

Impacts of Two Technology Interventions on Associate's Degree Completion or Equivalent Transfer:

Final Report of Results from the Robin Hood College Success Prize Competition

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The findings and conclusions in this report do not necessarily represent the official positions or policies of the funder.

Final Report of Results from the Robin Hood College Success Prize

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Executive Summary

Robin Hood Success Prize and RCT

The Robin Hood Foundation sponsored the College Success Prize (Prize) competition in 2014 to encourage the development of technology-based interventions to help New York City-based community college students—especially those in need of remediation—complete college. The Prize competition involved the potential awarding of up to \$5 million in prize money. The non-profit organization, ideas42, which uses insights from human behavior—why people do what they do—to help improve lives, build better systems, and drive social change, administered the competition and provided technical assistance to the competitors. Rules for the competition were established to guide all aspects of the competition's activities, including the selection of finalists and the conduct of a randomized controlled trial (RCT) to select competition prize winners.

One hundred and four teams submitted applications for the Prize competition. In 2015, 18 of the teams were selected as semi-finalists. Two competitors were selected as finalists:

- 1. Beyond 12, which entered its MyCoach app into the competition; and
- 2. **Kinvolved**, which entered its Campus Kit app into the competition.

The final stage of the Prize competition was an RCT to evaluate the effectiveness of the two apps in facilitating students' achievement of the outcomes being assessed in the competition. The Robin Hood Foundation engaged Abt Associates (Abt) in 2014 to conduct the RCT.

The study was conducted during three academic years from fall semester 2015 through the end of summer 2018. The City University of New York (CUNY) participated in the RCT at two of its community college campuses, LaGuardia Community College (LAGCC) and Borough of Manhattan Community College (BMCC), with the goal of identifying interventions that can increase graduation rates for its students, particularly those in need of remediation. The study examined outcomes separately for two groups of students:

- Competition-eligible—First time, full-time students who tested into remediation in at least one subject (math, reading, or writing); and
- Not-competition-eligible—First time, full-time students who did not test into remediation.

The competition-eligible students were the focus of the competition. However, it was thought that CUNY students who did not test into remediation could also benefit from the use of the apps. Thus both groups of students were included in the RCT.

Members of these two groups were randomly assigned to one of three experimental conditions: one treatment group of students was provided access to Beyond 12's MyCoach app; one treatment group of students was provided access to Kinvolved's Campus Kit app; and a third control group received no app. Abt collected background information and academic data from CUNY for all students participating in the study. We also received usage data from Beyond 12 and Kinvolved for the students who received an app.

The RCT assessed the impacts of the apps on three outcomes:

- Year 1 Outcome. Students' first to-second-year full-time persistence in college (i.e., persistence from fall 2015 to fall 2016). Under the competition rules, Beyond 12 and/or Kinvolved would qualify for a prize if the impact of their app on that outcome on *competition-eligible* students (i.e., students who tested into remediation) was 10 percentage points or greater. This means that the persistence rate of the students assigned to that app would need to be 10 percentage points higher than that of the control group.
- 2) Year 2 Outcome. Students' completion of an associate's degree or transfer to a four-year college with at least 60 credits by fall 2017. Under the competition rules, Beyond 12 and/or Kinvolved would qualify for a prize if the impact of their app on *competition-eligible* students was 5 percentage points or greater. This means that the two-year completion or transfer rate of the students assigned to that app would need to be at least 5 percentage points greater than that of the control group.
- 3) Year 3 Outcome. Students' completion of an associate's degree or transfer to a four-year college with 60 or more credits by fall 2018. Under the competition rules, Beyond 12 and/or Kinvolved would qualify for a prize if the impact of their app on *competition-eligible* students was 15 percentage points or greater. This means that the three-year completion or transfer rate of the students assigned to that app would need to be at least 15 percentage points greater than that of the control group.

