental offerings. The types of texts and activities used to build students' skills also differed. The curricular analysis shows that non-CUNY Start texts tended to be longer than CUNY Start texts, and non-CUNY Start classes used a wider range of texts, including *New York Times* articles; full-length works of contemporary and classic fiction; full-length works of nonfiction; short readings drawn from journalism, psychology, and sociology; and textbooks focused on reading comprehension, grammar, or rhetoric. Moreover, while CUNY Start explicitly teaches metacognition through metacognitive logs, comparable assignments were not commonly used in non-CUNY Start classes. Finally, the writing assignments in CUNY Start and non-CUNY Start classes were slightly different. Non-CUNY Start developmental English courses that served students deemed close to being college-ready required each student to write a research synthesis in addition to the reading response papers that both CUNY Start and non-CUNY Start classes required. The CUNY Start curriculum does not include research papers as part of its academic assignments but rather includes a final analysis paper that asks students to synthesize material from assigned texts.

⁶On the survey, students were asked if they were enrolled in any English class, which could have included CUNY Start reading/writing, a standard (non-CUNY Start) developmental reading or writing class, or college-level English. Student transcript data show that among the students who reported taking an English class, 7 percent were enrolled in a college-level English class that was not a "corequisite" remediation course (that is, a course that combined developmental education and college-level material). Furthermore, according to transcript data, 13 percent of control group survey respondents who reported taking an English class were enrolled in college-level English classes (that were not corequisite remediation courses), compared with 5 percent of program group respondents who reported taking an English class. Student responses (and particularly control group student responses) to the reading/writing portions of the survey therefore represent a mix of different types of English remediation courses and programs and college-level English courses.

Table 2.5
Reading/Writing Curriculum and Pedagogy
Student Survey Results

Measure (%)	Sample Size	Program Group	Control Group	Difference	P-Value
Attended any reading, writing, academic literacy, English, or English language arts class	2,098	72.6	81.1	-8.5 ***	<0.001
<i>Among those who attended a reading/writing class</i>					
<i>Student often or always</i>					
<i>Reads books, short stories, or articles in class</i>	1,574	91.1	81.1	9.9	
<i>Practices finding the main idea and supporting details in reading</i>	1,572	93.6	87.3	6.3	
<i>Drafts essays in class</i>	1,569	80.3	62.8	17.5	
<i>Works on essay revisions in class</i>	1,574	78.7	63.7	15.0	
<i>Practices using information from readings in essays</i>	1,574	88.0	73.7	14.3	
<i>Student felt moderately or very comfortable</i>					
<i>Asking questions in class</i>	1,574	83.6	78.4	5.2	
<i>Responding to questions even when unsure of the answer</i>	1,573	76.2	75.0	1.2	
<i>Responding to other students' comments or questions in class</i>	1,574	79.2	71.7	7.6	
Sample size (total = 2,098)		1,480	618		

SOURCE: MDRC calculations using data from the student survey.

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 and survey sample selection.

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

Italic type indicates nonexperimental data. Significance tests are generally not calculated for nonexperimental data.

Pedagogy

Like CUNY Start math, CUNY Start's reading/writing course uses student-centered teaching methods. It relies on techniques such as *modeling* and *coaching*, both of which position students as apprentices learning the habits and processes of expert readers and writers. Modeling requires teachers to think aloud to show students the processes used by proficient readers and writers, such as identifying evidence to support a claim or theme, identifying the author's point of view, interpreting a text, or talking about how specific parts of a story are connected to others. This technique can be used with the whole class, with small groups, or with individual students. Coaching requires instructors to offer responses, questions, and examples that direct students back to a text or writing exercise to deepen their understanding. As is the case in math, reading/writing instructors are expected to ask questions that uncover students' understanding or misunderstanding rather than giving them the correct response.

CUNY Start reading/writing instructors implemented these pedagogical techniques as intended. They modeled features of the writing process for students using a variety of techniques, for example, demonstrating writing strategies by using a document reader to draft along with students.⁷ Instructors also followed the coaching technique. In interviews, most CUNY Start instructors said that they encouraged students to refer to the text when they had a question or wanted to justify an answer.

CUNY Start and non-CUNY Start reading/writing classes had similar pedagogical approaches. Many non-CUNY Start instructors described teaching practices similar to those used by CUNY Start instructors, such as having students work in small groups to discuss texts. Instructor survey responses show that about the same proportions of non-CUNY Start instructors and CUNY Start instructors led interactive discussions (see Table 2.6). Program and control group survey respondents reported similar levels of comfort asking and responding to questions in class, and responding to other students' questions and comments (see Table 2.5). Classroom observation data suggest slight differences in the use of class time, however. They show that CUNY Start instructors spent more time leading discussion, initiating individual work, or providing support to individuals. It is more difficult to draw generalizations from observations of non-CUNY Start classes, since most were reading only and writing only (see Table 2.7).⁸ Across this mix of non-CUNY Start classes, instructors lectured more often and, for the most part, initiated individual work and provided support to individuals less frequently.

⁷A document reader is an electronic device that allows instructors to write notes on a document while projecting it before the class.

⁸One of the non-CUNY Start classes that was observed combined reading and writing. It is included as a data source for this chapter. However, no time-series data were collected during this observation, so the class is not included in Table 2.7.

Table 2.6
Reading/Writing Pedagogy
Instructor Survey Results

Measure (%)	Sample Size	CUNY Start	Non-CUNY Start	Difference
<i>When introducing content, instructor often or always</i>				
<i>Asks students to work collaboratively on activities</i> <i>or assignments during class</i>	96	92.6	72.5	20.1
<i>Facilitates interactive discussion</i>	97	96.3	97.1	-0.8
Sample size (total = 156)		32	124	

SOURCE: MDRC calculations using data from the instructor survey.

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

Italic type indicates nonexperimental data. Significance tests are generally not calculated for nonexperimental data.

Table 2.7
Reading/Writing Observation Time Series Pedagogical Breakdown

Measure (%)	CUNY Start		Non-CUNY Start	
	Reading/ Writing	Writing	Reading	Writing
Instructor initiates individual work	18.3	7.3	8.7	
Instructor initiates small-group work	7.6	7.3	13.0	
Instructor leads interactive discussion	35.7	14.6	31.3	
Instructor leads lecture	3.8	19.5	23.5	
Instructor provides support to individuals	14.8	2.4	2.6	
Instructor provides support to small groups	6.5	0.0	17.4	
Instructor facilitates interactive learning	5.7	48.8	0.0	
Students present prepared work	1.9	0.0	0.0	
Other	5.7	0.0	3.5	
Sample size (total = 21)		12	3	6

SOURCE: Community College Research Center field research data.

Student Support

CUNY Start offers three main types of student support: a college success seminar, individual advising, and tutoring. To help them develop peer relationships, CUNY Start students also take their academic classes in a cohort that is supported by an assigned adviser who leads their weekly college success seminar. These components of the CUNY Start student support model were implemented as intended and were distinct from the forms of support available to non-CUNY Start students.

College Success Seminar

All CUNY Start students are required take a college success seminar with their cohort, led by their assigned adviser, for 1.25 to 2.5 hours per week. The seminar aims to acquaint students with college resources and help them develop the skills and dispositions to balance school and life commitments, solve problems, advocate for themselves, and view themselves as learners. Classroom observation data indicate that across colleges, CUNY Start seminar classes addressed similar concepts, such as researching and selecting a major and applying for financial aid.

Program group survey respondents were more likely than control group respondents to say they had participated in a college success seminar (78 percent compared with 29 percent), and they rated the quality of the seminar higher than did control group survey respondents who took such a seminar, as shown in Table 2.8. In general, non-CUNY Start students were not required to take college success seminars. Some non-CUNY Start students had access to college success seminars that covered content similar to CUNY Start's, but these seminars were not usually led by students' advisers. At one college, students could participate in a first-year "learning academy" with other students in their year that introduced them to the college's academic and nonacademic resources. At another college, students could participate in a seminar tailored to broad disciplines in the college (for example, health sciences, business, or liberal arts).

Individual Advising

In addition to leading the seminar class, CUNY Start advisers meet with students in the program individually. Individual advising creates an additional opportunity to help students matriculate and reach their academic and social goals. Advisers build relationships with students and their instructors that enable them to intervene if students are struggling. Program directors explained that while they preferred that advisers meet with students at least twice a semester, there was no formal policy dictating how many times advisers must meet with students. Advisers meet weekly with the reading/writing and math instructors for their cohorts to discuss students' progress and plan for intervention if necessary. In individual sessions, CUNY Start advisers help students develop self-awareness and inform them about college resources such as financial aid, course registration, and college policies to aid their integration into the college once they complete

Table 2.8
Student Seminar, Advising, and Tutoring Experience
Student Survey Results

Measure	Sample Size	Program Group	Control Group	Difference	P-Value
<u>Seminar</u>					
Currently taking a weekly college seminar taught by the student's adviser, college success seminar, freshman seminar, or student development seminar (%)	2,065	78.2	28.7	49.5 ***	<0.001
<i>Among those who took a seminar</i>					
<i>Averaged 4 or higher out of 5 on the quality-of-seminar scale^a (%)</i>	1,306	80.3	64.8	15.6	
<u>Advising</u>					
Had at least one one-on-one advising session with an adviser (in person or on the telephone) (%)	2,045	82.1	65.3	16.8 ***	<0.001
Median number of one-on-one advising sessions	2,045	2.0	1.0	1.0 ***	<0.001
<i>Among those who attended a one-on-one advising session</i>					
<i>Median amount of time spent talking with the adviser (minutes)</i>	1,510	15.0	15.0	0.0	
<i>Saw or spoke with the same adviser each time (%)</i>	1,569	82.0	40.7	41.3	
<i>Discussed the following topics^b (%)</i>					
<i>Academic goals</i>	1,616	74.6	59.2	15.4	
<i>Academic progress</i>	1,616	67.1	45.3	21.8	
<i>Class attendance or punctuality</i>	1,616	55.5	29.1	26.4	
<i>Study skills or time management</i>	1,616	53.4	33.8	19.6	
<i>Course selection</i>	1,616	45.9	62.7	-16.8	
<i>Major</i>	1,616	68.0	73.4	-5.4	
<i>Requirements for graduation</i>	1,616	40.9	35.6	5.4	
<i>Internships</i>	1,616	24.6	14.6	10.0	
<i>Job opportunities</i>	1,616	31.6	18.0	13.6	
<i>Career planning</i>	1,616	44.0	25.7	18.3	
<i>College policies such as transfer credit policies, probation, and drop/add policies</i>	1,616	32.4	24.8	7.6	

(continued)

Table 2.8 (continued)

Measure	Sample Size	Program Group	Control Group	Difference	P-Value
<i>College services such as financial aid, tutoring, and counseling</i>	1,616	48.6	34.8	13.8	
<i>Personal matters</i>	1,616	29.7	14.5	15.1	
<i>Something else</i>	1,614	4.4	3.9	0.5	
<i>Averaged 4 or higher out of 5 on the quality-of-advising scale^a (%)</i>	2,027	67.3	39.4	27.9	
<u>Tutoring</u>					
Received any tutoring (%)	2,072	45.0	33.6	11.4 ***	<0.001
<i>Among those who received tutoring</i>					
<i>Received tutoring in (%):</i>					
<i>Math</i>	860	74.9	43.1	31.8	
<i>Reading</i>	860	44.4	37.6	6.7	
<i>Writing</i>	860	53.7	56.4	-2.7	
<i>Some other subject</i>	859	2.7	11.6	-8.9	
<i>Median number of times student met with a tutor</i>	818	3.0	4.0	-1.0	
<i>Rated the tutoring received during the semester as moderately or very helpful (%)</i>	861	87.6	74.9	12.7	
Sample size (total = 2,098)		1,480	618		

SOURCE: MDRC calculations using data from the student survey.

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 and survey sample selection.

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

Italic type indicates nonexperimental data. Significance tests are generally not calculated for nonexperimental data.

^aSee Appendix D for details on the survey scales.

^bDistributions do not add to 100 percent because categories are not mutually exclusive.

the program. During the study, CUNY Start advisers managed caseloads of up to 75 students, compared with non-CUNY Start advisers, who could be responsible for several hundred students.

The implementation of CUNY Start's individual advising varied across colleges and sometimes within colleges. Absent a formal policy about how often advising should take place, CUNY Start advisers and administrators noted that they provided assistance more frequently to students who were facing challenges. An adviser explained:

Usually, we have to see people when they have attendance issues, and we try to problem solve with them and figure out why it's happening and what we can do to improve the situation. Meetings [can be] about discipline issues in the classroom. We try not to pull them out of class because we don't want them to fall behind.

Responses on the student survey corroborate these accounts (see Table 2.8). Sixty-seven percent of program group survey respondents who met with an adviser at least once reported discussing academic progress with that adviser, and 56 percent reported discussing class attendance or punctuality issues.

CUNY Start's individual advising model and smaller caseloads stood in contrast to non-CUNY Start advising services. A CUNY Start student has a sustained relationship with the same adviser throughout the semester, and this adviser is more likely than a non-CUNY Start adviser to know about the student's academic progress and challenges, probably because non-CUNY Start advisers work with many more students. During the study, non-CUNY Start advisers indicated that while most colleges require incoming freshmen to meet with advisers to discuss their placement test scores and arrange their schedules, students were not required to attend additional individual advising sessions except for enrollment and course registration.

Student survey responses offer additional information on the differences between CUNY Start and non-CUNY Start individual advising (see Table 2.8): 82 percent of program group survey respondents reported having at least one individual advising session, compared with 65 percent of control group respondents. The median control group survey respondent had one individual advising session during a semester, while the median program group respondent had two. CUNY Start students were also more likely to see or speak with the same adviser each time than control group students. Of those who reported seeing an adviser at least once, program group survey respondents were more likely to report having discussed academic goals and career planning, while control group respondents more often reported discussing course selection. Students were asked to describe the quality of advising using several survey questions that were then combined to create a scale (see Appendix D). On average, 67 percent of program group survey respondents rated their advising highly on the scale, compared with 39 percent of control group survey respondents. In general, while some non-CUNY Start students had access to advising similar to that available to CUNY Start students, they needed to take more initiative to seek it out and

to develop a personal relationship with an individual adviser in which they could discuss nonacademic and personal issues.

Academic Support

In addition to the multifaceted support provided by advisers, CUNY Start offers students integrated academic resources. Writing assistants worked with the instructor in most observed reading/writing classrooms, providing individual support to students during class, grading assignments, and leading after-class tutoring sessions. Math tutors, who are former CUNY Start students, also circulated during observed classes to assist students, and administered after-class tutoring. These support staff members operate as backup instructors when the lead instructor is busy or if they identify a struggling student.

Overall, 45 percent of program group survey respondents reported receiving academic tutoring, compared with 34 percent of control group respondents (see Table 2.8). Among those who received tutoring, program group survey respondents were more likely than control group respondents to say they had engaged in math tutoring (75 percent compared with 43 percent). Eighty-eight percent of program group survey respondents who received tutoring rated that tutoring as moderately or very helpful, compared with 75 percent of control group respondents. Among those who received tutoring, the median number of meetings was 3 for program group survey respondents and 4 for control group respondents. While these CUNY Start and non-CUNY Start survey results appear similar, the integrated nature of CUNY Start's academic support services may mean that CUNY Start students receive tutoring more often. CUNY Start students may not identify every interaction in class with an embedded classroom writing assistant and or math tutors as "tutoring," and as a result their survey responses may underrepresent their engagement with tutoring. Alternatively, CUNY Start students may not need as much tutoring as non-CUNY Start students because they are receiving more intensive developmental education instruction.

Staffing, Training, and Professional Development

CUNY Start instructors are expected to implement the curriculum as designed and use student-centered teaching practices to impart the thought processes of proficient mathematicians and scientists or readers and writers. CUNY Start advisers provide support through individual advising and by teaching the college success seminar. To meet these unique teaching and advising expectations, the program recruits instructors and advisers based on their pedagogical experience and their openness to the prescribed pedagogy, and provides them extensive training and continuing professional development. Professional development staff members from CUNY's Office of Academic Affairs (hereafter called "professional developers") work with campus programs to oversee the recruitment, hiring, and training of CUNY Start instructors and advisers. Staffing, training,

and professional development practices were implemented as expected and were distinct from what colleges' full- and part-time developmental education faculty members and advisers experienced.

Staff Recruitment

Staff members are recruited by the CUNY Central Office and campus programs working in concert. Professional developers participate in the screening and interview process, and campus-based CUNY Start directors and program coordinators make the final hiring decisions. Applicants must be prepared to teach reading, writing, or math and must be willing to implement CUNY Start's curriculum and student-centered pedagogy. Applicants must also be interested in working with the CUNY Start population. According to one CUNY Start director, the primary reason potential instructors are turned away is that they prove unwilling to adjust to CUNY Start's pedagogy. Professional developers report that instructors with extensive teaching experience are less willing to adopt a wholly new way of teaching, which could explain why CUNY Start instructors had less teaching experience on average (8 years total, 3 at the college level) than did non-CUNY Start instructors (15 years total, 12 at the college level). CUNY Start instructors tended to have teaching experience in both K-12 and higher education. Some had taught basic skills as adjunct professors or in adult education programs. Similarly, CUNY Start advisers often had experience working with adult learner populations through social work or had been high school guidance counselors.

CUNY Start and non-CUNY Start instructors had different educational credentials as well. The majority of both CUNY Start and non-CUNY Start instructors had master's degrees, but CUNY Start instructors were less likely to have doctorate degrees than non-CUNY instructors. CUNY Start instructors were also on average 20 years younger than non-CUNY Start instructors. Table 2.9 provides additional information about the characteristics of CUNY Start and non-CUNY Start instructors.⁹

New Instructor Training

Once hired, CUNY Start instructors are expected to participate in a one-semester intensive apprenticeship designed to provide them with the skills and understanding they need to implement the program's pedagogy and curriculum effectively. This apprenticeship is a full-time paid position in which new hires learn new teaching strategies and become familiar with the curriculum.

⁹Comparable data were not collected for CUNY Start and non-CUNY Start advisers.

Table 2.9
CUNY Start and Non-CUNY Start
Developmental Education Instructor Characteristics

Characteristic	Sample Size	CUNY Start	Non-CUNY Start
Highest degree completed (%)			
Doctorate	212	3.7	28.5
Master's ^a	212	72.2	64.6
Bachelor's	212	24.1	6.3
No degree	212	0.0	0.6
Female ^b (%)	211	69.8	54.4
Median total years taught at any level	211	7	20
Median total years taught at the college or graduate level	210	3	13
Median age (years)	196	32	52
Sample size (total = 342)		66	276

SOURCE: MDRC calculations using data from the instructor survey.

NOTES: ^aA small proportion of respondents selected a professional degree (such as MD, DO, JD, etc.). Due to the small sample, these are included in the master's category.

^bA small proportion of respondents indicated a nonbinary gender identity; due to small sample issues these responses have been excluded from the proportions shown.

During the early stages of the apprenticeship, newly hired instructors, referred to as co-operating instructors or “co-ops,” observe the lead instructor’s teaching daily. They discuss the lessons and specific practices with the lead instructor and at CUNY Central Office training sessions with other co-ops. As co-ops become comfortable with the curriculum and pedagogy, they gradually assume responsibility for teaching while the lead instructor observes, helping them gain independence and mastery.

Reports from CUNY Start instructors indicate that this staged element of training took place as intended. One math instructor described initially spending time watching and listening and then, as the semester progressed, leading some of the class activities. Toward the end of the semester, he led an entire class. Similarly, when asked to describe her apprenticeship, a CUNY Start reading/writing instructor explained that in the beginning of the semester, she reviewed and discussed lesson plans with the lead instructor, and then eventually she managed several lessons

independently, after which she would receive comments on her performance from the lead instructor.

As a co-op begins teaching, both the lead instructor and CUNY Start professional developers provide comments on the strengths and weaknesses of his or her teaching. These comments are designed to prepare co-ops to become instructors in the following term. If new instructors do not show proficiency with the pedagogy by the end of the co-op semester, they may be invited to stay on to support other teachers and continue to immerse themselves in the model until they are deemed ready to lead their own classes.

The CUNY Start instructor-training model was generally implemented as planned. Instructor survey data indicate that all math instructors went through an apprenticeship period, as did 77 percent of reading/writing instructors (not shown in a table). According to CUNY Start administrators, some reading/writing instructors may have bypassed the co-op phase to accommodate the rapid pace at which the program was expanding before the study began. In addition, CUNY Start allowed writing assistants to transition to teaching without apprenticing; however, these were rare exceptions to the training model and the practice was discontinued during the study. A former writing assistant explained that, because she had been with the program for several years, and because the program needed instructors, she was able to become a core instructor without apprenticeship training. In lieu of that training, she received extra support and frequent observations and comments on her performance from the professional developers.

The CUNY Start training model is distinct from what is offered to non-CUNY Start developmental education instructors. Interview data suggest that non-CUNY Start instructors were less likely to participate in training before teaching a course for the first time, apart from those at one college that mandated a yearlong seminar for new faculty members during their first year of teaching. At this college, new faculty members met once or twice a month to discuss curriculum planning and student learning.

Instructor Professional Development

CUNY Start provides continuing professional development through classroom observations by professional developers and all-staff development events. Additionally, CUNY Start instructors and advisers can participate in email listservs on which professional information can be shared.