Impact Findings

This report presents Abt's analyses of the results from the three years of the Prize competition. Estimates of the impacts of the two apps are shown in Exhibit 1. The impacts are presented for both the competition-eligible students and the not-competition-eligible students. The Prize was based on the results for the *competition-eligible* students. In summary, the results from the Year 1 analyses indicated that **neither finalist qualified for a prize at this point in the competition**. The results from the Year 3 analyses indicated that **neither finalist qualified that neither finalist qualified for a prize at this point in the competition**. The results from the Year 3 analyses indicated that **neither finalist qualified for a prize at this point in the competition**. The results from the Year 3 analyses indicated that **neither finalist qualified for a prize at this point in the competition**.

| | | | | Impact of | f App | |
|------|--|--|------------------------|---------------------------|--------------------------|---------------------------|
| | | | Competition-Eligi | ible | Not-Competition-Eligible | |
| Year | Outcome | Prize Cut-Off for Competition- Eligible Students Only | Beyond 12 (MyCoach) | Kinvolved (Campus Kit) | Beyond 12 (MyCoach) | Kinvolved (Campus Kit) |
| 1 | Students' first-to- second-year persistence | Impact of 10 percentage points or greater | -3.2 | -4.9 | 13.7*** | 13.6** |
| 2 | Students' attainment of associate's degree or transfer-fall 2017 | Impact of 5 percentage points or greater | -0.7 | 0.3 | 7.2 | 2.9 |
| 3 | Students' attainment of associate's degree or transfer-fall 2018 | Impact of 15 percentage points or greater | -2.7 | -1.7 | 13.7*** | 9.1 |

| Exhibit 1 | Summary | v of Findinas | hv Year | and Finalist |
|-----------|---------|---------------|---------|--------------|
| | Summary | y or r munigs | by icai | and i mansi |

Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; **= 5 percent; *= 10 percent.

The impact analyses were conducted following a detailed pre-analysis plan that was shared with the two finalists and published before the beginning of the RCT in fall 2015. Following such a plan was intended to almost entirely eliminate researcher discretion during the conduct of the analysis and ensure that the RCT was fair and impartial.

Other Findings: Analyses of App Usage

To understand the extent to which treatment students used the apps, Abt analyzed the usage data provided by the two finalists in terms of days that students accessed the apps. We also analyzed students' use of each feature of each app, but we could not compare the two apps because their features are different.

Overall, the students' use of the apps was limited. During Year 1, somewhat more than three-quarters of the competition-eligible students used their apps for more than one day. Students assigned to the Kinvolved group used their app more often than students assigned to Beyond 12 did. Among all competition-eligible students, those assigned to the Kinvolved group used their app for a mean of 14 days over the course of Year 1, compared to 7 days for Beyond 12 students. The same trend was observed among not-competition-eligible students; the mean was 14 days for the Kinvolved group compared with 9 days for the Beyond 12 group. Within the Beyond 12 group, the not-competition-eligible students used the app on more days than their competition-eligible peers did—about two more days on average. This difference was statistically significant at the five-percent level.

App usage in Year 2 was much lower than in Year 1. Just 5 percent of the competition-eligible students used their apps at least one day during that year. The competition-eligible students who were assigned to the Kinvolved group used their app for a mean of 0.4 day over the course of Year 2, compared to 0.3 day for the Beyond 12 students. A different trend was observed among not-competition-eligible students; the average was 0.6 day for the Beyond 12 group and 0.4 day for the Kinvolved group. Within the Beyond 12 group, the not-competition-eligible students used the app about two more days, on average, than their competition-eligible peers did. However, this difference was not statistically significant.

The usage of both apps continued to decrease in Year 3. During this year, 2 percent of Beyond 12's competition-eligible students used the app at least one day, and the mean days of use was only 0.04. Approximately 4 percent of Kinvolved's competition-eligible students used the app at least one day, and the mean days of use for these students was 0.1.

Results were similar for the not-competition-eligible students. Only 1 percent of Beyond 12 students and 2 percent of Kinvolved's students used the app at least one day in Year 3.

We ran four regression models of associate's degree attainment or transfer to a four-year college with at least 60 credits by fall 2018 (the outcome for Year 3) on days of app usage using the same covariates that were in the impact model. These regressions are an attempt to see how usage affected persistence. For the competition-eligible students who used the Beyond 12 app, there was a correlation between days of usage of the app and the likelihood of completing an associate's degree or transferring to a four-year college. Since these analyses are exploratory, we cannot draw any conclusions from the results.

Discussion

We found no impacts of the apps on persistence and attainment of an associate's degree or transferring to a four-year college for students who tested into remediation. That is, the results for competition-

eligible students indicated no significant impacts of either app on their outcomes for any of the three years of the competition. Though the Kinvolved competition-eligible students used their app at a slightly higher rate than their Beyond 12 counterparts for each of the three years, the mean days of use for both apps ranged between 14 (Kinvolved) and 8 (Beyond 12) during the first year of the competition and less than one day in the second and third years.

We discuss below possible factors affecting these results for students who participated in the Prize competition.

Competition-Eligible Students

One explanation for these results might be that the competition-eligible students, who had tested into remediation during Year 1 of the competition and who had lower placement test scores than the not-competition-eligible students at the time they entered college, did not find the apps to be helpful in addressing their immediate need to succeed in credit-bearing courses. The features of the apps were designed to address student retention and other challenges faced by college students, but the apps were not focused on addressing students' academic needs.

Another factor that might have influenced competition-eligible students' results is the limited number of push notifications that were sent by the apps to study treatment group participants. Emerging research on the use of mobile apps to increase higher education students' engagement, retention, and academic achievement point to the importance of having frequent push notifications and other prompts to encourage students' use of apps (Pechenkina et al., 2017).

Not-Competition-Eligible Students

The significant impacts for the not-competition-eligible students suggest that some features of the apps were helpful to students. The not-competition-eligible students had a slightly higher rate of app use than the competition-eligible students did. This difference was statistically significant (at the five-percent level) for the Beyond 12 students. A higher percentage of the Beyond 12 not-competition-eligible students also completed modules and earned badges compared to the competition-eligible students. The combination of greater use and the appeal of some of the Beyond12 app's features for these students may have contributed to their better outcomes.

Both Groups of Students

The results from focus groups of 16 study participants that CUNY conducted at LAGCC and BMCC in January 2016 provide anecdotal data that are insightful about students' use of the apps. Students reported that the apps were most helpful in supporting their time management and planning, prompting them to go to class, locate resources, and schedule activities. Some focus group participants commented on the value of the points and badge features as motivating them. Students viewed the apps as not helpful in supporting their academic development or in enabling them to customize information that facilitated their activities or communication. They also noted that some features were useful the first time they were accessed and then were not used again. Students using Kinvolved's app also indicated that there were a number of "glitches" with this app, which was a deterrent to its use. While the focus groups involved a very limited number of study participants, their comments align with the app usage data and provide some understanding of participants' perceptions of the apps and their role in assisting them in college.

Abt's RCT was designed to test the impacts of the finalists' apps on the Prize outcomes. The study did not include an implementation study to examine the academic and supportive environment at the two colleges participating in the Prize. Thus we do not know whether the academic activities and support services were similar at each college and the extent to which study students accessed these services. It might be the case that the differential availability of services and their use by students affected students' college completion outcomes.

Implications for Further Research

The Prize competition is a significant effort to rigorously test the efficacy of a technology-based intervention on community college students' persistence and completion. Abt's experience in conducting the RCT was that the Prize's well-structured competition with strong leadership and collaborative partners made it possible to implement a successful experiment. Our work on the study suggests some implications for future competitions of technology-based interventions, particularly mobile apps.

- Plan the schedule for a competition so that the phases of intervention development or adaptation can be implemented with time for a pilot test and modifications after the pilot test. The Prize had included a pilot-test phase, but due to the finalists' schedule in preparing their apps for a launch in fall 2015, the pilot test was not able to be conducted. Given the issues that are likely to occur in the initial use of any technological tool, it would be better to ensure that the intervention is working well before beginning a large-scale experiment.
- Include representatives from the intended group of users in the pilot test to ensure that the design and content of the intervention is aligned with users' needs and preferences. Particularly with technology that is evolving, it is critical to determine the types of user needs that the intervention can adequately address. For the Prize, the competition-eligible students needed assistance in developing their academic and psychosocial skills in order to achieve their academic goals. The finalists' apps were able to address some aspects of psychosocial skills, such as time management and planning, but did not have the range of content that students needed for college success.
- In specifying an intervention to test, consider the plausibility of any one intervention, particularly a technology-based tool, being able to affect a high-stakes academic outcome in individuals with different backgrounds. Because of the range of academic and other needs that students have and the limitations of any one intervention to address these needs, the specification of outcomes expected from an intervention is a critical point. Especially in testing technology interventions, such as the use of mobile apps and text messages to prompt students' behavior and facilitate their activities, it might be reasonable to set interim outcomes that are key benchmarks leading to a high-stakes academic outcome. In the Prize competition, the persistence from year one to year two is an example of an interim outcome for students. Another example, though not aligned to the Prize apps, would be successfully completing developmental education courses and enrolling in credit courses. The point is to ensure that the intervention is well aligned to the expected outcomes.
- Anticipate that there may be heterogeneity of effects across the groups of individuals participating in an intervention, and plan for a systematic study of the factors that may contribute to these effects. Further research could explore how similar interventions offer services that align to the needs of different groups of students and the ways in which these interventions affect more proximal outcomes, such as college persistence and credit accumulation.