CUNY Start professional developers are expected to observe all instructors twice during their first semester of teaching and at least once in subsequent semesters. Professional developers noted that the purpose of the observations is to ensure that elements of the pedagogical model such as student-centered instruction are present, and to identify areas where instructors need to improve their teaching practice. A math professional developer explained that they want to see

instructors asking good questions and not giving students the answer too quickly. After the classroom observations, professional developers send their notes to the instructors and shortly thereafter meet with them to discuss what worked well and what could be improved.

In addition to undergoing classroom observations, CUNY Start instructors are expected to participate in at least four mandatory and several voluntary professional development opportunities sponsored annually by the CUNY Central Office. These workshops address broad topics that apply across programs, such as training in interpersonal interactions and emotional intelligence to improve classroom management. Instructors are also encouraged to use email listservs to keep in touch and stay up-to-date throughout the year.

Many CUNY Start instructors participated in this mix of professional development opportunities, and a majority reported on the instructor survey that they participated in workshops that addressed broad topics. Almost all math instructors and 100 percent of reading/writing instructors reported receiving comments on their instruction from administrators and colleagues (not shown in table). However, during interviews, several instructors raised questions about the consistency and purpose of these comments. Several instructors noted that the comments came more sporadically than anticipated, and that it was not clear whether the observations were intended to inform their teaching or evaluate their performance.

Overall, CUNY Start and non-CUNY Start instructors had different opportunities for professional development. CUNY Start instructors were more likely than non-CUNY Start instructors to receive comments on their instruction from administrators and colleagues (see Table 2.10). Non-CUNY Start faculty members reported participating in fewer hours of professional development during a semester and described obstacles to participation, such as limited time due to teaching responsibilities. While non-CUNY Start instructors reported participating in professional development activities similar to the workshops for CUNY Start instructors, these activities focused on different topics. Compared with CUNY Start instructors, non-CUNY Start instructors were more likely to say they had attended professional development workshops on designing effective lessons and assessments. See Table 2.10 for survey findings on instructors' professional development.

Adviser Training and Professional Development

Professional development for CUNY Start advisers is focused on helping them implement the seminar effectively and conduct individual advising. New advisers participate in a semester-long apprenticeship, in which they learn to lead the seminar and gain experience in individual advising while gradually assuming more responsibility over these duties. While training for the seminar, some advisers take on a caseload of 50 students to learn the necessary advising responsibilities. Advisers in training are observed by senior advisers and professional

Table 2.10
Professional Development Among CUNY Start and Non-CUNY Start Instructors

Measure	Sample Size	CUNY Start	Non-CUNY Start
Went through an apprenticeship period as a cooperating instructor (%)	56	89.3	-
Participated in workshops, institutes, or conferences for faculty members/ instructors at instructors' college only (%)	217	73.7	70.6
Attended workshops, institutes, or conferences organized outside CUNY (%)	216	28.1	46.5
Participated in departmental meetings to discuss curriculum, instruction, or pedagogy (%)	217	86.0	66.9
Received comments on instruction from administrators and colleagues (%)	215	98.2	67.1
Attended professional development sessions on (%)			
Designing effective lessons	206	60.7	76.0
Designing effective assessments	203	33.9	74.8
Median total hours spent on professional development activities	202	16	10
Sample size (total = 342)		66	276

SOURCE: MDRC calculations using data from the instructor survey.

developers to determine their readiness to handle their own caseload. During this time, CUNY Start advisers must also familiarize themselves with campus resources so that they can inform students about the range of services available. They also attend training sessions at the CUNY Central Office to supplement their on-campus training.

Because CUNY Start had recently expanded to all the CUNY campuses, some advisers had to lead seminars and advise students during their apprenticeship semesters rather than only observing, working with, and learning from a lead adviser. Some of these advisers indicated that they would have benefited from more assistance during training. Due to limited data on the training experiences of non-CUNY Start advisers, it is unclear what training opportunities were available to those advisers and what professional development activities they participated in.

Chapter 3

Short-Term Effects on Educational Outcomes

CUNY Start aims to enable students with substantial developmental education requirements to dramatically reduce or eliminate those requirements in a single semester, preparing them for academic success in college-level courses. Students are asked to focus solely on progress through their developmental education requirements before working to earn college-level credits. After one semester, students participating in CUNY Start are expected to have made substantial progress through those developmental education requirements in lieu of accumulating the college-level credits they may have earned otherwise.

This chapter presents the effects of CUNY Start on students' short-term academic progress. The primary measures of academic progress analyzed are enrollment, progress through developmental education, and college-level credit accumulation. At the time this report was written, data were only available for the program semester (when most program group students participate in CUNY Start) and the start of the first postprogram semester. (Box 3.1 provides additional details on how program and postprogram semesters are determined for students participating in CUNY Start or enrolled in non-CUNY Start courses.) Therefore, the analyses presented here only provide preliminary information on whether CUNY Start is producing the expected results. Follow-up data must be collected over a longer time to assess whether CUNY Start's short-term trade-off ultimately improves students' long-term educational progress and success.

Summary of Findings

These early analyses find the following:

- CUNY Start is performing in a manner consistent with its theory of change: During the program semester, program group students made substantially more progress through their developmental education requirements than control group students, while control group students accumulated more college-level credits.
- During the first postprogram semester, program group students enrolled at CUNY colleges (that is, either participated in CUNY Start as nonmatriculated students or enrolled in non-CUNY Start courses as matriculated students) at a higher rate than control group students. This positive effect largely reflects the fact that program group students participated in CUNY Start at a higher rate

Box 3.1

The Timing of Program and Postprogram Semesters

CUNY Start follows the same structure at all the colleges in the study. As described in Chapter 1, the program has two phases: Phase I involves 12 weeks of instruction. Students who do not pass tests at the end of Phase I receive an additional 3 to 6 weeks of instruction in Phase II.

Students who have enrolled at a CUNY college take courses during terms defined by each college. At Kingsborough Community College and LaGuardia Community College, the academic calendar is divided into two terms (fall and spring), each of which has a “main session” (generally 12 weeks) and an “intersession” (usually 6 weeks). At Borough of Manhattan Community College and Queensborough Community College, the academic calendar is divided into four terms (fall, winter, spring, and summer), with fall and spring being longer terms (generally 14 weeks) and winter and summer being shorter terms (from 4 to 8 weeks). Generally, at the end of each term students enrolled in developmental education courses at any CUNY college take exit tests for the subject areas in which they received remediation.

In order to create a uniform set of metrics for students participating in CUNY Start and students enrolling in non-CUNY Start courses at CUNY colleges (as matriculated students), “semesters” are defined in the following way in the analyses in this report: For students participating in CUNY Start, the semester refers to course taking and performance on exit tests during Phase I and Phase II. For students enrolled in non-CUNY Start courses at CUNY colleges, at Kingsborough and LaGuardia the semester refers to course taking and performance on exit tests during both the main session and the intersession, and at Borough of Manhattan and Queensborough it refers to both the longer and shorter follow-up terms (fall and winter, or spring and summer). At all four colleges, CUNY Start generally started within two weeks of the college’s other courses, so defining semesters in this way results in mostly overlapping time periods.

The study includes three cohorts of students: those who started in spring 2015, fall 2015, and spring 2016. These cohorts are also aligned in the analyses so that the program semester refers to the first semester after random assignment and the postprogram semester refers to the subsequent term. The table below shows the program semester and postprogram semester for each cohort.

Cohort	Program Semester		Postprogram Semester	
	CUNY Start Phase I	CUNY Start Phase II	CUNY Start Phase I	CUNY Start Phase II
Spring 2015				
Kingsborough and LaGuardia	Spring 2015 main session	Spring 2015 intersession	Fall 2015 main session	Fall 2015 intersession
Queensborough and Borough of Manhattan	Spring 2015	Summer 2015	Fall 2015	Winter 2016

(continued)

Box 3.1 (continued)

Fall 2015

Kingsborough and LaGuardia	Fall 2015 main session	Fall 2015 intersession	Spring 2016 main session	Spring 2016 intersession
Queensborough and Borough of Manhattan	Fall 2015	Winter 2016	Spring 2016	Summer 2016

Spring 2016

Kingsborough and LaGuardia	Spring 2016 main session	Spring 2016 intersession	Fall 2016 main session	Fall 2016 intersession
Queensborough and Borough of Manhattan	Spring 2016	Summer 2016	Fall 2016	Winter 2017

NOTE: Enrollment data are not available for the fall 2016 intersession or the winter session of 2017, but test data from this period are available.

- than control group students in that postprogram semester. The two groups enrolled in non-CUNY Start courses as matriculated students at similar rates.
- Exploratory analyses suggest that program group students learned more in math, reading, and writing than control group students by the end of the program semester.
- Preliminary analyses suggest that certain types of students may have more to gain than others from the trade-off of making a priority of developmental education before working on college-level credits. The trade-off seems to favor students planning to participate in the CUNY Start full-time program and students assessed as needing remediation in all three subject areas (math, reading, and writing).

Analyses

As discussed in Chapter 1, this study is a randomized controlled trial. Individuals were randomly assigned to one of two groups through a process that functions like a lottery. The program group was given the opportunity to participate in CUNY Start. The control group was given the opportunity to take colleges' usual courses and services outside of CUNY Start. Because of random assignment, the two groups of students were similar at the start of the study. Appendix Table A.1 compares the characteristics of students in the program and control groups, as reported by students on the CUNY Start application before random assignment. As shown in the table and discussed in more detail in Appendix A, most of the program and control groups' measured characteristics

were very similar. As a result of random assignment, differences between the average future outcomes of *all* program group members and *all* control group members constitute an unbiased estimate of the effect of the opportunity to participate in CUNY Start.

This chapter addresses two main topics. Most of the chapter describes the effect of CUNY Start by presenting student progress using three primary academic outcomes: enrollment, progress through developmental education, and college-level credit accumulation. The chapter also contains an exploratory discussion of CUNY Start’s effects on student learning, as approximated by scores on standardized exit tests in math, reading, and writing. Next, the chapter describes whether the effects on the three primary academic outcomes are different among different types of students (for example, those referred to developmental education courses in all three subject areas compared with those with fewer developmental education requirements). The estimation methods for the analyses are described in Appendix E.

At the time this report was written, data for the full sample of students were available for the program semester and the start of the following semester. For most students randomly assigned to the program group, the program semester was the first and only semester they participated in CUNY Start (as nonmatriculated students). Most students randomly assigned to the control group enrolled in non-CUNY Start courses at CUNY colleges (as matriculated students). Because only a limited amount of follow-up data are currently available, these analyses only offer a preview of CUNY Start’s effect on student academic outcomes.¹

CUNY Start’s Effects on Student Academic Outcomes

The main analyses in this section compare the academic outcomes of all students in the program group with the academic outcomes of all students in the control group. Box 3.2 provides details on how the academic outcomes are defined.

¹Before any analyses were conducted, an analysis plan was written to prespecify which analyses would be conducted and which of these would be considered the main indicators of CUNY Start’s success — these are called “confirmatory” analyses. The analysis plan specifies that all confirmatory analyses are based on students’ academic outcomes at the end of the *postprogram* semester and beyond. The analyses presented here are considered exploratory; they provide information about the program’s effects but will not be the main ones used to assess CUNY Start’s success in this evaluation.

Box 3.2

Definitions of Outcome Measures

This chapter examines CUNY Start's effects on three types of outcomes: enrollment, college readiness, and credits attempted and earned.

Enrollment: Students have a variety of course offerings and programs available to them at CUNY, including CUNY Start, developmental education courses, and college-level courses. Students can also take immersion programs and workshops (most of which are intended for matriculated students, though not all). Students in CUNY Start who maintained attendance through the enrollment cut-off date (typically two to three weeks after the start of the program) are referred to as “participating in CUNY Start (as nonmatriculated students).” Students enrolled in developmental education courses or college-level courses who remained registered in at least one course through the census date (the twenty-first day of classes) are referred to as “enrolling in any non-CUNY Start courses (as matriculated students).” Because relatively few students enrolled in immersion programs and workshops and data on their participation is incomplete, they are not reported separately and are also considered as “enrolling in any non-CUNY Start courses (as matriculated students).” The outcome “enrolled at a CUNY college” is a catchall that includes students who participated in CUNY Start (as nonmatriculated students) *or* enrolled in any non-CUNY Start courses (as matriculated students).

College readiness: A student who is eligible to take at least one college-level course in math, reading, or writing is considered to be “college-ready” in that subject area. At the time of the study, students were generally required to demonstrate college readiness by having high enough scores on the SATs, on the New York State Regents exams, on the assessments they took before enrolling (“placement tests”), or on the final exams they took at the end of a developmental course sequence or CUNY Start (“exit tests”). In developmental courses, students had to pass the course in addition to the final test. More details on these tests are available in Appendix B. Some colleges also offered “corequisite” remediation courses, which combined developmental education and college-level material; students who passed any college-level courses (including corequisite courses) are considered college-ready. Additionally, some colleges offered alternative pathways (for example statistics instead of algebra in math); students with passing scores at the end of any developmental course sequences (including alternative pathways) are also considered college-ready.

Credits attempted and earned: This report focuses specifically on college-level credits attempted and earned and does not report on any credits associated with developmental education courses. Credits attempted are measured based on the courses in which students were registered as of the census date.

Enrollment in the Program Semester

Enrollment at a CUNY college is the first measure of academic progress. Table 3.1 shows educational enrollment among program and control group students (refer to Box 3.3 for an explanation of how to read this table).

Table 3.1
Enrollment in the Program Semester

Outcome (%)	Program Group	Control Group	Difference	P-Value
Enrolled at a CUNY college	89.0	78.7	10.3 ***	<0.001
Participated in CUNY Start (as a nonmatriculated student)	80.6	0.6	80.0 ***	<0.001
Enrolled in any non-CUNY Start courses (as a matriculated student)	17.9	78.2	-60.3 ***	<0.001
Enrolled in CUNY Start reading/writing or developmental English at a CUNY college	68.8	63.9	4.8 ***	0.003
Enrolled in CUNY Start math or developmental math at a CUNY college	75.1	57.5	17.6 ***	<0.001
Sample size (total = 3,835)	2,997	838		

SOURCES: MDRC calculations using CUNY Start application data, MDRC random assignment data, data from CUNY’s Institutional Research Database, and CUNY Start program participation data.

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.

In the program semester, 89 percent of program group students and 79 percent of control group students enrolled at a CUNY college (that is, participated in CUNY Start as nonmatriculated students or enrolled in any non-CUNY Start courses as matriculated students), a difference of 10 percentage points.² In other words, one effect of CUNY Start is that it encouraged more students to enroll in education. Students in the study were not mandated to enroll in the program to which they were randomly assigned. Students assigned to the program group had the *option* of

²As discussed in Chapter 1, CUNY Start is offered through the Continuing Education division of a college; students participating in CUNY Start do not take college courses while participating in CUNY Start. They are considered enrolled at that CUNY college as nonmatriculated students. While most study students who enrolled in CUNY colleges enrolled in one of the four study colleges, a small proportion enrolled at a different CUNY college. Enrollment at *any* CUNY college is reflected here.

Box 3.3

How to Read the Effect Tables in This Report

The tables in this chapter that show program effects use the format excerpted below. The first row shows that 56.8 percent of students randomly assigned to the program group and 24.7 percent of students randomly assigned to the control group were college-ready in math at the end of the program semester. The difference of 32.1 percentage points is the estimated effect of the option to participate in CUNY Start. (See Box 2.1 in Chapter 2 for a more detailed explanation of estimated effects.) That is, the offer of CUNY Start caused an estimated 32.1 percentage points more program group students to become college-ready in math than would have been the case had they not been offered CUNY Start. Moreover, this estimate is statistically significant at the 1 percent level (the p-value), indicated by three asterisks. That is, if CUNY Start had no true effect, there is less than a 1 percent chance that the estimated effect would be 32.1 percentage points or larger. Two asterisks indicate a p-value of 5 percent, and one asterisk indicates a p-value of 10 percent.

Academic Outcomes for Full Sample

Outcome (%)	Program Group	Control Group	Difference	P-value
College-ready in math at the end of the program semester	56.8	24.7	32.1	*** <0.001
Sample size (total = 3,835)	2,997	838		

participating in CUNY Start, but were not required to do so. Most program group students (81 percent) did participate in CUNY Start. Eighteen percent of the program group enrolled in non-CUNY Start courses during the program semester. (A portion of this 18 percent overlaps with the 81 percent who participated in CUNY Start.)³ Similarly, control group students were not required to enroll in non-CUNY Start courses, but they were generally restricted from participating in CUNY Start for three semesters. Seventy-eight percent of control group students enrolled in non-CUNY Start courses. Fewer than 1 percent of control group students participated in CUNY Start during the program semester; that is, a small number of control group students were inadvertently allowed to participate in CUNY Start.⁴

³Because of the way CUNY Start was aligned with the academic terms at the colleges (see Box 3.1 for details), a portion of this 18 percent matriculated *after* successfully completing CUNY Start.

⁴These students are included in the analyses and still considered control group members. This kind of “cross-over” is common in randomized trials. In this case, the rate is so low that it does not compromise the findings in any substantial way.

More program group students than control group students took developmental education courses in the subject areas where they required remediation. Students could have worked on completing their developmental education requirements by participating in CUNY Start or taking a developmental education course or program (such as an immersion program or a developmental education workshop course) at a CUNY college. Sixty-nine percent of program group students participated in some type of course or intervention to meet a developmental education requirement in reading or writing, compared with 64 percent of the control group.⁵ The difference in math is even more striking: 75 percent of the program group participated in math remediation compared with 58 percent of the control group.

Students in the program group may have enrolled in college (and more specifically a developmental education course or program) at a higher rate than control group students for several reasons. First, as discussed in Chapter 1, after they went through random assignment students assigned to the program group were given a checklist of the steps they need to complete to sign up for CUNY Start. Control group students, on the other hand, often had to go to another location at the college to meet with advisers and get information on how to register for classes. Second, it is possible that CUNY Start may have been more appealing to students because it offered them the possibility of making substantial progress through developmental education at a low up-front cost and without dipping into their financial aid.⁶ This appeal could serve to increase college enrollment.

CUNY Start's effects on college readiness and college-level credit accumulation presented in this chapter compare these outcomes for the full sample of students, not just those who participated in CUNY Start (as nonmatriculated students) or enrolled in non-CUNY Start courses at CUNY colleges (as matriculated students). Consequently, these analyses assess the effects of students *being given the option* of CUNY Start. The evaluation focuses on effects defined in this way for three reasons. First, the approach incorporates the meaningful effect on enrollment — which the option of CUNY Start causes — into its effects on future outcomes. Second, analyzing academic outcomes for the full sample of students provides information on the progress a group of students can make when given the option of participating in CUNY Start. This information can

⁵As shown in Table 2.5, on the student survey more control group students reported taking English classes than program group students, a finding that contradicts this finding derived from transcript data. There are two possible reasons for the discrepancy. First and most important, students were asked on the survey whether they enrolled in *any* English class, including college-level English, whereas the transcript measure shown in Table 3.1 excludes students who enrolled in college-level English courses. Second, on the survey students may have reported enrollment in developmental education English programs that do not appear in the transcript data.

⁶It is also true that the CUNY Start program generally requires more in-class time than a typical control group student's course load at a CUNY college during a single semester, which could lead one to expect fewer program group members to participate. However, all of the students in the study — program group students and control group students — were considering participating in CUNY Start when they were randomly assigned, so they may have already determined how they could fit CUNY Start in with their other commitments.

be valuable because CUNY Start is offered (not mandated) as one of many developmental education options available to students at CUNY. Showing outcomes for the full program group, then, provides a meaningful assessment of how a group of students may perform when CUNY Start is one of the options available to them. Finally, comparing the academic outcomes of the full program group with those of the full control group ensures a comparison of two groups that were not systematically different at the start of the study. For ease of exposition, throughout the remainder of this chapter the results will be discussed as *the effects of CUNY Start* though they are technically *the effects of being given the option of CUNY Start*.

The positive 10 percentage point impact on enrollment in the program semester has implications for the interpretation of the estimated effects on subsequent academic outcomes, such as completion of developmental education and credit accumulation. Effects on these outcomes may be due, at least in part, to the increased enrollment of program group students rather than to the specific structural, curricular, and pedagogical reforms that are the core of CUNY Start.⁷ The effects on these later outcomes are important regardless of the specific mechanism that causes them. However, the effects on these outcomes should be interpreted differently if they are primarily a result of inducing more students to enroll rather than primarily a result of the core components of CUNY Start. This issue is discussed in detail in supplemental analyses in Appendix G.⁸ These supplemental analyses strongly suggest that the observed effects on completion of developmental education and college credit accumulation are *not* simply a result of the enrollment effect.

Academic Progress by the End of the Program Semester and Beyond

To assess whether CUNY Start meets the short-term goal of helping students make substantial progress through their developmental education requirements before they matriculate, the following academic outcomes were measured at the end of the program semester: the number of subject areas (math, reading, and writing) where students were “college-ready,” whether students were college-ready in each subject area separately, and college-level credits attempted and earned. Table 3.2 shows program and control group outcomes, along with the estimated effect of CUNY Start on these outcomes at the end of the program semester and the beginning of the first

⁷It may also be the case that the enhanced instruction and services of CUNY Start is what led more program group students to remain engaged with CUNY Start through the enrollment cut-off date, and that the lack of these enhancements is what caused some control group students to withdraw from all of their courses before the census date.

⁸Appendix G provides estimates of the effect of *participating* in CUNY Start compared with what otherwise would have happened (a “treatment-on-the-treated” analysis) and also of the effect of participating in CUNY Start compared with enrolling in any non-CUNY Start courses.

postprogram semester.⁹ For reference, the first panel of the table shows students' college readiness overall and in each subject area before they were randomly assigned (and before they experienced the program).¹⁰ The outcomes by the end of the program semester are shown in the second panel. Enrollment measures during the first postprogram semester are presented in the third panel.

By the end of the program semester, a higher percentage of students in the program group were college-ready in more subject areas than in the control group. Before they were randomly assigned, just over half of the students in both groups were not college-ready in any subject area (also known as being "triple remedial"). By the end of the program semester, 16 percent of program group students and 24 percent of control group students were triple remedial, an estimated effect of -8 percentage points. Similarly, a smaller percentage of program group students than control group students were college-ready in only one or two subject areas by the end of the program semester. Consequently, a large proportion of program group students (38 percent) successfully completed all developmental education requirements and became fully college-ready. Some control group students also made progress through their developmental education requirements, with 13 percent becoming fully college-ready. CUNY Start caused an estimated 25 percentage points more students to complete all their developmental education requirements within one semester.

Another way to look at this result is to consider the total number of subject areas where students achieved college readiness. Before random assignment, students in both the program and control groups were college-ready in an average of 0.65 out of 3 subject areas. By the end of the program semester, program group students were college-ready in an average of 1.87 subject areas and control group students were college-ready in 1.38 subject areas. On average, then, program group students became college-ready in 1.23 additional subject areas, whereas control group students became college-ready in only 0.73 additional subject areas. CUNY Start caused program group students to become college-ready in an estimated 0.49 more subject areas than they would have otherwise (1.87 minus 1.38).

Within math, reading, and writing, more program group students than control group students became college-ready by the end of the program semester. CUNY Start had the greatest effect in math, with 57 percent of the program group college-ready in math by the end of the program semester, compared with 25 percent of the control group. Given that both groups started

⁹A table that meets What Works Clearinghouse guidelines for this analysis and subsequent analyses is in Appendix F.

¹⁰Table 1.2 shows student developmental education subject areas required before random assignment. In Table 3.2, this same measure is presented as college readiness for consistency with the outcome measures (which are also shown in terms of college readiness). Though they are described differently, the two tables show the same thing. In Table 1.2 about half of the study sample is presented as requiring developmental education in three subject areas before they were randomly assigned; similarly, the first panel of Table 3.2 shows that about half of program and control group students were college-ready in zero subject areas before random assignment.

with very low college-readiness rates in math (between 5 percent and 6 percent), this gain is particularly substantial. Program group students also made more progress in reading and writing than control group students. At the start of the study, about 36 percent of students in both the program and control groups were college-ready in reading and about 23 percent of students in both groups were college-ready in writing. Substantial percentages of control group students made progress in both areas during the program semester, with 62 percent college-ready in reading and 52 percent college-ready in writing by the end of the program semester. But even greater percentages of program group students made progress in those areas during the same period, as 8 percentage points more program group students became college-ready in reading and 9 percentage points more became college-ready in writing.

While program group students, on average, were making substantial progress through developmental education, control group students were also making academic progress by attempting and earning college-level credits. As discussed earlier, most control group students enrolled in non-CUNY Start courses as matriculated students and could take a mix of developmental education and college-level courses. During the program semester, control group students therefore had the possibility of earning more college-level credits than program group students. The second panel of Table 3.2 shows college level credits attempted and earned by both groups. As expected, control group students attempted nearly 3 more college-level credits, on average, than did program group students. Much of this lead in credits attempted is maintained in credits earned. Control group students earned about 2.4 credits, on average, by the end of the program semester. A small proportion of program group students also earned college-level credits. These students may have opted to enroll in non-CUNY Start courses instead of participating in CUNY Start, or may have enrolled in non-CUNY Start courses as matriculated students in intersessions, after completing CUNY Start. They bring the program group average to 0.6 college-level credits. The estimated difference in college-level credit accumulation caused by CUNY Start is -1.9 credits. To put this finding in context, consider that most associate's degree programs require 60 college-level credits. To earn an associate's degree within three years (six semesters), therefore, students must earn at least 10 college-level credits per semester; the estimated effect of CUNY Start represents just under 20 percent of 10 college-level credits.

Longer-term data are needed to gauge the overall success of CUNY Start and learn whether this short-term trade-off of making progress through developmental education in place of earning college credits benefits students over time. Currently, only educational participation measures are available for the first postprogram semester; these measures are presented in the last panel of Table 3.2. In that semester, 5 percentage points more students in the program group than in the control group enrolled at CUNY colleges. Most students in the program group enrolled in non-CUNY Start courses (as matriculated students), with fewer than 5 percent of program group members participating in CUNY Start in the first postprogram semester. This finding is somewhat

Table 3.2
Educational Achievement

Outcome	Program Group	Control Group	Difference	P-Value
<u>Before random assignment</u>				
Number of college-ready subject areas (%)				
Zero	51.2	51.0	0.2	0.919
One	33.4	33.2	0.2	0.923
Two	15.2	15.4	-0.2	0.894
Three (fully college-ready)	0.2	0.4	-0.2	0.415
Number of college-ready subject areas (out of 3)	0.64	0.65	-0.01	0.790
College-ready in the 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
<u>End of the program semester</u>				
Number of college-ready subject areas (%)				
Zero	16.1	24.2	-8.1	*** <0.001
One	18.3	26.7	-8.4	*** <0.001
Two	27.7	36.1	-8.4	*** <0.001
Three (fully college-ready)	37.9	13.0	24.9	*** <0.001
Number of college-ready subject areas (out of 3)	1.87	1.38	0.49	*** <0.001
College-ready in the 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-level credits attempted	0.8	3.6	-2.7	*** <0.001
College-level credits earned	0.6	2.4	-1.9	*** <0.001

(continued)

Table 3.2 (continued)

Outcome	Program Group	Control Group	Difference	P-Value
<u>Postprogram semester</u>				
Enrolled at a CUNY college (%)	69.4	64.3	5.1	*** 0.006
Participated in CUNY Start (as a nonmatriculated student)	3.9	0.5	3.4	*** <0.001
Enrolled in any non-CUNY Start courses (as a matriculated student)	65.9	63.9	2.0	0.288
Enrolled in CUNY Start reading/writing or developmental English at a CUNY college (%)	22.3	30.3	-8.0	*** <0.001
Enrolled in CUNY Start math or developmental math at a CUNY college (%)	19.8	31.9	-12.2	*** <0.001
College-level credits attempted	7.0	5.2	1.8	*** <0.001
Sample size (total = 3,835)	2,997	838		

SOURCES: MDRC calculations using CUNY Start application data, MDRC random assignment data, data from CUNY's Institutional Research Database, CUNY Start program participation data, and test data from CUNY's Administrative Data Warehouse.

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.

surprising given that at the start of the study, 30 percent of students required developmental education in all three subject areas but intended to participate in CUNY Start's part-time program, which would allow them to become college-ready in, at most, two subject areas. Such students are eligible for a second semester of CUNY Start, but most did not participate in the program during the postprogram semester. Similar percentages of program and control group students enrolled at CUNY colleges in non-CUNY Start courses (as matriculated students) in the first post-program semester.

In that first postprogram semester, more control group students than program group students enrolled in developmental education courses. Twenty-two percent of the program group enrolled in CUNY Start reading/writing or developmental English, compared with 30 percent of the control group. Similarly, 20 percent of program group students enrolled in CUNY Start math

or developmental math, compared with 32 percent of control group students. Both estimated effects are statistically significant and suggest that a portion of the control group may begin to catch up to the program group in college readiness over time.

Program group students attempted 7.0 college-level credits in the first postprogram semester, on average, compared with 5.2 college-level credits attempted by control group students. The difference of 1.8 college-level credits is statistically significant and substantively meaningful. However, at this point, it appears likely that program group students will need more than one semester to fully catch up with control group students in college-level credits, given the control group's lead of nearly 2 college-level credits.

This expectation — that program group students will need several semesters to catch up to the control group in college-level credits — is consistent with existing research and some preliminary analyses. For program group students to catch up in a single semester, CUNY Start would have to achieve greater effects on college-level credit accumulation than have been detected even in studies of highly effective programs. For example, even CUNY's Accelerated Study in Associate's Programs (ASAP), which nearly doubled graduation rates within three years, only boosted college-level credit accumulation by 1.9 credits or fewer for any given semester.¹¹ In fact, as mentioned in Chapter 1, CUNY expects students who participate in CUNY Start to catch up in college-level credits in their *fourth* semester. Analyses using the first two cohorts of the research sample in this evaluation found that, by the end of the first postprogram semester, program group students had begun to close the gap in college-level credits earned but had not yet caught up with control group students. It will be important to continue to track the study sample for at least four semesters to more fully evaluate CUNY Start's effectiveness.

CUNY Start's Effects on Learning

It is also important to determine whether assignment to CUNY Start causes students to gain greater skills in math, reading, or writing. This question is explored here, including a discussion of why answering this question requires strong assumptions, and thus the evidence here is considered suggestive, rather than conclusive, unlike the results already presented.

Before random assignment, most students in the study took standardized placement tests in math, reading, and writing, administered by CUNY and called CUNY Assessment Tests

¹¹Scrivener et al. (2015).

(CAT).¹² Placement tests were administered for the purposes of placing students into the appropriate math, reading, and writing courses (that is, developmental education or college-level courses). At the time of the study, students referred to developmental education were required to pass a common *exit test* in each subject area in order to be deemed college-ready.¹³ These exit tests are a measure of student skills (though an imperfect one), and many students took them toward the end of the program semester, well after random assignment, giving them enough time to acquire new skills in CUNY Start or other developmental education courses. For the most part, only a student who enrolled in and completed a developmental education course or program (such as CUNY Start) can take an exit test.

A strong approach to estimating CUNY Start's effect on learning would be to compare the average exit test scores of *all* program group members with the average exit test scores of *all* control group members. However, not everyone took the exit tests. In fact, CUNY Start caused many more program group students to take the exit tests (see Table 3.3). For example, the program group was 37 percentage points more likely to take the math exit test than the control group. This difference occurred for several reasons. First, CUNY Start caused more students to enroll in college and to attempt math classes. Second, many control group students were enrolled in multicourse developmental math sequences lasting multiple semesters, in which students would only take the exit test at the end of the sequence. Finally, some control students were in special remedial programs that have been exempted from giving the exit test.

Random assignment does *not* ensure that subsets of students (for example, test takers) identified based on decisions or processes that occurred after random assignment (for example, taking an exit test) were highly similar in the program group and the control group at the outset of the study. Consequently, differences in the average exit test scores of program and control group *exit test takers* cannot confidently be interpreted as being caused by CUNY Start. Differences may also be a result of the types of students CUNY Start caused to take the exit tests.

In fact, in all three subject areas, the placement test scores of students who ultimately took exit tests were lower, on average, in the program group than in the control group. That is, program group exit test takers began the study less academically prepared than control group exit test takers. Stated differently, by inducing more students to attempt the exit tests, CUNY Start caused some initially less-well-prepared students to take the exit test. This fact should be kept in

¹²Some students were exempt for various reasons. At the time of the study, the math and reading placement tests were COMPASS tests and the writing test was CUNY's own test. The terms *placement test* and *exit test* are those of the authors and may not reflect CUNY's terminology.

¹³In mathematics, students took the CUNY Elementary Algebra Final Test (CEAFE), a common departmental exit test. In reading, students took a COMPASS test, and in writing they took a CUNY test. In mathematics, students were required to achieve a minimum course average in addition to a minimum test score. In this report, however, students are considered college-ready in math if they passed the math test.

Table 3.3
Gains in Skills/Knowledge by the End of the Program Semester

Outcome	Program Group		Control Group		Difference	P-Value
	Sample Size	Mean	Sample Size	Mean		
CUNY Elementary Algebra Final Exam (CEAFE)						
Took the test (%)	2,997	61.2	838	23.8	37.4 ***	<0.001
<i>Test score (out of 100) — unadjusted</i>	1,832	72.6	198	66.0	6.6 ***	<0.001
<i>Test score (out of 100)</i>	1,832	73.0	198	62.4	10.6 ***	<0.001
CUNY Assessment Test (CAT) in reading						
Took the test (%)	2,997	42.7	838	30.0	12.8 ***	<0.001
<i>Test score (out of 100) — unadjusted</i>	1,275	73.2	254	71.1	2.1 ***	0.005
<i>Test score (out of 100)</i>	1,275	73.3	254	70.2	3.1 ***	<0.001
CUNY Assessment Test (CAT) in writing						
Took the test (%)	2,997	53.1	838	36.5	16.6 ***	<0.001
<i>Test score (out of 100) — unadjusted</i>	1,595	55.8	299	55.2	0.6	0.183
<i>Test score (out of 100)</i>	1,595	55.9	299	54.8	1.1 **	0.013
Sample size (total = 3,835)	2,997		838			

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

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.

Final grades are among those who attempted the test in the program semester.

Italic type indicates nonexperimental data.

mind when interpreting the average exit test scores of these two groups of students — it appears to favor the control group test takers.¹⁴

Table 3.3 summarizes the exit test findings — the first row under each exit test panel presents the percentage of all students who took the exit test during the program semester. The

¹⁴While program group exit test takers began the study less prepared than control group exit test takers, it is unknown how the two groups compare with respect to unobserved characteristics such as tenacity, motivation, and study habits. It is primarily for this reason that the evidence of CUNY Start's effect on skills and knowledge is considered suggestive rather than conclusive.

second row under each exit test presents the average scores among exit test takers, without taking into account any pre-random assignment differences between the two groups. The third row under each exit test presents the average scores among exit test takers, after statistically controlling for pre-random assignment differences in several observable student characteristics, including placement test scores.

In all three subject areas, substantially higher percentages of program group members than control group members took the test. Despite starting further behind, on average, CUNY Start test takers scored higher on the exit test than control group test takers in all three subject areas. This finding is notable, and the difference is especially large in math.¹⁵

After adjusting for pre-random assignment placement test scores (and several other student characteristics), program group members still scored higher on exit tests than their control group counterparts in math, reading, and writing. In all three cases the adjusted differences are larger than the unadjusted differences, reinforcing the point that CUNY Start causes initially less-well-prepared students to take the exit test, and that CUNY Start is improving learning as measured by the exit tests.

These findings suggest that CUNY Start, with its intensive focus on math, reading, and writing, does enable students to gain greater skills in these subject areas — a conclusion that aligns with CUNY Start’s theory of change. Again, however, as described above, control group students took and earned more college-level credits, often in other subject areas. The control group may therefore have gained skills and knowledge in these other areas that cannot be captured by this evaluation.

CUNY Start’s Effects on Academic Progress Among Subgroups of Students

The findings for the full sample presented in the first section of this chapter demonstrate how CUNY Start affects students’ academic progress, *on average*. However, different types of students may respond differently to CUNY Start or the alternative courses and services offered at

¹⁵In effect sizes (not shown in the table), the differences are 0.27σ , 0.19σ , and 0.08σ , in math, reading, and writing, respectively. In K-12 research, there is a wealth of information used to provide context and meaning to the magnitude of estimated effects presented in effect size units. In community college research, however, such information is virtually nonexistent. One approach Hill, Bloom, Black, and Lipsey (2008) offer to aid in interpreting effect sizes is to compare estimated differences in effect-size units to policy-relevant performance gaps. For example, achievement gaps on the placement tests between black and white students in the study sample were 0.35σ , 0.06σ , and 0.02σ in math, reading, and writing, respectively. The differences presented above, in other words, are as large as or larger than the achievement gap between black and white students. National achievement gaps, CUNY-wide achievement gaps, or both may be more meaningful points of comparison.

CUNY. Thus, the effects may vary for different students. Such differences are masked when testing overall average effects. This section explores the extent to which CUNY Start is more effective for particular types, or subgroups, of students.

Three types of subgroups are of particular interest because there are program-related reasons to expect CUNY Start's effects to vary by them.¹⁶ The definitions of these subgroups follow; the reasons why effects were expected to vary by these subgroups defined in these ways are offered later.

Intended CUNY Start program: Before random assignment, students were asked whether they intended to participate in the full-time or part-time CUNY Start program if they were selected for the program group. This subgroup analysis compares the estimated effects of CUNY Start among students who intended to participate in the full-time CUNY Start program with the estimated effects among students who intended to participate in the part-time program.¹⁷

Number of college-ready subject areas before random assignment: CUNY Start is designed to serve students with different combinations of developmental education requirements in the three subject areas. This analysis compares CUNY Start's effects among students who had zero college-ready subject areas at the start of the study (who were triple remedial) with its effects among those who were college-ready in one or two subject areas.¹⁸

College: Students were randomly assigned at the college in which they intended to participate in CUNY Start or enroll in non-CUNY Start courses. This subgroup is defined based on the college where students were randomly assigned.¹⁹

¹⁶These three subgroups were prespecified as confirmatory in the analysis plan mentioned in footnote 1 of this chapter that was created before any outcome data were examined. The remaining subgroups are exploratory. As noted in footnote 1, however, all outcomes in the current time frame are exploratory.

¹⁷In the program semester, 76 percent of program group students participated in their "intended" CUNY Start program type (representing 95 percent of all program group members who participated in CUNY Start). Among students in the control group, 68 percent of students who had intended to participate in the full-time CUNY Start program (if assigned to CUNY Start) and 55 percent of students who had intended to participate in the part-time program attempted a full-time course load of 12 or more credits. Therefore, this subgroup analysis is a weak proxy for comparing (1) the effect of participating in the full-time CUNY Start program rather than taking a full-time course load in college with (2) the effect of participating in the part-time CUNY Start program rather than taking a part-time course load in college. Instead, this analysis provides useful information about the effect of being offered CUNY Start among students interested in the full-time program compared with students interested in the part-time program.

¹⁸A small number of students were identified as having no developmental education requirements at the start of the study. These students are excluded from this subgroup analysis.

¹⁹Most students either participated in CUNY Start at their college of random assignment or enrolled in non-CUNY Start courses at their college of random assignment.

In addition to these three subgroups, the variation in CUNY Start's effects was examined by subgroups defined using student demographic characteristics that are known to be associated with gaps in educational achievement, including gender, age, race/ethnicity, prior education, and term of enrollment (fall or spring).

This section presents the results of subgroup analyses for the following outcomes: educational participation, college readiness, and college-level credit accumulation.

Variation in Effects on Enrollment

Table 3.4 shows the subgroup results for enrollment, an outcome for which CUNY Start's effects were not expected to vary. In every single subgroup of students examined, CUNY Start is estimated to have increased enrollment, and among half of the subgroups the effects are statistically significant. Thus, any differences in enrollment effects by subgroup (for example, triple remedial students compared with students with one or two remedial requirements) reflect effects on enrollment that are all positive, but that are of different sizes.

The estimated effects on enrollment are similar regardless of students' intended CUNY Start program (full-time or part-time) or number of college-ready subject areas before random assignment. However, the effect varies depending on which college the student intended to attend. The effect on enrollment was largest at College D, which also had the lowest control group enrollment. At College C, however, the enrollment effect was small and not statistically significant; this college also had the highest control group enrollment. Colleges A and B fall between the other two.

The last five panels of Table 3.4 show variations in the enrollment effect by subgroups created using student demographic characteristics. Estimated effects are statistically indistinguishable by gender and by prior education level. The enrollment effects are larger among older students, Hispanic students, and students who entered the study in a spring semester. The pattern among these subgroup findings is that the effect estimates are largest among the subgroups where the control group outcome levels are lowest, suggesting program effects are largest among those at the greatest risk.

The next section discusses variation in the program's effects on progress through developmental education. The variation in effects on enrollment may lead to some of the variation in effects on academic progress.

Table 3.4
Enrollment at CUNY Colleges,
by Subgroup

Characteristic	Sample Size	Enrollment (%)			P-Value for Difference	P-Value for Difference	P-Value for Differential for Estimated Effects
		Program Group	Control Group	Difference			
Intended CUNY Start program						0.316	
Part-time	1,480	87.4	75.3	12.1 ***	<0.001		
Full-time	2,355	90.0	80.7	9.3 ***	<0.001		
Total sample size	3,835						
Number of college-ready subject areas at random assignment						0.136	
Zero	1,935	88.6	76.5	12.1 ***	<0.001		
One or two	1,859	89.6	81.4	8.2 ***	<0.001		
Total sample size	3,794						
Intended college						0.013 ††	
College A	1,167	88.9	79.8	9.1 ***	<0.001		
College B	440	92.2	83.2	9.1 ***	0.008		
College C	632	87.7	85.0	2.7	0.405		
College D	1,596	88.8	74.0	14.8 ***	<0.001		
Total sample size	3,835						
Gender						0.362	
Female	1,840	88.7	79.8	9.0 ***	<0.001		
Male	1,434	89.4	77.8	11.5 ***	<0.001		
Total sample size	3,274						
Age						0.010 ††	
19 or younger	1,837	92.3	85.1	7.2 ***	<0.001		
20 to 23	1,153	87.6	76.7	11.0 ***	<0.001		
24 or older	845	84.1	66.0	18.1 ***	<0.001		
Total sample size	3,835						

(continued)

Table 3.4 (continued)

Characteristic	Sample Size	Enrollment (%)			P-Value for Difference	P-Value for Difference	P-Value for Differential for Estimated Effects
		Program Group	Control Group	Difference			
Race/ethnicity ^a						0.003	†††
Hispanic	1,391	90.8	74.2	16.6	***	<0.001	
White	224	88.4	82.3	6.1		0.294	
Black	985	87.3	80.6	6.8	**	0.010	
Asian or Pacific Islander	330	88.9	86.2	2.8		0.570	
Other ^b	249	84.9	83.5	1.3		0.815	
Total sample size	3,179						
Prior education						0.523	
High school diploma	2,641	90.2	81.3	9.0	***	<0.001	
High school equivalency	497	83.3	71.4	12.0	***	0.007	
Total sample size	3,138						
Cohort						0.011	††
Fall	1,556	89.5	83.2	6.3	***	0.002	
Spring	2,279	88.7	75.7	13.0	***	<0.001	
Total sample size	3,835						

SOURCES: MDRC calculations using CUNY Start application data, MDRC random assignment data, data from CUNY's Institutional Research Database, CUNY Start program participation data, and test data from CUNY's Administrative Data Warehouse.