The lessons from the Prize competition come at an important time in education as large investments are being made in tests of technology to address important societal issues, such as the need to improve the rates of adult literacy that can result in increased worker productivity, decreased health costs, and increased overall well-being. The Prize's structure and successful execution provide important lessons for future endeavors.

A. Introduction

Background

A college degree is critical to economic opportunity in today's economy. National estimates indicate that postsecondary credentials are important for access to middle class jobs (BLS, 2017). Though college participation rates have increased over the past two decades, students from low-income backgrounds and racial/ethnic minority groups are less likely to attend, persist, and complete college than their peers (see, for example, Bailey and Dynarski, 2011; Haskins, 2008; U.S. Department of Education, 2016). Low-income students, in particular, along with first-generation college students, racial/ethnic minorities, and males have been found to be underrepresented in postsecondary education (Arnold et al., 2009; Arnold, Lu, and Armstrong, 2012; Harper 2006; Harper & Griffen 2011; Tym et al., 2004).

Among the factors contributing to low college attendance and completion rates among students from low-income backgrounds and racial/ethnic minority groups are gaps in information and in support available to them once they enroll and attend college (Arnold et al., 2009; Avery & Kane, 2004; Avery, Howell, & Page, 2014; Bozick & DeLuca, 2011; Roderick et al., 2008). Students may also lack access to professional guidance on understanding the financial aid process and options (Arnold et al., 2009; Bettinger et al., 2012; Roderick et al., 2008) or to prompts that remind them to meet unfamiliar deadlines (Hoxby & Turner, 2013; Ross et al., 2013). Furthermore, they may require additional social-emotional supports during their transition to college. Students may struggle socially and emotionally with entering college; such difficulties have been found to influence their overall college engagement, achievement, and adjustment to college (Walton & Cohen, 2011).

Many first-generation college students enter higher education underprepared for college-level academic demands, which can affect their capacity to persist and complete college degrees (Greene &Winters, 2005). Recent attention has been focused on strategies for assisting underprepared students. One study noted that academic advising can consistently and effectively connect these students to academic resources on campus. This analysis found that the odds of a first-generation college student remaining enrolled at a given college increased 13 percent for every meeting with an advisor (Swecker, Fifolt, & Searby, 2013).

Efforts to ease students' transition into college, whether focused on helping students manage the financial, administrative, or academic obstacles they may face, are particularly important for students who may not have sufficient resources and supports during the transition to college. To address the needs of students attending community colleges in New York City, the Robin Hood Foundation (Robin Hood) sponsored the College Success Prize (Prize) competition to increase college success rates, in terms of both persistence and degree attainment. The Prize was a next step for Robin Hood in helping students attain associate's degrees in three years. Building on its collaboration with the City University of New York (CUNY) in supporting the Accelerated Study in Associate Programs (ASAP,) Robin Hood wanted to test the ways in which the use of technology can assist students in addressing common challenges they experience as first-time community college participants. The Prize competition's finalists provided smartphone apps that offer ready access to supports and reminders for students; these apps had low marginal cost for including an additional student, one of the goals for the competition. This report presents the results of an evaluation of the efficacy of these interventions in improving community college students' college outcomes.

Robin Hood College Success Prize and RCT

Robin Hood sponsored the Prize competition in 2014 to encourage the development of technologybased interventions to assist New York City-based community college students—especially those in need of remediation—complete college. As part of the Prize competition, Robin Hood was to potentially award up to \$5 million in prize money. The non-profit organization, ideas42, which uses insights from human behavior—why people do what they do—to help improve lives, build systems, and drive social change, administered the competition and provided technical assistance to the competitors. Rules for the competition were established to guide all aspects of the competition's activities, including the selection of finalists and the conduct of a randomized controlled trial (RCT) to select competition prize winners.

One hundred and four teams submitted applications for the Prize competition. In 2015, 18 of the teams were selected as semi-finalists. Two competitors were then selected as finalists:¹

- 1. Beyond 12, which entered its MyCoach app into the competition; and
- 2. **Kinvolved**, which entered its Campus Kit app into the competition.