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.

A two-tailed t-test was applied to differences between research groups. Statistical significance levels are indicated as: *** = 1 percent, ** = 5 percent, * = 10 percent. See Appendix E for details on the impact-estimation model.

A two-tailed t-test was applied to differences in impacts between or among subgroups. Statistical significance levels are indicated as: ††† = 1 percent; †† = 5 percent; † = 10 percent.

^aRespondents who selected Hispanic for their ethnicity and chose another racial category are included only in the Hispanic category. Respondents who did not select Hispanic for their ethnicity and chose more than one racial category are included in the Other category.

^bOther includes "multiracial," "Native American/Alaskan Native," and other racial/ethnic categories.

Variation in Effects on College Readiness by the End of the Program Semester

CUNY Start's effect on college readiness is positive for each subgroup of students. This section focuses on the extent to which those effects are particularly large by certain subgroups of students.

CUNY Start's effect on college readiness was expected to be greater than average among students who intended to participate in the full-time CUNY Start program. By participating in the full-time program, students have the possibility of becoming college-ready in all three subject areas, whereas students in the part-time program can become college-ready in only one or two subject areas. Additionally, the full-time program requires nearly twice as many class hours per week (up to 26.5 hours) as the part-time program (13.5 hours), and that additional class time was expected to yield greater progress through developmental education.

Triple-remedial students can complete developmental education requirements in up to three subject areas, compared with just one or two subject areas for students who were already college-ready in one or two subject areas before random assignment. Thus, triple-remedial students were also expected to experience greater-than-average effects on progress through developmental education. Because triple-remedial students are disproportionately represented in the full-time CUNY Start program, these two factors (that is, being triple remedial and intending to participate in the full-time CUNY Start program) are related.

Finally, effects on college readiness were expected to vary by college due to differences in the types of students attending the colleges (including the amount of remediation they required), the program's implementation at the colleges, and the alternative services available to students at the colleges.

Table 3.5 shows the results of the subgroup analyses with respect to the average number of subject areas in which students were college-ready by the end of the program semester. As predicted, CUNY Start's effect on college readiness is larger among students who intended to participate in the full-time CUNY Start program than it is among those who intended to participate in the part-time program. By the end of the program semester, program group students who intended to participate in the full-time CUNY Start program were college-ready in 1.87 subject areas out of 3 on average, an estimated 0.64 subject areas more than control group students who intended to participate in the full-time program. This effect is more than twice as large as the effect among students who intended to participate in the part-time program (0.27 subject areas). Similarly, as expected, CUNY Start's effects on college readiness are larger among triple-remedial students (0.62 subject areas) than among students who were already college-ready in one or two subject areas (0.37 subject areas).

Table 3.5
Number of College-Ready Subject Areas (Out of 3) by the End of the Program Semester, by Subgroup

Characteristic	Sample Size	Average Number of College-Ready Subject Areas			P-Value for Difference	P-Value for Difference	P-Value for Differential for Estimated Effects	
		Program Group	Control Group	Difference				
Intended CUNY Start program						<0.001	†††	
Part-time	1,480	1.87	1.60	0.27 ***	<0.001			
Full-time	2,355	1.87	1.24	0.64 ***	<0.001			
Total sample size	3,835							
Number of college-ready subject areas at random assignment						<0.001	†††	
Zero	1,935	1.47	0.85	0.62 ***	<0.001			
One or two	1,859	2.30	1.93	0.37 ***	<0.001			
Total sample size	3,794							
Intended college						<0.001	†††	
College A	1,167	2.01	1.58	0.43 ***	<0.001			
College B	440	1.97	1.09	0.88 ***	<0.001			
College C	632	1.92	1.59	0.33 ***	<0.001			
College D	1,596	1.74	1.22	0.52 ***	<0.001			
Total sample size	3,835							
Gender						0.060	†	
Female	1,840	1.90	1.48	0.42 ***	<0.001			
Male	1,434	1.84	1.28	0.57 ***	<0.001			
Total sample size	3,274							
Age						0.090	†	
19 or younger	1,837	2.04	1.47	0.58 ***	<0.001			
20 to 23	1,153	1.73	1.27	0.46 ***	<0.001			
24 or older	845	1.72	1.32	0.39 ***	<0.001			
Total sample size	3,835							

(continued)

Table 3.5 (continued)

Characteristic	Sample Size	Average Number of College-Ready Subject Areas				P-Value for Difference	P-Value for Differential for Estimated Effects
		Program Group	Control Group	Difference	Significance		
Race/ethnicity^a							0.642
Hispanic	1,391	1.91	1.36	0.55	***	<0.001	
White	224	2.01	1.69	0.32	**	0.035	
Black	985	1.78	1.30	0.48	***	<0.001	
Asian or Pacific Islander	330	1.93	1.50	0.43	***	0.002	
Other ^b	249	1.53	1.14	0.39	***	0.003	
Total sample size	3,179						
Prior education							0.245
High school diploma	2,641	1.91	1.39	0.51	***	<0.001	
High school equivalency	497	1.75	1.36	0.39	***	<0.001	
Total sample size	3,138						
Cohort							0.881
Fall	1,556	1.94	1.44	0.49	***	<0.001	
Spring	2,279	1.83	1.33	0.50	***	<0.001	
Total sample size	3,835						

SOURCES: MDRC calculations using CUNY Start application data, MDRC random assignment data, data from CUNY's Institutional Research Database, and test data from CUNY's Administrative Data Warehouse.

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.

A two-tailed t-test was applied to differences between research groups. Statistical significance levels are indicated as: *** = 1 percent, ** = 5 percent, * = 10 percent. See Appendix E for details on the impact-estimation model.

A two-tailed t-test was applied to differences in impacts between or among subgroups. Statistical significance levels are indicated as: ††† = 1 percent; †† = 5 percent; † = 10 percent.

^aRespondents who selected Hispanic for their ethnicity and chose another racial category are included only in the Hispanic category. Respondents who did not select Hispanic for their ethnicity and chose more than one racial category are included in the Other category.

^bOther includes "multiracial," "Native American/Alaskan Native," and other racial/ethnic categories.

The third panel of Table 3.5 shows progress through developmental education by college. The effects vary substantially by college, ranging from 0.33 to 0.88 subject areas. College B (with the largest effect estimate) is the only college that did not offer the part-time CUNY Start program, and compared with the other three colleges, College B served a much higher proportion of triple-remedial students (about 80 percent of students). As discussed above, both characteristics were found to be related to larger-than-average effects on progress through developmental education.

The remaining panels of Table 3.5 show the estimated effects on progress through developmental education across several student demographic characteristics. CUNY Start's effects were larger among male students than among female students. The effects were also larger among younger students than older students, the opposite of the variation of the effect on enrollment discussed earlier.²⁰ Notably, the effect on progress through developmental education did not vary by race/ethnicity, prior education, or semester of enrollment, characteristics that are associated with educational achievement gaps.

Variation in College-Level Credit Accumulation

CUNY Start's effect on initial college-level credit accumulation is negative for each subgroup of students and at all institutions examined. This section focuses on the extent to which those effects are more or less negative for certain subgroups of students. Because program group students were expected to attempt and earn zero college-level credits, the expectations for the control group dictated the hypotheses concerning which subgroups would fall farthest behind.

There was no clear-cut hypothesis about whether intending to participate in the full-time program would influence CUNY Start's effects on college-level credit accumulation.²¹ The program's effects were expected to be larger than average among students who were college-ready in one or two subject areas before random assignment, because when those students were assigned to the control group, they were expected to register for more college-level courses than triple-remedial students. As with college readiness, college-level credit accumulation can be expected to vary by college due to differences in the student populations and the services the colleges offered. Results from the subgroup analyses on CUNY Start's effect on college-level credit accumulation are shown in Table 3.6.

²⁰This difference may be due in part to the fact that, among program group students, a smaller proportion of older students enrolled than younger students.

²¹On the one hand, it was hypothesized that students who intended to participate in the full-time CUNY Start program and were assigned to the control group would register for more credits than students who intended to participate in the part-time program and were assigned to the control group. This expectation would lead one to predict that CUNY Start's effects on college-level credits earned would be larger than average among students who intended to participate in the full-time program. On the other hand, students intending to participate in the part-time program were also expected to have more college-level classes available to them, because they had fewer developmental education requirements at the start of the study than full-time students did.

In the absence of CUNY Start, students who intended to participate in the part-time CUNY Start program earned more college-level credits than students who intended to participate in the full-time program (as shown in the first panel). Control group students who intended to participate in the part-time CUNY Start program earned 3.1 college-level credits, on average, compared with 0.8 earned by similar program group students, an estimated effect of -2.3 credits. Among those intending to participate in the full-time CUNY Start program, control group students earned 2.1 college-level credits on average, compared with 0.4 earned by those in the program group, an estimated effect of -1.6 credits. The result occurred, in part, because a large percentage of control group students who intended to participate in the part-time CUNY Start program actually registered for a full-time course load when assigned to the control group.

Taken together, the results indicate that even though CUNY Start had similar effects on enrollment by intended participation intensity (that is, by intent to participate in the full-time or part-time CUNY Start program), students who intended to participate in the full-time program saw greater gains in college readiness and smaller losses of college-level credit accumulation than students who intended to participate in the part-time program. Thus, in the short term, CUNY Start appears more promising for students who intended to participate in the full-time CUNY Start program.

CUNY Start also had different effects on college-level credit accumulation among triple-remedial students than it did among students with fewer developmental education requirements. As expected, students in the program group earned few college-level credits regardless of their college readiness before random assignment. However, students in the control group earned more college-level credits if they were college-ready in one or two developmental subject areas when they were randomly assigned than they did if they were college-ready in none. CUNY Start therefore appears to be quite favorable for triple-remedial students in the short term. The story is more complex for students who were college-ready in one or two subject areas: The program's effects on progress through developmental education are positive, but these students missed the opportunity of earning a larger-than-average number of college-level credits.

The estimated effects on college-level credit accumulation also vary substantially by college. Most of the variation is caused by differences in credit accumulation among the control group students at the colleges, as program group students generally earned very few college-level credits. In the most extreme example, at College C control group students earned an average of 5.8 college-level credits, which resulted in a 4.6 college-level-credit deficit for program group students.

Table 3.6
College-Level Credits Earned by the End of the Program Semester,
by Subgroup

Characteristic	Sample Size	Average College-Level Credits Earned				P-Value for Difference	P-Value for Differential for Estimated Effects	
		Program Group	Control Group	Difference	***			
Intended CUNY Start program							0.002	††
Part-time	1,480	0.8	3.1	-2.3	***	<0.001		
Full-time	2,355	0.4	2.1	-1.6	***	<0.001		
Total sample size	3,835							
Number of college-ready subject areas at random assignment							<0.001	†††
Zero	1,935	0.2	1.4	-1.2	***	<0.001		
One or two	1,859	0.9	3.5	-2.5	***	<0.001		
Total sample size	3,794							
Intended college							<0.001	†††
College A	1,167	0.7	2.5	-1.8	***	<0.001		
College B	440	0.1	2.1	-2.0	***	<0.001		
College C	632	1.3	5.8	-4.6	***	<0.001		
College D	1,596	0.4	1.2	-0.8	***	<0.001		
Total sample size	3,835							
Gender							0.727	
Female	1,840	0.6	2.5	-1.9	***	<0.001		
Male	1,434	0.5	2.5	-1.9	***	<0.001		
Total sample size	3,274							
Age							0.018	††
19 or younger	1,837	0.7	2.8	-2.1	***	<0.001		
20 to 23	1,153	0.5	2.2	-1.7	***	<0.001		
24 or older	845	0.4	1.9	-1.5	***	<0.001		
Total sample size	3,835							

(continued)

Table 3.6 (continued)

Characteristic	Sample Size	Average College-Level Credits Earned			P-Value for Difference	P-Value for Difference	P-Value for Differential Effects
		Program Group	Control Group	Difference			
Race/ethnicity^a							<0.001 †††
Hispanic	1,391	0.6	2.0	-1.4	***	<0.001	
White	224	0.8	4.0	-3.2	***	<0.001	
Black	985	0.6	2.6	-2.0	***	<0.001	
Asian or Pacific Islander	330	0.6	3.1	-2.6	***	<0.001	
Other ^b	249	0.4	2.4	-2.0	***	<0.001	
Total sample size	3,179						
Prior education							0.004 †††
High school diploma	2,641	0.5	2.6	-2.0	***	<0.001	
High school equivalency	497	0.6	1.8	-1.2	***	<0.001	
Total sample size	3,138						
Cohort							0.043 ††
Fall	1,556	0.8	2.9	-2.1	***	<0.001	
Spring	2,279	0.4	2.1	-1.7	***	<0.001	
Total sample size	3,835						

SOURCES: MDRC calculations using CUNY Start application data, MDRC random assignment data, data from CUNY's Institutional Research Database, and test data from CUNY's Administrative Data Warehouse.

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.

A two-tailed t-test was applied to differences between research groups. Statistical significance levels are indicated as: *** = 1 percent, ** = 5 percent, * = 10 percent. See Appendix E for details on the impact-estimation model.

A two-tailed t-test was applied to differences in impacts between or among subgroups. Statistical significance levels are indicated as: ††† = 1 percent; †† = 5 percent; † = 10 percent.

^aRespondents who selected Hispanic for their ethnicity and chose another racial category are included only in the Hispanic category. Respondents who did not select Hispanic for their ethnicity and chose more than one racial category are included in the Other category.

^bOther includes "multiracial," "Native American/Alaskan Native," and other racial/ethnic categories.

Several factors could be influencing this variation in college-level credit accumulation across the colleges. First, the four colleges serve different types of students who may have responded differently to the mix of non-CUNY Start services available at their colleges. Second, the colleges offer students different non-CUNY Start options and, for example, have different approaches to student advising. Whether their decisions can be attributed to the types of non-CUNY Start services available at College C, or to the advising strategies employed there, control group students at this college took substantially more total credits (college-level and developmental education) than control group students at the other colleges. In fact, control group students at College C attempted by far the *most* college-level credits and the *fewest* developmental education credits, even though study students at College C did not have the fewest developmental education requirements compared with study students at the other colleges. This finding suggests that something about regular course enrollment patterns at College C may be influencing the high level of college-level credit accumulation among the control group at this college.

The effects on college-level credit accumulation vary substantially across most of the student demographic characteristics and, as seen in the other subgroups, this variation is largely associated with fluctuations in control group students' credit accumulation. CUNY Start's effects on college-level credit accumulation are more negative among younger students than older students; coupled with the larger effect on college readiness, this finding suggests that the trade-off of focusing on college readiness in exchange for fewer college-level credits is more dramatic for younger students than older students. The effect on college-level credit accumulation also varied significantly depending on students' races/ethnicities, prior education, and entering semester, and this variation matches expectations based on known student risk factors and educational achievement gaps. For example, while all program group students earned roughly comparable numbers of college-level credits regardless of their races/ethnicities, white and Asian or Pacific Islander students in the control group earned more credits (4.0 and 3.1, respectively) than Hispanic, black, or other students (who earned between 2.0 and 2.6 credits). Since there was no discernable variation in effects on college readiness by race, and since Hispanic and black students fell the least behind in college-level credits, CUNY Start may be able to help Hispanic and black students the most. The results for prior education and entering semester tell similar stories.

At this point, the subgroup analyses present an early view of the types of students for whom or the types of circumstances in which CUNY Start may work better. As with the main results, long-term follow-up data are essential to understand how the trade-off of focusing on college readiness in place of short-term college-level credit accumulation will play out.

Chapter 4

Conclusion

CUNY Start is an innovative approach to addressing the challenges faced by community colleges seeking to meet the needs of underprepared students. Many developmental education reforms aim to improve students' experiences in the traditional, multicourse developmental sequence most colleges offer. CUNY Start makes broader changes to the student experience than these other reforms. The program increases the amount of time spent on developing skills during a single semester; uses curricula that align with research-based practices in math, reading, and writing instruction for adults and older adolescents; employs teaching methods based on active learning; and includes many forms of student academic support. Students only pay \$75 for the program, including the course materials, and do not use their financial aid. Additionally, CUNY Start recruits instructors with content and pedagogical knowledge and provides them with hands-on training during an apprenticeship period, and with professional development thereafter.

Summary of Findings

This evaluation finds that CUNY Start was generally implemented as its designers intended. Math instructors followed the curriculum and pedagogy most of the time. They typically taught the prescribed content at the pace required, used the assignments and assessments provided, and applied the prescribed instructional techniques. Reading/writing instructors also followed the specified curriculum and pedagogy, but the reading/writing curriculum had some flexibility built into it, with instructors free to add readings and assignments. CUNY Start gave students enhanced support: a college success seminar taught by an adviser that focused on developing skills to succeed in both the academic and nonacademic aspects of college, advisers with reduced caseloads, and additional forms of academic support inside and outside of class. Finally, instructor job applicants were evaluated on their preparation to teach reading, writing, or math and on their willingness to implement CUNY Start's curriculum and student-centered pedagogy. Most instructors participated in the apprenticeship period before teaching their own classes, as expected, and received professional development in the form of workshops sponsored by CUNY Central and in the form of comments on their instruction following regular classroom observations.

CUNY Start differs from the standard developmental education that control group students received in its structure, curriculum, pedagogy, student support services, and staffing and training. CUNY Start classes met more frequently. The math curriculum differed substantially from traditional developmental math courses in a few ways: It was standardized across the colleges, focused on providing a conceptual understanding of math, and incorporated academic skill-building activities. CUNY Start's math pedagogy employed more active learning than did

non-CUNY Start courses, in which non-CUNY Start instructors typically spent a greater proportion of class time lecturing.

The reading/writing curriculum shared some learning objectives with traditional developmental reading and writing courses, but the two remediation approaches had important differences. Most notably, developmental reading and developmental writing were integrated into a single course for CUNY Start, while at three out of the four study colleges developmental reading and developmental writing courses are taught separately. CUNY Start systematically combines reading and writing, which reinforces the relationship between the two by using tools such as metacognitive logs and discussion journals; this approach allows students to move more quickly through their developmental education requirements in these subject areas. Both CUNY Start reading/writing and traditional developmental education courses in these subject areas tended to take a student-centered instructional approach, though there is some indication that non-CUNY Start instructors also spent more class time lecturing.

Student support services for control group students typically were not integrated closely into the classroom experience, so students often needed to apply more initiative to take advantage of advising and tutoring services. Furthermore, control group students generally were not required to attend college success seminars; for those who did, the topics covered differed depending on a student's college and program. CUNY Start instructors came from a variety of professional backgrounds and generally had fewer advanced degrees than non-CUNY Start instructors, a higher proportion of whom had PhDs. Non-CUNY Start instructors, however, had less access to personalized and sustained professional development.

The short-term results on CUNY Start's effects show that the program is meeting its goal of enabling students to complete or reduce substantially their developmental education requirements within one semester, particularly in math. At this point, data are only available from the end of the program semester and the beginning of the first postprogram semester. By design, students in CUNY Start are asked to make a trade-off: to make a greater priority of developmental education requirements than college-level credit accumulation in the short term, with the assumption that they will be better prepared for college before they matriculate and thereby better set up for success once in college. It was expected, therefore, that their peers in the control group would accumulate more college-level credits in the short term. Indeed, they did. During the program semester, students in the control group made less progress in developmental education than program group students and instead earned some college-level credits.

Across all subgroups examined, this same pattern holds: Program group students became college-ready in more subject areas during the program semester while earning fewer college-level credits than similar control group students. However, the current evidence suggests that the one-semester trade-off may favor particular types of students more than others, including those

planning to participate in the full-time CUNY Start program and those who were assessed as needing remediation in all three subject areas.

Implications of the Findings

Community colleges and policymakers have recognized for many years that developmental education requirements are among students' greatest barriers to graduation. Within the span of one semester, CUNY Start enabled students to make substantial progress through developmental education — more progress than has been seen in most other developmental education reforms that have been evaluated in randomized controlled trials.¹ It is noteworthy that a pre-matriculation program like CUNY Start can produce such substantial results on progress through developmental education in a single semester. The effects in math are especially striking, since developmental math requirements, in particular, prevent many students from earning degrees.² Furthermore, by enabling students to make substantial progress in or complete their developmental education requirements, CUNY Start can help them maintain their financial aid eligibility by allowing them to avoid repeating noncredit courses (which can affect their ability to meet Satisfactory Academic Progress [SAP] standards) or use up their available semesters of federal Pell Grant funds.

CUNY Start's short-term success is also remarkable given that the program actively targets students with substantial developmental education requirements. In contrast, other successful developmental education reforms that are currently gaining traction, such as corequisite remediation (which combines developmental education, college-level courses, and academic support into a single course), are often unavailable to students with the lowest levels of skill in a subject area.³

While these results are promising, it is important to consider whether or not they apply more broadly. The specific findings reported here apply only to the research sample. The study included a particular group of students who were interested in the possibility of CUNY Start. Students interested in the full-time program indicated that they could dedicate up to 26.5 hours of time to classes per week, far more hours than are spent in class by many community college students. Even students interested in the part-time program indicated that they could dedicate 13.5 hours to classes per week. Some students in the control group, on the other hand, who are relying on standard developmental education courses, may end up spending more total time on their developmental education across multiple semesters if they need to take more than one course in a

¹See, for example, Logue, Watanabe-Rose, and Douglas (2016); Scrivener et al. (2015); and Zachry Rutschow and Schneider (2011).