The final stage of the competition was an RCT to evaluate the effectiveness of two apps in facilitating students' achievement of the outcomes being assessed in the competition. In an RCT, students are randomly assigned to one or more "treatment" groups, which receive the intervention(s) being tested, and a control group. An RCT study is considered the most rigorous test of the efficacy of a new practice or product, and is commonly used in education and social research.

Robin Hood engaged Abt Associates (Abt) in 2014 to conduct the RCT. Abt conducted the study during the three academic years that began in fall semester 2015 and ended in summer 2018. The City University of New York (CUNY) participated in the study at two of its community college campuses, LaGuardia Community College (LAGCC) and Borough of Manhattan Community College (BMCC), with the goal of identifying interventions that can increase graduation rates for its students—particularly those in need of remediation at college entry. At CUNY, 26 percent of students enrolled in remedial classes graduate within six years, compared to 40 percent of students not enrolled in remedial coursework (CUNY Office of Academic Affairs, 2011).

The study examined outcomes separately for two groups of students:

- Competition- eligible: First time, full-time students who tested into remediation in at least one subject (math, reading, or writing); and
- Not-competition-eligible: First time, full-time students who did not test into remediation.

While the competition-eligible students were the focus of the competition, it was thought that CUNY students who did not test into remediation could also benefit from the use of the apps. Thus both groups of students were included in the RCT.

The RCT began in 2015. During July, August, and September, Abt randomly assigned 2,166 students from LAGCC and BMCC to one of three experimental groups—**one treatment group for each app** (Beyond 12's MyCoach and Kinvolved's Campus Kit) and a **control group**. Approximately equal

¹ While three finalists were selected, one dropped out of the competition.

numbers of students were assigned to each group. Students were considered eligible for the RCT if they met the following four criteria during July through September 2015:

- Enrolled at LAGCC or BMCC;
- Enrolled in an associate's degree program;
- Enrolled full-time;² and
- Is a first-time, first-year student (i.e., a first-time freshman, as defined by each campus).

The RCT was designed to answer the following research questions, which are each aligned with one of the prizes described in the competition rules:

- 1. Are students assigned to a treatment group for either the Beyond 12 or Kinvolved apps more likely to persist in college in Year 2 as full-time students than those assigned to the control group?
- 2. Are students assigned to a treatment group for either the Beyond 12 or Kinvolved apps more likely, by the end of Year 2, to earn an associate's degree or transfer to a four-year college with at least 60 credits than those assigned to the control group?
- 3. Are students assigned to a treatment group for either the Beyond 12 or Kinvolved apps more likely to earn an associate's degree or transfer to a four-year college with at least 60 credits by the end of Year 3 of the RCT than those assigned to the control group?

Abt estimated these impacts through the use of regression models that predict community college persistence and completion in terms of the given treatment (MyCoach or Campus Kit) on persistence and completion, controlling for a set of baseline student characteristics. The impact analyses were conducted separately for two groups of students:

- 1. Study students who were eligible under the competition rules (*competition eligible*) because they tested into remediation in at least one subject (math, reading, or writing); and
- 2. Other study students who did not test into remediation and thus were not eligible for the competition (*not-competition-eligible*).

The *competition-eligible* students were the focus of the Prize competition. However, it was thought that CUNY students who did not test into remediation could also benefit from the use of the apps. Thus both groups of students were included in the RCT.

Overview of Study Results

This report presents the findings for the College Success Prize Competition for each of the three years of the competition, as shown in Exhibit 1. Below, the impacts of the two apps on competition-eligible students' outcomes are summarized first, followed by the results for the not-competition-eligible students.

Exhibit 1. Summary of Findings by Year and Finalist

² Students were considered full-time for determining eligibility for the RCT if they enrolled in at least 12 "equated" credits, including non-credit remedial coursework, at some point up to and including the first day of classes.

| | | | Impact of App | | | |
|------|---|---|------------------------|------------------------------|--------------------------|------------------------------|
| | | | Competition-E | ligible | Not-Competition-Eligible | |
| Year | Outcome | Prize Cut-Off for Competition- Eligible Students Only | Beyond 12 (MyCoach) | Kinvolved (Campus Kit) | Beyond 12 (MyCoach) | Kinvolved (Campus Kit) |
| 1 | Students' first-to- second-year persistence | Impact of 10 percentage points or greater | -3.2 | -4.9 | 13.7*** | 13.6** |
| 2 | Students' attainment of associate's degree or transfer-fall 2017 | Impact of 5 percentage points or greater | -0.7 | 0.3 | 7.2 | 2.9 |
| 3 | Students' attainment of associate's degree or transfer-fall 2018 | Impact of 15 percentage points or greater | -2.7 | -1.7 | 13.7*** | 9.1 |

Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; **= 5 percent; *= 10 percent.