²Attewell, Lavin, Domina, and Levey (2006).

³See, for example, Logue, Watanabe-Rose, and Douglas (2016).

subject area or have to repeat courses. The concentration of class time may be one of the keys to CUNY Start's sizable effect on progress through developmental education, and yet this same aspect may be a barrier to participation for students who are balancing several commitments in addition to their education and cannot dedicate the required amount of time in a single semester. More research is needed to determine whether the program would be the right fit for the broader population of students who require developmental education.

Furthermore, the study occurred within the particular context of four community colleges in the CUNY system. The colleges are located in a large, urban setting and have a racially diverse mix of students. Additionally, during the period discussed in this report, CUNY required students to pass tests to exit developmental education, while many other community colleges have different policies. It is uncertain whether the barriers to student success and CUNY Start's approaches to addressing these barriers can be applied in other community college contexts.

Nonetheless, these findings suggest that with the right mix of reforms, students with a variety of developmental requirements — including those with substantial requirements in one or more subject areas — can make a considerable amount of progress. It is not known whether specific components of the CUNY Start model made more of a difference in students' experience and progress than others. One could argue that increased time spent on the developmental disciplines in a compressed time frame may help students focus their learning and gain the subject skills more quickly.

At the same time, the increased intensity of the program cannot be separated from the curricular and pedagogical reforms. The sizable effect on the percentage of students who became college-ready in math compared with the smaller but still meaningful effect on the percentage of students who became college-ready in reading and writing may indicate that certain components of the model simply produce more dramatic effects in math. The larger effect on math completion may also be because there are greater differences in math curriculum and pedagogy between CUNY Start and non-CUNY Start courses, whereas CUNY Start and non-CUNY Start reading and writing curriculum and pedagogy shared some techniques and principles. Among members of the study research sample, CUNY Start also had more room to produce larger effects in math than in reading and writing, as the vast majority of study students (over 90 percent) required at least some remediation in math at the start of the study and many may have needed to take more than one developmental math class. In contrast, more students were assessed as college-ready in reading, writing, or both at the start of the study.

The student support services are also important to keep in mind, as they affect how students seek out guidance on succeeding in a course or navigating through college. In particular, the lower student-to-adviser ratio and integrated student services in CUNY Start allowed staff members to pay more attention to individual students and potentially to intervene more quickly

when students encountered obstacles. The changes to instructor recruitment and professional development also inevitably inform the experiences students have in the classroom and outside of it.

Though the effects on progress through developmental education are impressive, it remains an open question how the trade-off of making a greater priority of developmental education over college-level credit accumulation in the short term will play out in the long term. The program theorizes that if it can improve students' college readiness in math, reading, and writing, and help them develop as learners before they matriculate, students will be better prepared and make greater progress toward their degrees in subsequent terms. Given the limited amount of follow-up data currently available in this evaluation, at this point it is only certain that the trade-off of developmental education over college-level credit accumulation took place. In subsequent semesters, program and control group students may continue to make progress through developmental education and earn college-level credits. Since CUNY Start compressed the amount of time students needed to complete developmental requirements to one semester, it is possible that some control group students will begin to catch up to program group students in terms of college readiness, while other control group students who put off completing their developmental education requirements may be unable to enroll in additional college-level courses. Follow-up data must be collected over a longer period to see whether students in the program group persist in college, catch up with the control group in college-level credit accumulation, and, most important, surpass them in graduation rates.

In the larger context of developmental education reform, CUNY Start is one program with remarkable short-term results. Understanding whether the trade-offs CUNY Start offers to students results in long-term educational gains will be another valuable piece of evidence regarding what strategies can help some of the lowest-performing students succeed in their long-term academic goals. For example, if CUNY Start's effects on students' academic progress are sustained through graduation, the program could serve as a useful option for students with substantial developmental requirements, particularly triple-remedial students, who currently have stubbornly low graduation rates.

Future Research

The research collaboration among MDRC, the Community College Research Center, and CUNY will continue to share results and guidance for the field from this evaluation. MDRC will follow the academic progress of students in this study for at least two years after they enrolled in the study to measure their longer-term educational outcomes. The team will also explore CUNY Start's costs and cost-effectiveness, which will be useful in determining the program's relevance outside the CUNY context. A final report presenting longer-term effects and cost-effectiveness is scheduled to be published in 2020. In addition, the Community College Research Center will

publish two topical papers focusing on CUNY Start's math curriculum and pedagogy and CUNY Start's staffing and professional development model. Finally, CUNY will develop a toolkit on CUNY Start best practices, with a focus on CUNY's internal use of data for program management and evaluation.

Appendix A

Students' Baseline Characteristics

Student characteristics at the time of random assignment come primarily from two main data sources: test data from the City University of New York's (CUNY's) Administrative Data Warehouse and student responses on the CUNY Start application. Before random assignment, each student was asked to fill out a CUNY Start application. However, several student applications were not collected or completed until after random assignment. To avoid bias in the collection of application forms after random assignment (for example, collecting more application forms from program group members after random assignment than control group members because program group members were in CUNY Start and could be tracked), only data from applications collected before random assignment were used in any of the statistical analyses presented in this report. As a result, data from the CUNY Start application are missing for 14 percent of the study sample. Table 1.2, which provides *descriptive* information on the research sample, shows percentages among those with CUNY Start application data, including those sample members who only submitted their applications after random assignment, whereas Appendix Table A.1 shows percentages among the full sample and *only* includes data from applications collected before random assignment.

Test data from CUNY's Administrative Data Warehouse are handled similarly, with a few differences. Pre-random assignment test data are used to determine students' developmental education requirements at the start of the study. Some students took placement or exit tests in the time after they were randomly assigned and before the start of their program semester; again, to avoid bias, these test results are considered as follow-up data and not baseline data. Students who are missing pre-random assignment test data for a subject area are assumed to require remediation in that subject area.

The goal of random assignment is to have relatively similar students in the study's program and control groups. A few tests were conducted to confirm whether the program and control group students were truly similar. The first of these is shown in Appendix Table A.1: The proportion of students with particular characteristics is shown for the program and control group, and the differences between the groups are tested to see if any are statistically significant. The only characteristic with a statistically significant difference (at the 10 percent level) is the number of hours worked among those employed (note that the difference between the two groups in employment rates was not significant). Given the number of tests that were run, one statistically significant finding is not surprising. Second, an omnibus F-test was conducted to see whether students' baseline characteristics were jointly predictive of students' random assignment status. Logistic regression was used for this analysis, where the outcome was students' random assignment status and the predictors were the student characteristics. The result from this test was not statistically significant, with a p-value of 0.885. Finally, a comparison between the program and control groups shows that the magnitude of any of the differences in baseline characteristics is small (rarely exceeding 3 percentage points). Taken together, this information demonstrates the similarity of the program and control groups at the start of the study.

Appendix Table A.1

Baseline Characteristics of the Evaluation Sample, by Research Group

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)

Appendix Table A.1 (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
Is currently employed	41.7	42.6	-0.9	
Is not currently employed	43.6	43.6	0.0	
Missing	14.7	13.7	0.9	

(continued)

Appendix Table A.1 (continued)

Characteristic (%)	Program Group	Control Group	Difference	P-Value
Among those currently employed:				
Number of hours worked per week				0.101
1-10	9.6	10.2	-0.6	
11-20	20.8	14.4	6.4	
21-30	23.2	27.1	-3.9	
31-40	28.6	28.0	0.6	
More than 40	4.3	4.1	0.2	
Missing	13.5	16.2	-2.7	
Family education				
Is the first person in the family to attend college	29.0	28.8	0.2	0.992
Is not the first person in the family to attend college	53.6	53.8	-0.3	
Missing	17.5	17.4	0.1	
Highest diploma or degree earned by the parent with the most education				
Not a high school graduate	14.2	12.5	1.7	0.492
High school diploma or equivalent	22.3	20.7	1.6	
Some college (but not a 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
High school equivalent	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 equivalent				
During the past year	61.8	62.3	-0.5	0.937
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)

Appendix Table A.1 (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
Has attended college previously	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 the 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 student hopes to achieve				0.844
Some college (but not a degree)	0.4	0.3	0.1	
Associate's degree	10.3	10.9	-0.6	
Bachelor's degree	45.7	45.2	0.5	
Postgraduate or professional degree	20.4	21.6	-1.2	
Missing	23.2	22.1	1.1	
Sample size (total = 3,835)	2,997	838		

(continued)

Appendix Table A.1 (continued)

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 ($p = 0.885$).

^aRespondents 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 racial category are included in the Other category.

^bOther includes "multiracial," "Native American/Alaskan Native," and other racial/ethnic categories.

^cDistributions do not add to 100 percent because categories are not mutually exclusive.

^dNontraditional students are defined as those who were 24 or older, who worked 35 or more hours per week, who had children, or who had not received a high school diploma and who 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 are missing data on two or more of these characteristics and have no other nontraditional characteristic.

Appendix B

Data Sources

The analyses in this report rely on multiple data sources, described below.

Chapter 1

- **CUNY Start application.** Just before students were randomly assigned, they were asked to complete the CUNY Start application, which includes demographic and other background information. These data are used in Chapter 1 to describe the evaluation sample. The data are also used in Chapter 3 to define subgroups of students.

Chapter 2

- **Interviews and focus groups.** In the spring 2015, fall 2015, and spring 2016 semesters, staff members from the Community College Research Center (CCRC) conducted interviews with CUNY Start and non-CUNY Start administrators, instructors, advisers, tutors, and students, as well as with the CUNY Start professional development staff. In all, CCRC conducted 134 interviews. The interviews provided detailed information on the operation of CUNY Start and information about the service contrast between CUNY Start and standard college courses and services.
- **Classroom observations.** In the spring 2015, fall 2015, and spring 2016 semesters, CCRC and MDRC staff members conducted structured observations of CUNY Start and standard developmental math, reading, and writing courses. In total, the research team observed 23 math classes and 23 reading/writing classes. Two researchers observed each class and used a structured protocol to record course format, pedagogical approaches, curricular components, and student engagement at five-minute intervals. Staff members also observed 7 CUNY Start college success seminars.
- **CUNY Start professional development observations.** In the summer 2015 and fall 2015 semesters CCRC and MDRC staff members conducted observations of CUNY Start professional development training sessions and workshops.
- **CUNY Start curricula and other documents.** The City University of New York (CUNY) provided CCRC with documents that describe in detail CUNY Start's math and reading/writing curricula, as well as documents describing CUNY Start's core values. The documents provided detailed information about the content and approaches of CUNY Start's courses.

- **Course syllabi.** CUNY Start staff members provided CCRC with syllabi from CUNY Start math and reading/writing classes. Departments provided CCRC with syllabi from 7 standard developmental math courses across three of the colleges in the evaluation and 10 standard developmental reading and writing courses across all four of the colleges. The syllabi provided information about how the courses were structured, what topics were covered, and assignments and expectations for students.
- **Student survey.** A survey was administered to some students in the evaluation sample during their first semester in the evaluation — all of the control group members and 67 percent of the program group members.¹ The survey was administered in the spring 2015, fall 2015, and spring 2016 semesters. It was initially administered online; students who did not respond were called on the phone. In the end, 75 percent of the students in the targeted sample completed the survey — 75 percent of the targeted program group members and 75 percent of the control group members. As is described in Appendix D, program group and control group students who completed the survey were similar. The survey covered topics such as sample members’ participation in and experiences with student services; experiences in math, reading, and writing classrooms; and expectations about and engagement in college. Findings from the student survey are used in Chapter 2 to help describe CUNY Start and the service contrast between CUNY Start and standard college courses and services.
- **Instructor survey.** During the spring 2015, fall 2015, and spring 2016 semesters, a survey was administered to all CUNY Start instructors who had completed the apprenticeship semester (66 instructors) and a random sample of 276 standard developmental education instructors at the four colleges in the evaluation.² The survey was initially administered online; instructors who did not respond were called on the phone. In the end, 63 percent of the instructors who were targeted for the survey completed it — 86 percent of the targeted CUNY Start instructors and 58 percent of the targeted standard developmental education (or “non-CUNY Start”) instructors. As is described in Appendix D,

¹Survey fielding started within a few weeks of the end of random assignment. A few control group students were *not* given the survey because informed consent forms had not yet been collected from them. Once informed consent forms were obtained it was too late to include these students in the survey, but they are included in the outcome analyses in Chapter 3.

²On the survey, 4 instructors identified as CUNY Start instructors and 11 instructors identified as standard developmental education instructors said they did not teach courses in the semester in which they were administered the survey. They were excluded from all analyses, samples, and response-rate calculations.

because of the low response rate, the survey results for the non-CUNY Start instructors should be interpreted cautiously; it is quite possible that non-CUNY Start survey respondents are not representative of all non-CUNY Start instructors. The survey covered topics such as the instructors' backgrounds, the curricula and teaching methods used in their courses, and their experiences with professional development. Findings from the instructor survey are used in Chapter 2 to help describe CUNY Start and the service contrast between CUNY Start and standard college courses and services.

Chapter 3

- **CUNY student transcript data.** CUNY provided MDRC with information on the courses students took at the four colleges in the study and all the other colleges in the CUNY system. Transcript data from CUNY's Institutional Research Database are available for all sample members for the semester after random assignment (the "program semester") and through registration for the following semester (the "postprogram semester"). The postprogram semester registration data are preliminary and subject to change once final data (with grades) become available. Transcript data are used in Chapter 3 to provide a detailed look at CUNY Start's effects on students' academic outcomes.
- **CUNY Start program participation data.** CUNY provided MDRC with information on sample members' participation in CUNY Start. These data are collected and maintained by the CUNY Office of Research, Evaluation, and Program Support, which provides data support to CUNY Start and conducts ongoing evaluation of the program.
- **Test data.** CUNY provided data from its Administrative Data Warehouse on various tests that sample members took. Students at CUNY's colleges can demonstrate that they are prepared for college-level courses in a number of ways. Before they begin classes, students can take tests administered by CUNY in math, reading, and writing (known as the CUNY Assessment Tests, or CAT, and referred to in this report as "placement tests"). At the start of the study, the math and reading placement tests were COMPASS tests. In October 2016, CUNY began using ACCUPLACER rather than COMPASS. The writing placement test, called the CUNY Assessment Test in writing, was created by CUNY. Students can also submit New York Regents exam scores and SAT scores to provide evidence of college readiness. Regents exams are statewide standardized exams in core high school subjects. Students with high enough Regents exam scores or SAT scores are placed directly into college-level

courses.³ Finally, the individual colleges can grant exemptions on a case-by-case basis to allow students to take college-level courses in a given subject area, though such exemptions are very rarely granted.

During the period covered in this report, students in developmental education courses were generally required to pass tests to demonstrate their proficiency (referred to in this report as “exit tests”).⁴ For reading and writing, the same tests were used for placement and exit. For math, the exit test is the CUNY Elementary Algebra Final Exam (CEAFE), created by CUNY.

Test data are used in Chapter 3 to gauge students’ progress through developmental education and to define subgroups of students.

³Depending on the version of the Regents exam submitted, CUNY may not only need to see that students achieved a high enough score on the exam but may also analyze information from students’ applications to determine whether they passed certain qualifying high school math classes.

⁴There were a few exceptions. For example, students taking particular workshop classes may not have been required to take exit tests.

Appendix C

Implementation Research Methods

To complement the impact analyses, the implementation research aimed to answer the following research questions:

1. How is CUNY Start implemented?
2. To what degree is there fidelity to the CUNY Start model?
3. To what degree is there a service contrast between CUNY Start and the colleges' standard courses and services?

The implementation research was led by the Community College Research Center (CCRC) and conducted by experienced CCRC and MDRC researchers at the four City University of New York (CUNY) community colleges participating in the evaluation. The implementation research was designed to provide insight into CUNY Start's institutional context, describe fidelity to the model and the service contrast, and generate in-depth and detailed accounts of factors influencing fidelity and service contrast. In addition to the instructor survey and student survey (discussed in Appendix D), the research team conducted the following three qualitative data-collection activities. See Appendix Table C.1 for a summary of implementation research data-collection activities.

1. **Interviews and focus groups.** At each of the four evaluation colleges, researchers conducted interviews, focus groups, or both with CUNY Start instructors, non-CUNY Start developmental instructors, CUNY Start and non-CUNY Start advisers, academic support staff members, college administrators, CUNY Central administrators, and CUNY Start and non-CUNY Start students. Focus group and interview data were collected over three semesters using semistructured protocols that explored implementation topics in depth. Due to the large number of stakeholders on the control side and the smaller number of stakeholders involved with CUNY Start, the research team aimed to speak to all CUNY Start stakeholders except for students, who were randomly selected. Stakeholders across the control condition were identified by referrals from other participants and selected based on their roles and willingness to participate.
2. **Classroom observations.** Researchers conducted observations of courses and CUNY Start professional development sessions during three semesters of the study in order to better understand how the CUNY Start and traditional developmental education curricula and pedagogy were enacted. Classroom observations were conducted in a sample of CUNY Start math, reading/writing, and student seminar classes. Researchers also observed non-CUNY Start developmental math, reading, and writing classes at the four evaluation colleges to understand service contrast. Researchers identified potential classes based on a list of all classes being taught during

Appendix Table C.1

Implementation Research Data-Collection Totals

Research activity	CUNY Start	Non-CUNY Start	Total
<u>Observations</u>			
Math	14	9	23
Reading/writing	12	11	23
Seminar	6	-	6
<u>Instructor and department chair interviews</u>			
Math	10	10	20
Reading/writing	11	15	26
<u>Student interviews</u>			
Student focus groups	6	5	11
<u>Administrator and student success staff member interviews</u>			
Senior-level administrators	15	22	37
Tutors and other support staff members	15	12	27
<u>CUNY Central interviews</u>			
Senior-level administrators	-	-	5
Professional development providers	-	-	8

SOURCE: Community College Research Center field research data.

NOTE: CUNY Central interviewees serve students in both research groups.

that semester; classes were selected based on instructors' willingness to participate. When possible, researchers selected classes to observe in which the instructor also agreed to participate in an interview. Doing so allowed researchers to ask follow-up questions about what they observed during the class. Individual instructors were observed once during the study using an observation protocol created and pilot tested by the research team. Researchers kept a running record of classroom activities and, through a standardized observation protocol, documented the curricular content, pedagogical practices, and student engagement exhibited in a single class period. At five-minute intervals, researchers recorded the content, materials, instructional activity, pedagogy, and level of student engagement. The instructional-activities and peda-

gogy indicators drew from research on classroom practice and the CUNY Start instructional model. The instructional-activities categories included lesson set-up, introduction of a new topic, practice of topics, review of topics, assessment, and lesson wrap-up. The pedagogy categories included:

- a. **Instructor leads lecture:** Instructor is lecturing with little to no involvement from students.
- b. **Instructor leads interactive discussion:** Instructor is lecturing with frequent involvement from students.
- c. **Instructor facilitates interactive learning:** Instructor sets up a discussion in which students are the primary speakers. Instructor speaks less than 50 percent of the time.
- d. **Instructor initiates small-group work:** Instructor breaks students into groups with a task. Select this line only if instructor is NOT circulating and providing support.
- e. **Instructor provides support to small groups:** Instructor circulates class to check on each small group and assist them.
- f. **Instructor initiates individual work:** Instructor assigns a task for students to work on individually. Select this line only if instructor is NOT circulating and providing support.
- g. **Instructor provides support to individuals:** Instructor circulates class to check on each individual and assist him or her.
- h. **Students present prepared work:** Students present work that was prepared in advance. Includes formal presentations (for example, a culminating project) and less formal reporting (for example, groups report on their learning after a period of small-group work). Does NOT include impromptu student performance (for example, a student comes to the board to complete a math problem).
- i. **Pedagogy other:** Some other pedagogical practice not indicated in other categories.

Typically, two researchers conducted each observation, with one researcher responsible for the running record and the other responsible for the time-series protocol.

Researchers also conducted observations of CUNY Start professional development activities. For these observations, researchers used a running record. The professional development activities included planning sessions as well as workshops for staff members.

3. **Curricular review.** CCRC collected and reviewed curricular materials (for example, curriculum guides, lesson plans, syllabi, assignments, assessments, and student work), training materials, program descriptions, internal research, and policy documents from the CUNY Start central office and from all the evaluation colleges related to CUNY Start and CUNY's regular developmental education offerings. Researchers' aim was to understand the content and intent of various curricula as well as other factors that may have an impact on policy, practice, and academic outcomes.

Implementation research analysis was conducted by CCRC and organized according to the components of the CUNY Start program and its theory of change, with the goal of documenting the implementation of CUNY Start, assessing whether the program was implemented with fidelity to its model, and gauging the service contrast. These components include course offerings, academic and other support services for students, and recruitment and training processes for instructors. The student and instructor survey data were analyzed along with interview, focus group, and observation data, in order to examine variation between the program and control groups.

For interviews, focus groups, and the running record from the classroom observations, CCRC created a systematic process for managing, coding, and analyzing data. The coding process was intended to organize the interview and focus group data as well as the running-record section of the classroom observation data. The codes focused on broader topics within the data such as staff and instructor recruitment, pedagogy, curriculum, academic advising, and academic behaviors. Researchers were trained to apply codes consistently. The second round of coding provided a higher level of detail.

The analysis of data from interviews, focus groups, and classroom observation running records began by examining the data attached to each code to answer the research questions. The process was organized by the following categories: curriculum, pedagogy, student support, and staffing and training. For example, to understand how the math pedagogy was intended to be delivered, the researchers reviewed data collected from professional developers that were coded as "pedagogy" and "math." Researchers then read through the results to identify themes and conducted additional reviews when necessary. These data were then arranged by subtopic and researchers refined the themes before selecting illuminating quotes to be used when writing the report.

Survey responses were analyzed according to the construct in question. For example, survey items designed to address instructors' use of questioning were examined among program respondents for fidelity and compared between the program and control conditions to illuminate any service contrast. In most cases these data affirmed what was found in the qualitative data; however, discrepancies existed between instructor and student survey reports.

Finally, time-series data were coded by activity and length of time spent on the activity. These data were aggregated for math and reading/writing and for the program and control groups. They enabled the researchers to see whether they had observed the practices and concepts that instructors and students noted in their qualitative interviews and focus groups and on the survey.

Appendix D

**Student and Instructor Survey Documentation
and Analyses**

This appendix discusses the student and instructor surveys. For both surveys it provides information on survey fielding and response rates. For the student survey only, the appendix also discusses response bias analyses.

Student Survey

Survey Fielding and Respondent Sample

The student survey asked study participants (in the program and control groups) about a variety of topics including their experience with math and reading/writing courses and student services, as well as their engagement with school. Initially, students were sent multiple email messages encouraging them to complete the survey online. Later, students who did not complete the survey online were called on the phone to complete it in a computer-assisted telephone interview. Abt Associates led the fielding of the survey.

The survey was fielded to a stratified random sample of approximately two-thirds of all program group members ($n_{p-surveyed} = 1,985$) and to all control group members ($n_{c-surveyed} = 824$).¹ Fielding occurred during the first semester after a student was randomly assigned, starting around midway through the semester and lasting approximately 9 to 11 weeks. A total of 2,098 responses were collected (1,480 in the program group and 618 in the control group), an overall survey response rate of 74.7 percent; 74.6 percent of program group students responded and 75.0 percent of control group students responded.

Characteristics of Survey Respondents

Two analyses were conducted to understand how nonresponse might influence the interpretation of the findings from the student survey. First, characteristics of survey respondents were compared with the characteristics of the full study sample. Doing so provides an indication of how representative the survey respondents are of the full study sample, one way to consider whether the survey results generalize to the full study sample in light of survey nonresponse. Second, characteristics of program group survey respondents were compared with characteristics of control group survey respondents. Doing so provides an indication of how similar program and control group survey respondents were to each other at the outset of the study, one way to assess whether differences between the groups' later outcomes can be interpreted as being the result of CUNY Start.

¹A small number of program and control group members were not surveyed because their informed consent forms were not yet at MDRC when the survey sample was selected.

It is important to note that many survey questions were asked of subsets of survey respondents only (for example, those who took math classes during the semester after random assignment). In those cases, it is generally *not* warranted to interpret differences in later outcomes between the subsets of program and control group respondents as being caused by CUNY Start.

Comparison of Respondent and Full Sample Baseline Characteristics

Survey respondents and the full evaluation sample have many statistically significant differences with respect to their baseline characteristics. However, these statistically significant differences do not indicate any *practically* significant differences with respect to the representativeness of survey respondents. For example, compared with the full sample, survey respondents are 1.0 percentage points less likely to have a parent with a college degree and 0.9 percentage points more likely to have a parent who is not a high school graduate — differences that are statistically significant but practically not very meaningful.

The full sample and survey respondents exhibit the greatest dissimilarity with respect to gender; however, the difference is again not practically very meaningful. Women represent 50 percent of survey respondents and 47.5 percent of the full sample. Thus, women are overrepresented among survey respondents by 2.5 percentage points compared with the full sample. Comparing the characteristics of student survey respondents with the full evaluation sample provides some evidence that the survey results may generalize to the full sample.

Comparison of Program and Control Group Respondent Baseline Characteristics

Nearly identical proportions of the program and control groups responded to the survey (75 percent). With respect to their baseline characteristics, respondents in the two groups are highly similar. Survey respondents in the program and control groups only exhibited statistically distinguishable differences with respect to whether they had earned an occupational or technical certificate before random assignment. It is reasonable to compare the program and control groups and expect an internally valid estimate of CUNY Start's effect on survey respondents.

Creation of Student Survey Scales

This section of the appendix discusses two scales from the student survey reported in Chapter 2. Specifically, this section provides details on the “quality-of-seminar” scale and the “quality-of-advising” scale, including the questions that made up the scales and the data processing conducted to calculate the values presented in Chapter 2.

Quality-of-Seminar Scale

The quality-of-seminar measure presented in Table 2.8 is derived from five questions administered in the student survey. Students were asked to indicate whether they (1) strongly disagreed, (2) disagreed, (3) neither disagreed nor agreed, (4) agreed, or (5) strongly agreed with the following statements:

Your seminar provided you with practical experience for navigating the university and financial aid systems.

Your seminar supported your learning in your other course(s).

Your seminar provided important opportunities for you to present on topics of interest.

Your seminar improved your confidence in your ability to achieve your academic goals.

Your seminar helped improve your study or time management skills.

A scale was created as the unweighted average of a student's responses to all five questions. Respondents had the option to skip or refuse any question in the scale; some students responded to some, but not all the questions in the scale. The scale was only calculated for students who answered all five items. The table presents the percentage of students who averaged a score of 4 or higher.

Finally, a factor analysis tested how well the items included in the scale measure a common underlying construct. The factor analysis yielded a standardized Cronbach's alpha of 0.91, meaning that they did measure a common underlying construct.

Quality-of-Advising Scale

The quality-of-advising measure presented in Table 2.8 is derived from 11 questions administered in the student survey. The first five questions were adapted from the Academic Advising Inventory.² Students were asked to indicate whether they (1) strongly disagreed, (2) disagreed, (3) neither disagreed nor agreed, (4) agreed, or (5) strongly agreed with the following statements:

You are satisfied in general with the academic advising you have received.

You have received accurate information about courses, programs, and requirements through academic advising.

²Winston and Sandor (n.d.).

Academic advisors kept you informed about deadlines related to institutional policies and procedures, such as drop/add periods, withdrawal deadlines, registration periods, etc.

Academic advising has been available when you needed it.

Sufficient time has been available when you met with academic advisors.

You often discussed your academic goals and progress toward those goals with your advisor.

Your academic advisor acknowledged your accomplishments.

Advising has given you the tools needed to make sound academic choices.

Advising has enabled you to seek the resources required to achieve your academic goals.

Advising has given you the confidence to advocate for yourself as you navigate the university system.

You feel more prepared to pursue your academic goals and navigate the university system as a result of the advising you have received.

A scale was created as the unweighted average of a student's responses to all 11 questions. Respondents had the option to skip or refuse any question in the scale; some students responded to some, but not all the questions in the scale. The scale was only calculated for students who answered all 11 items. The table presents the percentage of students who averaged a score of 4 or higher.

Finally, a factor analysis tested how well the items included in the scale measure a common underlying construct. The factor analysis yielded a standardized Cronbach's alpha of 0.958, meaning that they did measure a common underlying construct.

Instructor Survey

Survey Fielding and Respondent Sample

The instructor survey asked CUNY Start math and reading/writing instructors as well as developmental math, reading, and writing instructors about a variety of topics including their backgrounds, instructional delivery, strategies, professional development, and use of time. CUNY Start instructors were also asked about their CUNY Start apprenticeships. Initially, instructors were sent multiple email messages encouraging them to complete the survey online. Later, instructors who did not complete the survey online were called on the phone to complete it in a computer-assisted telephone interview. Abt Associates led the fielding of the survey.

The survey was fielded to all CUNY Start math and reading/writing instructors ($n_{CS-surveyed} = 66$) and a random sample of non-CUNY Start developmental math, reading, and writing instructors ($n_{non-CS-surveyed} = 276$). Fielding occurred during spring 2015, fall 2015, and spring 2016, starting in April or October (depending on the cohort) and lasted approximately 6 to 10 weeks. Once an instructor responded to the survey, that instructor was not surveyed again in future semesters. Instructors who were selected for the survey in a semester and did not respond to it in that semester were fielded the survey again in the next semester that they taught. A total of 216 responses were collected (57 CUNY Start instructors and 159 non-CUNY Start instructors), an overall survey response rate of 63.2 percent; 86.4 percent of CUNY Start instructors responded and 57.6 percent of non-CUNY Start instructors responded. Due to the relatively low response rate of non-CUNY Start instructors, the non-CUNY Start instructor survey results must be interpreted cautiously — it is quite possible that non-CUNY Start survey respondents are not representative of all non-CUNY Start instructors.

Information on nonrespondent instructors is limited to their colleges, the terms they taught during the study period, and the subjects they taught. Because this information is so limited, this report does not comment on the representativeness of the instructor survey.

Appendix E

**Impact-Estimation Model Specifications and
Additional Analyses**

The Effect of the Option to Participate in CUNY Start

The main analyses presented in Chapter 3 are intent-to-treat (ITT) estimates. To conduct these analyses, a generalized least squares estimator is used to estimate the effect of the opportunity to participate in CUNY Start.¹ The following model specification is used:

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

Here, Y_i represents a target outcome (such as being deemed college-ready in math or not). Block_{ji} is a vector of J random assignment block indicators equal to 1 if student i is in block j and 0 otherwise.² P_i is a binary program assignment indicator equal to 1 if student i is randomly assigned to the program group and 0 otherwise. X_{ki} is a vector of $K/2$ student baseline characteristics and $K/2$ missing dummy indicators, one for each baseline variable. Baseline characteristics include pretest scores and random assignment date.³ The ε_i are the residual variances. Robust standard errors are used.

The parameter of interest is β_1 , the average effect of program assignment on Y_i . Since program assignment is random and weights are used to account for the changing random assignment ratio (see below), the estimator of β_1 is unbiased with respect to the average effect of the ITT.⁴

Subgroup Analyses

To test for differences in subgroup impacts, split-sample regression analyses were conducted and the H_T statistic used to determine statistical significance.⁵ This approach involves estimating the ITT effect for each group separately (for example, full-timers and part-timers) and then determining whether the amount of variation in estimated effects among the groups is greater than what would be expected to be seen by chance alone.

¹For the main analyses, SAS's SURVEYREG procedure is used. For the subgroup analyses, SAS's GLM procedure is used.

²Each *block* indicator represents a college x cohort x intended program type. The study includes four colleges and three cohorts. Three of the four colleges include two program types (full time and part time) and the fourth college only includes a full-time program. Thus 21 unique blocks are included.

³Random assignment date is included as the number of days before the close of registration that the student was randomly assigned.

⁴The estimand is the ITT effect for the average person, not the effect for the average site or average random assignment block.

⁵Greenberg, Meyer, and Wiseman (1994).

Weights for the Analyses (Chapter 3)

Weights are used in the main analyses to account for the changing random assignment ratio.⁶ Weights are calculated to make the effective (weighted) random assignment ratio the same in all random assignment blocks. The effective random assignment ratio is equal to the full sample's random assignment ratio. Weights are calculated as follows:

$$w_{ij} = P_{ij} \left(\frac{P_{..}}{P_{.j}} \right) + (1 - P_{ij}) \left(\frac{1 - P_{..}}{1 - P_{.j}} \right)$$

Where:

- P_{ij} is equal to 1 if individual i in random assignment block j is assigned to the program group and 0 if assigned to the control group.
- $P_{.j}$ is equal the proportion of sample members in random assignment block j assigned to the program group (that is, the average value of P_{ij} in random assignment block j).
- $P_{..}$ is equal the proportion of ALL sample members randomly assigned to the program group (that is, the average value of P_{ij} across all sample members).

Weights for the Student Survey Analyses (Chapter 2)

Survey weights are used in the survey analyses to account for the fact that the survey was fielded to nearly all control group members, but to a random sample of program group members. Survey weights are calculated to make the effective (weighted) random assignment ratio the same in all random assignment blocks and to make each block be weighted proportionately to its sample size in the full evaluation sample. Weights are calculated as follows:

$$w_{ij}^{survey} = \left[P_{ij} \left(\frac{P_{..}}{P_{.j}^{survey}} \right) + (1 - P_{ij}) \left(\frac{1 - P_{..}}{1 - P_{.j}^{survey}} \right) \right] * \left[\frac{\frac{n_j}{n}}{\frac{n_j^{survey}}{n^{survey}}} \right]$$

Where:

- P_{ij} is equal to 1 if individual i in random assignment block j is assigned to the program group and 0 if assigned to the control group.

⁶The random assignment ratio was different, by design, for each cohort. The changes were made due to different expectations in the fall and spring with respect to how many students could be recruited, and with respect to the number of program slots.

- P_{j}^{survey} is equal to the proportion of sample members in random assignment block j who were fielded a survey and assigned to the program group.
- $P_{.}$ is equal to the proportion of all sample members randomly assigned to the program group.
- n_j is the size of the analytic sample in random assignment block j .
- n is the total size of the analytic sample.
- n_j^{survey} is the size of the sample fielded a survey in random assignment block j .
- n^{survey} is the total size of the analytic sample fielded a survey.

The survey weights do not attempt to account for survey nonresponse.

Method for the Treatment-on-the-Treated (TOT) Analyses

Two-stage least squares is used to conduct the TOT analyses. The logic of the TOT analysis is as follows: The difference in the average outcomes of *all* program and control group members is an unbiased estimate of the average ITT. However, because only 81 percent of eligible students participated in the program, this difference is not the effect of the TOT. Instead, the ITT is a weighted average of an assumed zero average effect for the 19 percent who were “no-shows” and the average effect of the TOT for the 81 percent who participated in CUNY Start. Through simple algebra and the assumption of zero treatment effect on the “no-shows,” it is possible to estimate the effect of the TOT. The following formula can be used:

$$1.00 * ITT_Effect = 0.81 * TOT_Effect + 0.19 * 0 \quad (1)$$

Solving for TOT_Effect yields that $TOT_Effect = ITT_Effect / 0.81$.⁷ The effect of the treatment on the treated is simply the ITT effect divided by the participation rate. Two-stage least squares through the procedure described by Brachet is used to compute robust standard errors for the TOT effect estimate.⁸

⁷Bloom (1984).

⁸Brachet (2007).

Appendix F

What Works Clearinghouse-Style Impact Table

This table displays information similar to that contained in Table 3.2. The differences are that this table only includes continuous outcome variables and that it provides the standard deviations of the outcomes, which allows one to translate estimated effects in their original units into effect-size units. This information may be of interest to meta-analysts and to the What Works Clearinghouse.

Appendix Table F.1
Continuous Educational Outcomes in
What Works Clearinghouse Format

Outcome	Program Group		Control Group		Estimated Effect		
	Mean	Standard Deviation	Mean	Standard Deviation	Difference	Standard Error	P-Value
<u>End of the program semester</u>							
Number of college-ready subjects (out of 3)	1.874	1.091	1.379	0.990	0.49	0.032	<0.0001
College-level credits attempted	0.81	2.71	3.56	4.21	-2.75	0.13	<0.0001
College-level credits earned	0.56	2.16	2.45	3.65	-1.88	0.12	<0.0001
<u>Postprogram semester</u>							
College-level credits attempted	6.98	6.44	5.20	5.52	1.78	0.21	<0.0001
Sample size (total = 3,835)	2,997		838				

SOURCES: MDRC calculations using CUNY Start application data, MDRC random assignment data, data from CUNY's Institutional Research Database, and test data from CUNY's Administrative Data Warehouse.

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.

See Appendix E for details on the impact-estimation model.

Appendix G

Exploring the Effects of Participating in CUNY Start

The primary focus of Chapter 3 is answering the question, “What is the average effect of *the option* to participate in CUNY Start?” Analyses that answer this question are known as “intention-to-treat” (ITT) analyses. ITT analyses compare the average outcomes of *all* individuals randomly assigned to the program group with the average outcomes of *all* individuals randomly assigned to the control group, regardless of participation in CUNY Start (for program group members) or enrollment in non-CUNY Start courses (for control group members). The ITT effect is the average effect of the opportunity to participate in CUNY Start. The ITT effect reflects the reality that not all individuals assigned to a program comply by participating in it. In some cases, the ITT effect may reflect the effect that a policymaker can realistically expect to achieve, given the likely scenario that not everyone offered a program will participate in it.

In this appendix, two additional questions are explored:

1. What is the average effect of *participating* in CUNY Start, compared with *what otherwise would have happened*?¹

Analyses that answer this question are known as “treatment-on-the-treated” (TOT) analyses. The TOT analyses estimate the effect of participating in CUNY Start (as a nonmatriculated student) compared with whatever educational experiences otherwise would have occurred, whether those be immediately enrolling in non-CUNY Start courses (as a matriculated student) or not enrolling in college at all. The second question addressed is:

2. What is the average effect of *participating* in CUNY Start (as a nonmatriculated student), compared with *enrolling in non-CUNY Start courses (as a matriculated student)*?²

These second analyses estimate the effect of participating in CUNY Start compared with a specific alternative — immediately enrolling in non-CUNY Start courses. This analysis is particularly interesting because it is important to understand how much of CUNY Start’s effect on college readiness and college-level credit accumulation is due to its core classroom components and support services (as opposed to getting students to enroll).

More details on the importance of each of these questions are provided below. The distinction between these questions is elaborated upon at the start of the second set of analyses. These analyses are more technical than those presented in the main chapters of this report — readers

¹This effect is estimated among the subset of students who participate in CUNY Start if they are assigned to the program group, regardless of what they would do if they were assigned to the control group.

²This effect is estimated among the subset of students who participate in CUNY Start (as nonmatriculated students) if they are assigned to the program group, and who immediately enroll in non-CUNY Start courses (as matriculated students) if they are assigned to the control group.

primarily interested in the substantive implications should skip to the summary at the end of this appendix.

The Effect of Participating in CUNY Start: TOT Analyses

This section addresses the following question: What is the effect of participating in CUNY Start among program group students who chose to participate? This question may be of great interest to those who operate CUNY Start and would like to understand its effect on those who experience the program.

Recall that 19 percent of individuals who were randomly assigned to the program group did not participate in CUNY Start (see Table 3.1). In the experimental literature these individuals are often referred to as “no-shows.” Below, for a limited set of outcomes, estimates are provided of the average effect of *participating* in CUNY Start (TOT) among the 81 percent of program group members who did participate in CUNY Start. These analyses rely on stronger assumptions (described in the analyses section below) than the main ITT analyses presented in Chapter 3; therefore, caution is required when interpreting these results, and they are considered exploratory.³

The main TOT findings are:

- Some students who chose to participate in CUNY Start would not have enrolled at City University of New York (CUNY) colleges had they not been offered the option of CUNY Start.
- CUNY Start participation had a large, positive effect on the number of subjects in which students were college-ready at the end of the program semester.
- In alignment with CUNY Start’s theory of change, students participating in CUNY Start earned fewer college-level credits during the program semester than they otherwise would have.

³On a related note: Recall that the opportunity to participate in CUNY Start (the ITT effect, presented in Chapter 3) causes more students to enroll at a CUNY college (that is, to participate in CUNY Start or to enroll in any non-CUNY Start courses as matriculated students). Similarly, *participating* in CUNY Start (TOT) causes more students to enroll at a CUNY college. Had they not participated in CUNY Start, some CUNY Start participants would have elected *not* to enroll at a CUNY college. Such students are still included in these analyses. Consequently, the TOT analyses that examine outcomes such as college readiness and credits earned are influenced by this initial effect on getting students to enroll at a CUNY college.

These results mirror the ITT findings, though the effects found are larger and less certain. More information on the methods used for the TOT analyses is provided in Appendix E.

Before describing the results in more detail, it is important to highlight a critical assumption in these analyses: the TOT analyses rely on the assumption that the outcomes of the program group “no-shows” (the 19 percent of the program group who did not participate in CUNY Start) are the same as they would have been had these students been randomly assigned to the control group.⁴ In this study, the no-shows comprise two groups: the 8 percent of the program group who enrolled in non-CUNY Start courses at CUNY colleges (and did not participate in CUNY Start) and the 11 percent of the program group who did not enroll in a CUNY college (that is, they did not participate in CUNY Start or enroll in any other courses at a CUNY college).

Is the assumption reasonable? It is difficult to say for sure. Individuals in the evaluation who are randomly assigned to the program group have three options: (1) participate in CUNY Start, (2) enroll at a CUNY college in non-CUNY Start courses (as matriculated students), or (3) do not enroll at a CUNY college. Individuals who are randomly assigned to the control group only have options 2 and 3. Program group members who elect not to participate in CUNY Start (option 1) are left with the same two options as they would have had if assigned to the control group; therefore, rationally, they might be expected to behave the same way they would have had they been assigned to the control group in the first place (and thus end up with the same outcomes).

However, practically, there are plausible reasons this assumption may have been violated. For example, a student who is randomly assigned to the program group may initially sign up for CUNY Start and soon after realize he or she does not want to participate because of the program’s intensity, because of discomfort with its pedagogy, etc. By the time a student makes this decision, the option to enroll in non-CUNY Start courses may have changed — desired courses may have filled up, financial aid deadlines passed, etc. Consequently, such a “no-show” student may not end up enrolling in non-CUNY Start courses in that first semester even though, had the student been assigned to the control group initially, he or she would have enrolled in non-CUNY Start courses. Thus, the outcomes of the no-shows would have been different had they originally been assigned to the control group, violating the assumption.

Due to this fairly strong assumption, the results of the TOT analyses are considered exploratory.