Competition-Eligible Students

The results from the Year 1 analyses indicated that **neither finalist qualified for a prize at this point** in the competition. The results from the Year 2 analyses indicated that **neither finalist qualified for a prize at this point in the competition.** The results from the Year 3 analyses indicated that **neither finalist qualified for a prize in the competition.**

Not-Competition-Eligible Students

Beyond 12's app had significant impacts on students' outcomes in Year 1 and Year 3. Kinvolved's app had significant impacts on students' outcomes in Year 1. The two apps' other outcomes were positive but not statistically significant.

Abt conducted the impact analyses following a detailed pre-analysis plan that was shared with the two finalists and published before the analysis was conducted. Following such a plan was intended to almost entirely eliminate researcher discretion during the conduct of the analysis and ensure that the RCT is fair and impartial to both finalists (See Appendix D).

Overview of Final Report

Discussed in the balance of this report are: (a) the study design, including sample recruitment and random assignment, data collection, and characteristics of baseline sample; (b) descriptions of the finalists' apps; (c) methods for estimating impacts and the findings from the impact analysis; (d) analysis of students' use of the apps; and (e) summary and discussion.

B. Study Design

Student Recruitment and Randomization

This section describes the processes used to form the College Success Prize study group. Abt and CUNY worked together to recruit and randomly assign students, and through those processes, created the study group.

Exhibit 2 shows the steps in the recruitment and randomization phases of the study. We describe these steps below.





Orientation Session Presentations

Abt and CUNY, with advice from Robin Hood and ideas42, collaboratively developed the plan for recruiting students to participate in the Prize study. Students targeted for recruitment were first-time freshmen at the two participating CUNY campuses, LAGCC and BMCC. CUNY staff led the recruitment efforts by delivering Prize presentations in the mandatory in-person orientation and advising sessions at these two campuses. Sessions were held in the spring and early summer of 2015 prior to enrollment for the 2015 fall semester.

The Prize presentations provided information on the Prize study and the requirements for students' participation in the study. The study recruiters informed students that study participants would have a unique opportunity to test a smartphone app designed to help them succeed in college and would receive an incentive (\$76 gift card or \$76 New York City Transit MetroCard). The presentations made it clear that this study was an RCT; that is, not all students who agreed to participate would (1) be eligible, and (2) necessarily get access to one of the smartphone apps. Additionally, the presentations clarified that

only students who were enrolled full-time (i.e., taking at least 12 credit hours) in the fall 2015 semester would be eligible.

Student Consent

After each Prize presentation, interested students age 18 and older signed an informed consent form, which was available both in paper form and electronically. Interested students under age 18 were told they also needed the informed consent of a parent or guardian. The consent form was available for students to complete online at any point during the recruitment phase, but the majority of consenting did so in writing during the sessions.

Study Database Development and Early Random Assignment of Students

CUNY collected the consent forms that students completed in the orientation and advising sessions or online and sent them to Abt for entry into the Prize study database. As part of the study's early randomization process, Abt entered consented students into the Prize database; then randomly assigned them, with equal probability, to one of the two treatment groups (Beyond 12's MyCoach or Kinvolved's Campus Kit) or to the control group (no app). Once students enrolled in classes for the fall 2015 semester, CUNY provided updated enrollment records on a weekly basis. A total of 3,808 students consented to participate in the College Success Prize study.

Study Eligibility Determination

Next we reviewed the college records of the 3,808 students who consented to participate to determine their eligibility for the study against the criteria listed in this report's Section A, Introduction.

Of the 3,808 students screened for eligibility for the study, 2,859 were determined to be eligible for the study. We sent all eligible students an email message to remind them of the Prize study and the terms of eligibility and random assignment, and to alert them that they would receive invitations if they had been selected for the study. At this point in the randomization process, we did not share with them their experimental assignment. See Appendix A for detailed information about the study's eligibility determination process.

Student Invitations

Beginning on August 26, 2015, we distributed batches of emails and text message inviting students to participate in the Prize study. We formed these batches by randomly selecting a specified number of students from the pool of eligible students to meet the study's requirements for each of the three experimental groups and the number of competition-eligible (students who tested into remediation) and not-competition-eligible students (students who did not test into remediation). We sent students who did not respond to invitations two reminder messages via email and text. We sent 15 batches of electronic invitations to students between August 26 and September 22, 2015.