Appendix Table G.1 presents the estimated effects of participating in CUNY Start on a few selected academic outcomes, among those program group members who participated in

⁴This assumption is known as “the exclusion restriction” in the economics literature.

Appendix Table G.1

Effects of Participating in CUNY Start (Treatment-on-the-Treated)

Outcome	CUNY Start Participants	Control Group Counterparts	Difference	P-Value
<u>Enrollment during the program semester</u>				
Enrolled at a CUNY college (%)	100.0	87.2	12.8	*** <0.001
<u>Educational achievement by the end of the program semester</u>				
Number of college-ready subjects (out of 3)	2.03	1.41	0.62	*** <0.001
College-level credits earned	0.1	2.5	-2.4	*** <0.001
Sample size (total = 3,835)	2,997	838		

SOURCES: MDRC calculations using CUNY Start application data, MDRC random assignment data, data from CUNY's Institutional Research Database, CUNY Start program participation data, and test data from CUNY's Administrative Data Warehouse.

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.

Sample size refers to the number of students included in the analyses, not the number of CUNY Start enrollees in the program group.

CUNY Start, referred to as “CUNY Start participants.” By construction, the effect estimates presented in Appendix Table G.1 are 24 percent higher than the ITT effects on the same outcomes presented in earlier tables (ITT / 0.81).

Because TOT effects are estimated among CUNY Start participants, 100 percent of CUNY Start participants enrolled at a CUNY college. Among CUNY Start participants, an estimated 12.8 percentage points would *not* have enrolled at CUNY colleges had they been assigned to the control group (thus the control group counterparts are estimated to have enrolled at a rate of 87.2 percent). Whereas the ITT effect estimate on enrolling (that is, participating in CUNY Start or enrolling in any non-CUNY Start courses) was 10.3 percentage points (see Table 3.1), the TOT effect estimate is 12.8 percentage points, 24 percent higher than the ITT effect.

With respect to students' college readiness, by the end of the program semester CUNY Start participants were college-ready in 2.03 subject areas (out of 3) on average, whereas their control group counterparts were college-ready in an estimated 1.41 subject areas, for an estimated

TOT effect of 0.62 subject areas.⁵ Finally, CUNY Start’s estimated TOT effect on earning college-level credits is -2.4 credits. As is to be expected, the general substantive story presented in the TOT analyses is similar to that resulting from the ITT analyses, only more dramatic. Through the end of one semester, CUNY Start has a large, positive effect on college readiness, and a large, negative effect on earning college-level credits.

The Effect of Participating in CUNY Start Compared with Enrolling in Any Non-CUNY Start Courses

This appendix next examines the estimated effect of participating in CUNY Start compared with one specific alternative: immediately enrolling in non-CUNY Start courses at a CUNY college as a matriculated student. The effect is estimated through one semester after random assignment, among the subset of students who immediately enroll in non-CUNY Start courses if they are assigned to the control group, and who participate in CUNY Start if they are assigned to the program group.⁶

At first glance, the effect of participating in CUNY Start compared with immediately enrolling in non-CUNY Start courses may sound the same as the effect of participating in CUNY Start, presented in the previous section. However, there is at least one critical difference. The effect of participating in CUNY Start (TOT) presented previously is defined as the difference between two potential outcomes:

1. The outcomes of all program group members who participated in CUNY Start
2. The outcomes of program group members who participated in CUNY Start, had they been assigned to the control group

Evidence shows that *some* program group members who participated in CUNY Start would *not* have immediately enrolled in non-CUNY Start courses had they been assigned to the control group — that is, they would not have enrolled at any CUNY college. These students are included in the TOT analyses and are part of the TOT effects presented in the previous section. In contrast, the analyses presented next seek to estimate the effect of participating in CUNY Start

⁵For simplicity, Appendix Table G.1 presents the TOT effects for a limited set of outcomes only. To estimate the TOT effects for the other college-readiness measures presented in the second panel of Table 3.2, divide the ITT effects by 0.806.

⁶Part of what is described in this appendix is a theoretical framework (called principal stratification) that is helpful for understanding the assumptions and analyses conducted to estimate the effect of interest. While the framework involves theory, the goal of understanding the effect of participating in CUNY Start compared with immediately enrolling in non-CUNY Start courses is of practical significance.

compared with enrolling in non-CUNY Start courses (excluding anyone who would not enroll at all).

Part of the ITT and TOT effects on college readiness and credit accumulation stem from CUNY Start’s initial effect of getting more students to enroll at CUNY colleges. While that effect is important, getting more students to enroll in college is probably *not* a consequence of some of the most interesting components of CUNY Start — those that occur in the classroom (that is, CUNY Start’s intensity, pedagogy, and curriculum) and the student support services (for example, advising).

Thus, another question of great interest is, “What is the effect of participating in CUNY Start compared with immediately enrolling in non-CUNY Start courses at a CUNY college?”⁷ This question is an attempt to separate the portion of CUNY Start’s effects that stem from its effect on enrollment from the portion that can be attributed to the classroom components and support services. The question examined here is thus, “What is the effect of the classroom components and support services of CUNY Start?”

Random assignment ensures that the *full* program group and *full* control group are not systematically different at the outset of the study. The challenge with answering the question presented in the previous paragraph is that only 81 percent of students assigned to the program group participated in CUNY Start and 78 percent of students assigned to the control group enrolled in non-CUNY Start courses. Random assignment does *not* ensure that these two subsets of students were similar at the start of the study, so the differences between the two groups’ later outcomes could be a result of CUNY Start experiences compared with the experiences students would have had in non-CUNY Start courses, or they could reflect differences between the types of students who ended up participating in CUNY Start and those who ended up enrolling in non-CUNY Start courses. Below, two approaches are used to attempt to answer the question above.

Approach 1: Compare Program Group CUNY Start Participants with Control Group Students Enrolled in Non-CUNY Start Courses

One approach to estimating the effect of participating in CUNY Start compared with enrolling in non-CUNY Start courses (as a matriculated student) is to take the difference between (1) the average outcomes of the 81 percent of program group members who participated in CUNY Start (CUNY Start participants) and (2) the average outcomes of the 78 percent of control group members who enrolled in any non-CUNY Start courses as matriculated students (referred to hereafter as “college matriculates”). As noted above, there is a risk that this difference may be biased

⁷Note that, among the questions addressed within this report, the question that these analyses seek to answer is most closely aligned with the questions addressed in CUNY’s internal propensity-score-matching analysis of CUNY Start. See Allen and Horenstein (2013).

(with respect to the desired inference) because these two groups may have been systematically different before the study began.

One assurance that this potential bias is probably small comes from the U.S. Department of Education's What Works Clearinghouse (WWC) guidance on attrition in individual-level randomized controlled trials such as this study.⁸ The analysis described here can be thought of as an overall attrition rate of 20 percent, with differential attrition of 3 percentage points. According to the WWC criteria, this level of attrition would be considered low, with a low potential for bias when comparing these two groups.

A second assurance that the potential bias may be small comes from comparing the measured baseline characteristic of the two groups. Such a comparison finds that most of the two groups' measured baseline characteristics were similar,⁹ with the following exceptions:

- Compared with CUNY Start participants, college matriculates in the control group were 6 percentage points more likely to say English was their primary language.
- Compared with CUNY Start participants, college matriculates in the control group were 5 percentage points more likely to have applied for financial aid.
- Compared with CUNY Start participants, college matriculates in the control group were 4 percentage points less likely to be triple remedial.
- Compared with CUNY Start participants, college matriculates in the control group were 5 percentage points more likely to be college-ready in writing.

These general similarities *suggest* low bias, although it is still theoretically possible that important differences exist between the two groups with respect to unmeasured characteristics.

Appendix Table G.2 presents the estimated effects at the end of the program semester of participating in CUNY Start compared with enrolling in non-CUNY Start courses, on two outcomes: college readiness and college-level credits earned. The analyses compare program group CUNY Start participants with college matriculates in the control group.

Analyses that compare the regression-adjusted outcomes for these two groups show that, after one semester, CUNY Start participants were college-ready in 0.54 more subject areas (out

⁸U.S. Department of Education, Institute of Education Sciences (2014).

⁹In addition to the four bulleted characteristics, all characteristics presented in Appendix Table A.1 were examined. No other characteristics yielded statistically significant differences between CUNY Start participants and college matriculates in the control group.

Appendix Table G.2

Educational Achievement for CUNY Start Participants Compared with Control Group College Matriculates

Outcome	CUNY Start Participants	Control Group College Matriculates	Difference	P-Value
<u>Enrollment during the program semester</u>				
Enrolled at a CUNY college (%)	100.0	100.0	0.0	-
<u>Educational achievement by the end of the program semester</u>				
Number of college-ready subjects (out of 3)	2.05	1.51	0.54	*** <0.001
College-level credits earned	0.2	3.0	-2.9	*** <0.001
Sample size (total = 3,077)	2,416	661		

SOURCES: MDRC calculations using CUNY Start application data, MDRC random assignment data, data from CUNY's Institutional Research Database, CUNY Start program participation data, and test data from CUNY's Administrative Data Warehouse.

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.

of 3) than college matriculates in the control group (2.05 compared with 1.51 college-ready subject areas). This effect estimate is similar in magnitude to the ITT effect estimate on the same outcome (see Table 3.2). It suggests that the ITT effects on college readiness are *not* simply a result of getting more students to enroll in college, but rather that compared with enrolling in non-CUNY Start courses, participating in CUNY Start has large effects on college readiness.

Simultaneously, after one semester CUNY Start participants earned 2.9 fewer college-level credits (around one full course's worth) than college matriculates in the control group (0.2 compared with 3.0 college-level credits). This -2.9 credit effect is a full credit larger than the ITT effect estimate of -1.9 credits. There are two reasons for this shift. First, college matriculates in the control group earned more college-level credits than control group members who did not enroll in any college. Second, program group CUNY Start participants earned fewer college-level credits than did program group members who did not participate in CUNY Start, many of whom enrolled in non-CUNY Start courses. As a result, the negative effect comparing the full program group with the full control group is smaller than the negative effect comparing program group CUNY Start participants with college matriculates in the control group.

In sum, this analysis provides suggestive evidence that after one semester, participating in CUNY Start, compared with enrolling in non-CUNY Start courses as a matriculated student, has a large positive effect on college readiness and a large negative effect on college-level credit accumulation — reinforcing the notion that this program offers a short-term trade-off whose ultimate success will not be known without longer-term follow-up data collection.

Approach 2: Principal Stratification and Bounding

A second approach to addressing the question, “What is the effect of participating in CUNY Start compared with enrolling in any non-CUNY Start courses at a CUNY college?” relies on a theoretical framework known as principal stratification.¹⁰ This framework helps clarify the assumptions that go into answering this question, assumptions that are more opaque using the first approach. As will be shown, the general results are similar to those found using Approach 1.

Principal stratification describes individuals as belonging to one of many *strata*. Stratum membership is defined based on an individual’s potential values related to an *intermediate behavior* under *different states of the world*. In the current example, stratum membership is defined based on the intermediate behavior “enrollment status,” which can take on three values:

1. Do not enroll in a CUNY college [Don’t enroll (D)]
2. Enroll in any non-CUNY Start courses at a CUNY college as a matriculated student [Matriculate (M)]
3. Participate in CUNY Start [Participate in CUNY Start (C)]

The “different states of the world” refer to being randomly assigned to the program group or control group. A person’s stratum membership is defined based on what that person’s enrollment status would be (a) when assigned to the program group, and (b) when assigned to the control group. Stratum membership exists in principle, but cannot be observed in practice because it is not possible to simultaneously observe a person’s enrollment status when assigned to the program group and control group. Appendix Figure G.1 depicts the nine strata.

Starting in the top left cell, students who belong to the *Never Enroll (D-D)* stratum would not enroll at a CUNY college (that is, they would not participate in CUNY Start and they would not enroll in non-CUNY Start courses) if assigned to the control group, and similarly would not enroll if assigned to the program group. As another example, students who belong to the *D Induced to C (D-C)* stratum (bottom left) are those who would not enroll at a CUNY college if

¹⁰Page et al. (2015); Frangakis and Rubin (2002).

Appendix Figure G.1 Nine Strata Based on Enrollment Status

		No CUNY Start Offer (Control Group)		
		Don't Enroll (D)	Matriculate (M)	Participate in CUNY Start (C)
CUNY Start Offer (Program Group)	Don't Enroll (D)	Never Enroll (D-D)	M Induced to D (M-D)	Defier 1
	Matriculate (M)	D Induced to M (D-M)	Always Matriculate (M-M)	Defier 2
	Participate in CUNY Start (C)	D Induced to C (D-C)	M Induced to C (M-C)	Always Participate in CUNY Start (C-C)

assigned to the control group, and would participate in CUNY Start if assigned to the program group.

The research question addressed in this appendix is about one stratum — *M Induced to C (M-C)* — the effect of participating in CUNY Start compared with enrolling in non-CUNY Start courses, for the type of students who if assigned to the control condition would enroll in non-CUNY Start courses and if assigned to the program condition would participate in CUNY Start.

Through a series of assumptions (described below) and the use of basic algebra, it is possible to estimate the effect of participating in CUNY Start compared with enrolling in non-CUNY Start courses for the subgroup in that stratum, which is estimated to represent 71 percent of students in the evaluation.

The assumptions are:

- **Defiers 1-2 do not exist.**¹¹ Defiers are people who participate in CUNY Start if they are assigned to the control group, yet do *not* participate in CUNY Start if they are assigned to the program group. The assumption that defiers do not exist is a “weak” assumption, meaning it seems very reasonable.

Notably, within the control group, only 1 percent of students participated in CUNY Start. Thus, at most, defiers could represent 1 percent of the sample. What seems more likely, however, is that these students, who managed to participate in CUNY Start despite being assigned to the control group, would still have participated in CUNY Start had they been assigned to the program

¹¹The term “defier” is borrowed from Angrist, Imbens, and Rubin (1996).

group. In other words, they are most likely *Always Participate in CUNY Start (C-C)*, as is assumed here.

- ***M Induced to D (M-D) do not exist.*** *M Induced to D (M-D)* are people who do not enroll at all if they are assigned to the program group (that is, they do not participate in CUNY Start and do not enroll in non-CUNY Start courses), but do enroll in non-CUNY Start courses if they are assigned to the control group. In other words, the assumption is that the option to participate in CUNY Start does not induce anyone who otherwise would have enrolled in non-CUNY Start courses to instead not enroll in at all.

This is a “moderate” assumption, meaning it seems reasonable, yet there are plausible explanations for how it could be violated. It seems reasonable because it represents a seemingly inconsistent decision. If assigned to the control group, one can (1) enroll in non-CUNY Start courses at a CUNY college or (2) not enroll at a CUNY college. If assigned to the program group, one can choose between the control group’s two options or (3) participate in CUNY Start. For program group members who do not participate in CUNY Start, it is inconsistent for them to make a different decision among the first two options if assigned to the program group rather than the control group.

In practice, however, it is plausible that some students in the program group signed up for CUNY Start, attended a class or two, did not like it and dropped CUNY Start, and then found it was too late to enroll in non-CUNY Start courses at a CUNY college, so ended up not enrolling at a CUNY college at all. Such a student, if assigned to the control group, might have immediately enrolled in non-CUNY Start courses as a matriculated student. Thus, there are plausible scenarios in which this assumption may have been violated.

Notably, within the program group in this study, 11 percent of students did not enroll, so at most 11 percent of the sample could be *M Induced to D (M-D)*. The assumption that *M Induced to D* do not exist, along with the weak no-defiers assumption, places the 11 percent in the *Never Enroll (D-D)* stratum. This assumption is probably the strongest one made in these analyses. However, since this assumption only affects 11 percent of all students, unless it is grossly violated, its influence on the results is likely to be fairly small.

- ***D Induced to M (D-M) do not exist.*** *D Induced to M (D-M)* are people who enroll in non-CUNY Start courses if they are assigned to the program group, but who do not enroll at all if they are assigned to the control group. In other words, the assumption is that being offered CUNY Start does not induce anyone who otherwise would not have enrolled at all, to instead enroll in non-CUNY Start courses.

This is a weak to moderate assumption, meaning it seems very reasonable. *D Induced to M (D-M)* can enroll in non-CUNY Start courses as matriculated students whether they are offered CUNY Start or not, so it is hard to see why they would not enroll in those courses when they are assigned to do so (the control group), but would enroll in them when assigned to CUNY Start (the program group). However, there is at least one explanation of how this assumption could be violated: When a student is randomly assigned to the control group, the disappointment of not being offered CUNY Start could cause the student not to enroll at all. The same student, if instead offered CUNY Start, might feel good about the offer, sign up for CUNY Start, soon decide CUNY Start is too time-consuming, and then instead elect to enroll in non-CUNY Start courses. This hypothetical situation may have occurred, but it does not seem likely to have occurred very often.

Notably, in this study's program group only 8 percent of students enrolled in non-CUNY Start courses at CUNY colleges, so at most 8 percent of the sample could be *D Induced to M (D-M)*. The assumption that *D Induced to M* do not exist, along with the no-defiers assumption, places the 8 percent of all students in the *Always Matriculate (M-M)* stratum.

- **CUNY Start has no effect on D-D, M-M, or C-C.** It is assumed that those who *Never Enroll (D-D)*, *Always Matriculate (M-M)*, or *Always Participate in CUNY Start (C-C)* have the same outcome whether they are assigned to the program group or control group. This assumption seems plausible because under both scenarios a student's enrollment status is the same. This assumption could have been violated for *Always Matriculate (M-M)*, for example, if when assigned to the control group, a student immediately enrolls in non-CUNY Start courses. When assigned to the program group, that same student may only enroll in non-CUNY Start courses after trying out CUNY Start and deciding it is not for him or her. At that point non-CUNY Start courses may have filled up, so the student may perform differently than had he or she gone straight to the non-CUNY Start courses.
- **Outcome levels for individuals in D-C and M-C if assigned to the control group can be derived.** The outcome levels of individuals in the control group who enroll in non-CUNY Start courses if they are assigned to the control group are known. Among these students, there are two strata — M-M and M-C (the second column in the figure) — and for the former group we also know the outcomes of individuals in M-M if they are assigned to the control group, based on the “no-effects” assumption in the previous bullet. Therefore, using algebra and the proportion of individuals in each of these two strata, the average outcomes of students in M-C when assigned to the control group can be derived. A similar strategy can be used to derive the average outcomes of students in stratum D-C when assigned to the control group.

- **Plausible outcome levels for individuals in D-C when assigned to the program group can be assumed.** The outcome levels of individuals in strata D-C and M-C, when they are assigned to the program group (and thus participate in CUNY Start), cannot be uniquely determined for each stratum. However, the *relationship* between the outcomes of students in D-C and M-C when assigned to the program group can be represented algebraically. This fact means that by making a range of reasonable assumptions about the outcome levels of individuals in stratum *D Induced to C (D-C)* when assigned to the program group, the outcomes of students in stratum M-C when assigned to the program group can be bounded. By comparing these bounds with the outcome levels of students in stratum M-C when assigned to the control group (see previous bullet), one can also bound the impact of participating in CUNY Start for this stratum.

These assumptions, and potential violations, leave room for some concern regarding the analyses and results that follow. However, the large magnitude of the effects presented and the relatively small proportions of students for whom each assumption is made (and thus may be violated) suggest that the pattern of findings presented is likely to be accurate, although the magnitude of the effect estimates may be further off than conventional uncertainty estimates suggest, due to the potential for bias.

Results:

First, it is estimated that approximately 71 percent of study enrollees fall into the stratum *M Induced to C (M-C)*, comprising students who participate in CUNY Start if assigned to the program group and who enroll in non-CUNY Start courses at CUNY colleges if assigned to the control group. This estimate is derived based on basic algebra, using the observed marginal proportions in Appendix Figure G.2. In Appendix Figure G.2, p_{zt} is the proportion of students assigned to experimental condition z ($1 =$ program group, $0 =$ control group), whose enrollment status is t ($D =$ don't enroll, $M =$ matriculate, $C =$ participate in CUNY Start). In the program group, 11 percent did not enroll ($p_{1D} = 0.11$), 8 percent enrolled in non-CUNY Start courses as matriculated students ($p_{1M} = 0.08$), and 81 percent participated in CUNY Start ($p_{1C} = 0.81$). In the control group, 21 percent did not enroll ($p_{0D} = 0.21$), 79 percent enrolled

Appendix Figure G.2 Marginal Percentages for the Strata

		No CUNY Start Offer (Control Group)		
		Don't Enroll (D) $p_{0D} = 0.21$	Matriculate (M) $p_{0M} = 0.79$	Participate in CUNY Start (C) $p_{0C} = 0.01$
CUNY Start Offer (Program Group)	Don't Enroll (D) $p_{1D} = 0.11$	Never Enroll (D-D)	M Induced to D (M-D)	Defier 1
	Matriculate (M) $p_{1M} = 0.08$	D Induced to M (D-M)	Always Matriculate (M-M)	Defier 2
	Participate in CUNY Start (C) $p_{1C} = 0.81$	D Induced to C (D-C)	M Induced to C (M-C)	Always Participate in CUNY Start (C-C)

SOURCES: MDRC calculations using CUNY Start application data, MDRC random assignment data, data from CUNY's Institutional Research Database, and CUNY Start program participation data.

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.

in non-CUNY Start courses ($p_{0M} = 0.79$), and 1 percent participated in CUNY Start ($p_{0C} = 0.01$). The fact that 11 percent of the program group did not enroll, and the assumption of no *M-D* and no *Defier 1*, together imply that 11 percent of the sample are *Never Enroll (D-D)*. Similarly, the fact that 1 percent of program group members participated in CUNY Start, and the assumption of no *Defier 1* or *Defier 2*, together imply that 1 percent of the sample are *Always Participate in CUNY Start (C-C)*. Similar logic can be used to fill in the remaining strata, resulting in the estimate that 71 percent of the sample are *M Induced to C (M-C)*.

Second, the estimated effect of participating in CUNY Start compared with enrolling in non-CUNY Start courses on the number of developmental subject areas completed through one semester is between 0.57 and 0.78 subject areas (among *M Induced to C (M-C)*). On average, control group students who enrolled in non-CUNY Start courses were college-ready in 1.41 out of 3 courses after one semester, compared with an average of 1.98 to 2.19 among CUNY Start participants (among *M Induced to C (M-C)*). This large estimated effect is as large as (or larger than) the ITT effect on the same outcome. This estimated range is derived using

algebra similar to that described in the previous paragraph, along with assumed plausible bounds of the outcome levels for *D Induced to C (D-C)*.¹²

Third, the estimated effect of participating in CUNY Start compared with enrolling in non-CUNY Start courses on the college-level credits earned through one semester is between -2.76 and -2.70 credits (among *M Induced to C (M-C)*). On average, control group students who enrolled in non-CUNY Start courses earned 2.85 college credits after one semester, compared with an average of 0.10 to 0.15 credits among CUNY Start participants (among *M Induced to C (M-C)*). This large estimated effect is larger than the ITT effect on the same outcome and similar to the TOT effect estimate.

Summary

In this appendix, two sets of analyses are presented: first, estimates of the effect of participating in CUNY Start compared with whatever CUNY Start participants would have done otherwise; second, estimates of the effect of participating in CUNY Start compared with enrolling in non-CUNY Start courses as a matriculated student. Both analyses require stronger assumptions than the basic ITT analyses that are the focus of Chapter 3. Both analyses draw very similar conclusions: After one semester, participating in CUNY Start has a large, positive effect on college readiness and a large, negative effect on college-level credit accumulation (as expected). The ITT analyses presented in Chapter 3, the TOT analyses presented at the start of the appendix, and the final analyses presented above draw similar conclusions. Nonetheless, there are some important distinctions.

First, note that the ITT analyses presented in Chapter 3 and the TOT analyses presented at the start of this appendix suggest that one important benefit of CUNY Start is that the program gets more students to enroll in college (that is, to participate in CUNY Start or to enroll in non-CUNY Start courses). The program may have that effect because of its low cost, its unique approach to curriculum and pedagogy, its student support services, or its promise to greatly reduce

¹²For the outcome *number of developmental subjects completed*, the lower-bound assumption is that *D-C* students, when assigned to the program group, are college-ready in 0.85 subjects at the end of the first semester. The lower the assumed outcome level for this group, the larger the estimated effect for *M Induced to C (M-C)*. The chosen value was selected as a lower bound because: (a) this value is lower than the outcome level of any subgroup, and (b) this value is lower than the value in any stratum, except those who did not enroll.

The upper-bound assumption is that *D-C* students, when assigned to the program group, are college-ready in 2.41 subjects at the end of the first semester. The higher the assumed outcome level for this group, the smaller the estimated effect for *M Induced to C (M-C)*. The chosen value was selected as an upper bound because: (a) this value is well above the outcome level of any subgroup, and (b) this value is higher than the value in any other stratum.

students' developmental course needs in a single prematriculation semester, or it may be an artifact of the experiment.

Second, the TOT analyses provide important information on the outcome levels of CUNY Start participants and demonstrate even more dramatically than the ITT analyses the short-term trade-off of participating in CUNY Start. The outcome levels of CUNY Start participants (rather than all program group members) may be of great interest to those who implement CUNY Start since programs typically track the outcomes of their participants, not all individuals who expressed interest in the program. The program group participant outcome levels are most likely to match the outcome levels CUNY Start staff members are accustomed to seeing, since they *exclude* the 19 percent of the program group who did not participate in CUNY Start.

Finally, the estimated effects of participating in CUNY Start compared with enrolling in non-CUNY Start courses should provide reassurance that the ITT findings presented in Chapter 3 (and the TOT findings presented earlier in this appendix) are not only a consequence of getting more students to enroll in college, but instead are largely a consequence of experiencing CUNY Start rather than non-CUNY Start courses.¹³

¹³One risk in the evaluation described in this report (and in many real-world evaluations) is that the effect on getting students to enroll in college *could* be an artifact of the evaluation itself, rather than a real benefit of the program. Ordinarily, eligible students who are interested in participating in CUNY Start are offered a spot in the program unless all spaces are full. During the study, however, some interested students were randomly assigned to the control group. The disappointment of not being offered CUNY Start could partly explain the positive effects on enrollment at a CUNY college. Attempts were made to ensure a smooth transition to matriculation at CUNY colleges for individuals randomly assigned to the control group; still, the hurdle of matriculating may have been higher than the hurdle to start participating in CUNY Start.

A severe skeptic could be concerned that the effects on enrolling in college are the result of these factors. If that were true, then subsequent positive effects, which are in part a consequence of the effect on enrollment, could partly be explained by factors that are not at the core of CUNY Start (that is, its intensity, pedagogy, curriculum, and student support). For these reasons, the analyses presented in the second half of this appendix are an important supplement to the overall early results.

References

- Adelman, Clifford. 2004. *Principal Indicators of Student Academic Histories in Postsecondary Education, 1972-2000*. Washington, DC: U.S. Department of Education, Institute of Education Sciences.
- Allen, Drew, and Aaron Horenstein. 2013. *CUNY Start: Analysis of Student Outcomes*. New York: City University of New York.
- Angrist, Joshua D., Guido W. Imbens, and Donald B. Rubin. 1996. "Identification of Causal Effects Using Instrumental Variables." *Journal of the American Statistical Association* 91, 434: 444-455.
- Astin, Alexander W. 1993. *What Matters in College? Four Critical Years Revisited*. San Francisco: Jossey-Bass.
- Attewell, Paul, David Lavin, Thurston Domina, and Tania Levey. 2006. "New Evidence on College Remediation." *Journal of Higher Education* 77, 5: 886-924.
- Bailey, Thomas R., Shanna Smith Jaggars, and Davis Jenkins. 2015. *Redesigning America's Community Colleges: A Clearer Path to Student Success*. Cambridge, MA: Harvard University Press.
- Bailey, Thomas R., Dong Wook Jeong, and Sung-Woo Cho. 2010. "Referral, Enrollment, and Completion in Developmental Education Sequences in Community Colleges." *Economics of Education Review* 29, 2: 255-270.
- Barragan, Melissa, and Maria Cormier. 2013. "Enhancing Rigor in Developmental Education." *Inside Out* 1: 1-5.
- Berkner, Lutz, and Susan P. Choy. 2008. *Descriptive Summary of 2003-04 Beginning Postsecondary Students: Three Years Later*. NCES 2008-174. Washington, DC: U.S. Department of Education, National Center for Education Statistics.
- Bickerstaff, Susan, and Nikki Edgecombe. 2012. "Pathways to Faculty Learning and Pedagogical Improvement." *Inside Out* 1, 3: 1-4.
- Bloom, Howard S. 1984. "Accounting for No-Shows in Experimental Evaluation Designs." *Evaluation Review* 8, 2: 225-246.
- Brachet, Tanguy. 2007. "Computing Clustered Standard Errors for Two-Stage Least Squares in SAS." Website: <https://works.bepress.com/tbrachet/2>.
- California State University. 2011. "CSU Early Start Course Listing." Website: <http://earlystart.csusuccess.org>.
- City University of New York. 2018a. "About." Website: www2.cuny.edu/about.

- City University of New York. 2018b. "Developmental Education." Website: www2.cuny.edu/about/administration/offices/undergraduate-studies/developmental-education.
- City University of New York. 2018c. "Satisfactory Academic Progress." Website: www2.cuny.edu/financial-aid/student-eligibility/satisfactory-academic-progress.
- City University of New York Office of Institutional Research and Assessment. 2015. "Three-Year Graduation Rates of Full-Time, First-Time Freshmen Enrolled in Associate or Certificate Programs by Gender: Fall 2011 Entering Cohort." Website: https://cuny.edu/about/administration/offices/ira/ir/reports/HEOA/graduation/ftf_assoc_cert_gender_3yr_grad_f14.pdf.
- City University of New York Office of the Senior University Dean for Academic Affairs. 2017. "CUNY Start Student Outcomes: Gains in Basic Skills Proficiency." Website: www2.cuny.edu/wp-content/uploads/sites/4/media-assets/CS-Proficiency-Gains-Summary_FA09toFA16_final-1.pdf.
- City University of New York Office of Institutional Research and Assessment. 2018. "Total Enrollment by Undergraduate and Graduate Level, Full-Time/Part-Time Attendance, and College." Website: www.cuny.edu/irdatabook/rpts2_AY_current/ENRL_0019_UGGR_FTPT_HIST.rpt.pdf.
- Collins, Allan, John Seely Brown, and Susan E. Newman. 1987. *Cognitive Apprenticeship: Teaching the Craft of Reading, Writing, and Mathematics*. Champaign, IL: Center for the Study of Reading, University of Illinois at Urbana-Champaign.
- CUNY Task Force on Developmental Education. 2016. *Report of the CUNY Task Force on Developmental Education*. New York: City University of New York.
- Edgecombe, Nikki, Shanna Smith Jaggars, Elaine DeLott Baker, and Thomas Bailey. 2013. *Acceleration Through a Holistic Support Model: An Implementation and Outcomes Analysis of FastStart@CCD*. New York: Community College Research Center, Teachers College, Columbia University.
- Edgecombe, Nikki, Shanna Smith Jaggars, Di Xu, and Melissa Barragan. 2014. "Accelerating the Integrated Instruction of Developmental Reading and Writing at Chabot College." New York: Community College Research Center, Teachers College, Columbia University.
- Frangakis, Constantine E., and Donald B. Rubin. 2002. "Principal Stratification in Causal Inference." *Biometrics* 58: 21-29.
- Ginder, Scott A., Janice E. Kelly-Reid, and Farrah B. Mann. 2015. *Graduation Rates for Selected Cohorts, 2006-11; Student Financial Aid, Academic Year 2014-14; and Admissions in Postsecondary Institutions, Fall 2014: First Look (Provisional Data)*. NCES 2015-181. Washington, DC: U.S. Department of Education, National Center for Education Statistics. Website: <http://nces.ed.gov/pubs2015/2015181.pdf>.

- Graham, Steve, and Michael Hebert. 2010. *Writing to Read: Evidence for How Writing Can Improve Reading*. A Carnegie Corporation Time to Act Report. Washington, DC: Alliance for Excellent Education.
- Graham, Steve, and Dolores Perin. 2007a. "What We Know, What We Still Need to Know: Teaching Adolescents to Write." *Scientific Studies of Reading* 11, 4: 313-335.
- Graham, Steve, and Dolores Perin. 2007b. *Writing Next: Effective Strategies to Improve Writing of Adolescents in Middle and High School*. Washington, DC: Alliance for Excellent Education.
- Greenberg, David, Robert H. Meyer, and Michael Wiseman. 1994. "Multisite Employment and Training Program Evaluations: A Tale of Three Studies." *ILR Review* 47, 4: 679-691.
- Grubb, W. Norton. 2010. "The Quandaries of Basic Skills in Community Colleges: Views from the Classroom. An NCPR Working Paper." Paper presented at the National Center for Postsecondary Research Developmental Education Conference, New York, NY, September 23-24, 2010.
- Hern, Katie. 2010. *Exponential Attrition and the Promise of Acceleration in Developmental English and Math*. Berkeley, CA: The Research and Planning Group for California Community Colleges.
- Hiebert, James, Ronald Gallimore, Helen Garnier, Karen Bogard Givvin, Hilary Hollingsworth, Jennifer Jacobs, Angel Miu-Ying Chui, Diana Wearne, Margaret Smith, Nicole Kersting, Alfred Manaster, Ellen Tseng, Wallace Etterbeek, Carl Manaster, Patrick Gonzales, and James Stigler. 2003. *Teaching Mathematics in Seven Countries: Results from the TIMSS 1999 Video Study*. NCES 2003-013. Washington, DC: U.S. Department of Education, National Center for Education Statistics.
- Hill, Carolyn J., Howard S. Bloom, Alison Rebeck Black, and Mark W. Lipsey. 2008. "Empirical Benchmarks for Interpreting Effect Sizes in Research." *Child Development Perspectives* 2, 3: 172-177.
- Hodara, Michelle. 2011. *Reforming Mathematics Classroom Pedagogy: Evidence-Based Findings and Recommendations for the Developmental Math Classroom*. New York: Community College Research Center, Teachers College, Columbia University.
- Hodara, Michelle, and Shanna Smith Jaggars. 2014. "An Examination of the Impact of Accelerating Community College Students' Progression Through Developmental Education." *Journal of Higher Education* 85, 2: 246-276.
- Jenkins, Davis, Shanna Smith Jaggars, and Josipa Roksa. 2009. *Promoting Gatekeeper Course Success Among Community College Students Needing Remediation: Findings and Recommendations from a Virginia Study (Summary Report)*. New York: Community College Research Center, Teachers College, Columbia University.
- Jenkins, Davis, Cecilia Speroni, Clive Belfield, Shanna Smith Jaggars, and Nikki Edgecombe. 2010. "A Model for Accelerating Academic Success of Community College Remedial

- English Students: Is the Accelerated Learning Program (ALP) Effective and Affordable?" CCRC Working Paper No. 21. New York: Community College Research Center, Teachers College, Columbia University.
- Karp, Melinda Mechur. 2013. "Entering a Program: Helping Students Make Academic and Career Decisions." CCRC Working Paper No. 59. New York: Community College Research Center, Teachers College, Columbia University.
- Kemple, James J., Corinne M. Herlihy, and Thomas J. Smith. 2005. *Making Progress Toward Graduation: Evidence from the Talent Development High School Model*. New York: MDRC.
- Logue, A. W., Mari Watanabe-Rose, and Daniel Douglas. 2016. "Should Students Assessed as Needing Remedial Mathematics Take College-Level Quantitative Courses Instead? A Randomized Controlled Trial." *Educational Evaluation and Policy Analysis* 38, 3: 578-598.
- McClenney, Kay, C. Nathan Marti, and Courtney Adkins. 2012. *Student Engagement and Student Outcomes: Key Findings from "CCSSE" Validation Research*. Austin, TX: Community College Survey of Student Engagement.
- National Council of Teachers of Mathematics. 2000. *Principles and Standards for High School Mathematics*. Reston, VA: National Council of Teachers of Mathematics.
- National Governors Association Center for Best Practices, Council of Chief State School Officers. 2010. *Reaching Higher: The Common Core State Standards Validation Committee*. Washington, DC: National Governors Association.
- National Institute of Child Health and Human Development. 2000. *Report of the National Reading Panel. Teaching Children to Read: An Evidence-Based Assessment of the Scientific Research Literature on Reading and Its Implications for Reading Instruction*. NIH Publication No. 00-4769. Washington, DC: U.S. Government Printing Office.
- National Mathematics Advisory Panel. 2008. *Foundations for Success: The Final Report of the National Mathematics Advisory Panel*. Washington, DC: U.S. Department of Education.
- Page, Lindsay C., Avi Feller, Todd Grindal, Luke Miratrix, and Marie-Andrée Somers. 2015. "Principal Stratification: A Tool for Understanding Variation in Program Effects Across Endogenous Subgroups." *American Journal of Evaluation* 36, 4: 514-531.
- Perin, Dolores. 2013. "Literacy Skills Among Academically Underprepared Students." *Community College Review* 41, 2: 118-136.
- Provasnik, Stephen, and Michael Planty. 2008. *Community Colleges: Special Supplement to The Condition of Education 2008. Statistical Analysis Report*. NCEES 2008-033. Washington, DC: U.S. Department of Education, National Center for Education Statistics.
- Richburg-Hayes, Lashawn, Mary G. Visher, and Dan Bloom. 2008. "Do Learning Communities Effect Academic Outcomes? Evidence from an Experiment in a Community College." *Journal of Research on Educational Effectiveness* 1, 1: 33-65.

- Scott-Clayton, Judith, and Lauren Schudde. 2017. "Performance Requirements in Need-Based Aid: What Roles Do They Serve, and Do They Work?" New York: Center for Analysis of Postsecondary Education and Employment, Teachers College, Columbia University.
- Scrivener, Susan, and Michael J. Weiss. 2009. *More Guidance, Better Results? Three-Year Effects of an Enhanced Student Services Program at Two Community Colleges*. New York: MDRC.
- Scrivener, Susan, Michael J. Weiss, Alyssa Ratledge, Timothy Rudd, Colleen Sommo, and Hannah Fresques. 2015. *Doubling Graduation Rates: Three-Year Effects of CUNY's Accelerated Study in Associate Programs (ASAP) for Developmental Education Students*. New York: MDRC.
- Shapiro, Doug, Afet Dundar, Faye Huie, Phoebe Khasiala Wakhungu, Xin Yuan, Angel Nathan, and Youngsik Hwang. 2017. *Completing College: A National View of Student Attainment Rates by Race and Ethnicity — Fall 2010 Cohort*. Signature Report No. 12b. Herndon, VA: National Student Clearinghouse Research Center.
- Sommo, Colleen, Alexander K. Mayer, Timothy Rudd, and Dan Cullinan. 2012. *Commencement Day: Six-Year Effects of a Freshman Learning Community Program at Kingsborough Community College*. New York: MDRC.
- Stein, Mary Kay, Margaret Schwan Smith, Marjorie A. Henningsen, and Edward A. Silver. 2009. *Implementing Standards-Based Mathematics Instruction: A Casebook for Professional Development*. New York: Teachers College Press.
- Strumbos, Diana, and Zineta Kolenovic. 2016. "ASAP Evaluation Brief: ASAP Graduation Rates by Race/Ethnicity, Gender and Pell Status." New York: City University of New York.
- Tinto, Vincent. 1993. *Leaving College: Rethinking the Causes and Cures of Student Attrition*. Chicago: University of Chicago Press.
- U.S. Department of Education, Institute of Education Sciences. 2014. *What Works Clearinghouse Procedures and Standards Handbook, Version 3.0*. Washington, DC: U.S. Department of Education, Institute of Education Sciences.
- U.S. Department of Education, National Center for Education Statistics. n.d. "QuickStats." Website: <https://nces.ed.gov/datalab/quickstats>. Accessed on July 5, 2018.
- U.S. Department of Education, Office of Federal Student Aid. n.d. "Calculating Pell Grant Lifetime Eligibility Used." Website: <https://studentaid.ed.gov/sa/types/grants-scholarships/pell/calculate-eligibility#my-pell-leu>. Accessed on June 12, 2018.
- U.S. Department of Education, Office of Federal Student Aid. n.d. "Staying Eligible." Website: <https://studentaid.ed.gov/sa/eligibility/staying-eligible>. Accessed on June 12, 2018.
- U.S. Department of Education, Office of Vocational and Adult Education. 2011. *Building on Foundations for Success: Guidelines for Improving Adult Mathematics Instruction*. Washington, DC: U.S. Department of Education.

- Visher, Mary G., Heather Wathington, Lashawn Richburg-Hayes, and Emily Schneider. 2008. *The Learning Communities Demonstration: Rationale, Sites and Research Design*. New York: National Center for Postsecondary Research.
- Weiss, Michael J., Mary G. Visher, Evan Weissman, and Heather Wathington. 2015. "The Impact of Learning Communities for Students in Developmental Education: A Synthesis of Findings from Randomized Trials at Six Community Colleges." *Educational Evaluation and Policy Analysis* 37, 4.
- Winston, Roger B., Jr., and Janet A. Sandor. n.d. "Academic Advising Inventory." Website: www.nacada.ksu.edu/Portals/0/Clearinghouse/links/documents/AAI-Inventory-Master.pdf. Accessed on June 11, 2018.
- Zachry Rutschow, Elizabeth, and Emily Schneider. 2011. *Unlocking the Gate: What We Know About Improving Developmental Education*. New York: MDRC.

About MDRC

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Founded in 1974 and located in New York; Oakland, California; Washington, DC; and Los Angeles, MDRC is best known for mounting rigorous, large-scale, real-world tests of new and existing policies and programs. Its projects are a mix of demonstrations (field tests of promising new program approaches) and evaluations of ongoing government and community initiatives. MDRC's staff members bring an unusual combination of research and organizational experience to their work, providing expertise on the latest in qualitative and quantitative methods and on program design, development, implementation, and management. MDRC seeks to learn not just whether a program is effective but also how and why the program's effects occur. In addition, it tries to place each project's findings in the broader context of related research — in order to build knowledge about what works across the social and education policy fields. MDRC's findings, lessons, and best practices are shared with a broad audience in the policy and practitioner community as well as with the general public and the media.

Over the years, MDRC has brought its unique approach to an ever-growing range of policy areas and target populations. Once known primarily for evaluations of state welfare-to-work programs, today MDRC is also studying public school reforms, employment programs for ex-prisoners, and programs to help low-income students succeed in college. MDRC's projects are organized into five areas:

- Promoting Family Well-Being and Children's Development
- Improving Public Education
- Raising Academic Achievement and Persistence in College
- Supporting Low-Wage Workers and Communities
- Overcoming Barriers to Employment

Working in almost every state, all of the nation's largest cities, and Canada and the United Kingdom, MDRC conducts its projects in partnership with national, state, and local governments, public school systems, community organizations, and numerous private philanthropies.