Invitation Authentication

Next, the recruitment process required students to complete an authentication step to signal their formal acceptance of the invitation to participate in the study. This step verified that only eligible students who had provided consent to participate in the Prize study had received invitations. The electronic invitation took students to a site online where they were asked to enter their birthdate before they could see the invitation details.³ Each student's birthdate was electronically matched against the birthdate on file in the study database; matched records let students see the invitation details.

³ This authentication step began halfway through the recruitment process to address CUNY's concern that errors might be made with telephone numbers.

The invitation details included each student's experimental assignment—whether to one of the treatment groups to receive one of the two apps or to the control condition (no app). For the purposes of the Prize study, this is considered the point of random assignment, since this is when students became aware of their assignment and it could therefore begin to affect them.

App Activation and Gift Card Distribution

All students assigned to a treatment group received instructions on how to activate their apps (either Beyond 12's MyCoach or Kinvolved's Campus Kit) and claim their gift card. Activation required students to download their app, open it on their mobile device, and sign in using the activation code included in the invitation's instructions.⁴ Abt was electronically notified when students had completed the activation step, which allowed us to determine how many invited students had actually signed into their assigned app.

The study incentive was a \$76 gift card, available either as a \$76 New York City Transit MetroCard, which could be claimed on campus, or as a \$76 e-gift card redeemable at Amazon, Barnes & Noble, Best Buy, CVS, Gap, or Staples. The process differed for treatment versus control students: the treatment group students received instructions for claiming their gift card *after* activating their assigned app, whereas control group students received instructions earlier, after completing the authentication step. Among the treatment group students, only those who activated their app received the incentive.

Finalization of Study Group

All invitations expired at 5:00 pm on Friday, October 2, 2015, marking the end of the study group intake. Students who received invitations were made aware of this deadline. When the deadline passed, the study group for the RCT consisted of 1,728 competition-eligible students and 438 not-competition-eligible students.

Exhibit 3 (competition-eligible students) and Exhibit 4 (not-competition-eligible students) illustrate the formation of the final study group as students progressed through the steps discussed above. As shown in Exhibit 3, the 1,728 students in the final competition-eligible group were composed of students who accepted the invitation to participate in the study. This group included 575 students who were assigned to Beyond 12's app, 587 students who were assigned to Kinvolved's app, and 566 students who were assigned to the control group. Of the students in the two competition-eligible treatment groups, 84 percent of Beyond 12 students and 87 percent of Kinvolved students activated their apps.

As shown in Exhibit 4, the 438 students in the final not-competition-eligible group who accepted the invitation to participate in the study included 153 students who were assigned to the Beyond 12 app, 128 students who were assigned to Kinvolved's app, and 157 students who were assigned to the control group. Of the students in the two not-competition-eligible treatment groups, 88 percent of the students in each treatment group activated their apps.

⁴ The activation codes were used to restrict access to the apps. Since the two apps were available online for download from Google Play and the Apple App Store, students in the control group (or anyone else) were able to download the apps. However, without a valid activation code, a student could not use either app.



Exhibit 3. College Success Prize Study Competition-Eligible Group Intake Flowchart



Exhibit 4. College Success Prize Study Not-Competition-Eligible Sample Intake Flowchart

Exhibit 5 presents the Prize study's final sizes for the three experimental groups organized by competition-eligible and not-competition-eligible study participants.

Exhibit 5. Final Size of Groups for the RCT, by Competition Eligibility

| Study Participants | Beyond 12 MyCoach | Beyond 12 Kinvolved MyCoach Campus Kit | | Total |
|--------------------------|----------------------|---|-----|-------|
| All | 728 | 715 | 723 | 2,166 |
| Competition-eligible | 575 | 587 | 566 | 1,728 |
| Not-competition-eligible | 153 | 128 | 157 | 438 |

Study Data

To conduct the impact analyses for the RCT, Abt obtained background information and academic data from CUNY for students participating in the study. We describe these data below.

Baseline Characteristics

In January 2016, we obtained baseline data on student characteristics as of students' enrollment at CUNY. These data were students' performance in high school (e.g., high school GPA, scores on New York State Regents examinations), demographic characteristics (e.g., race, ethnicity, sex, language spoken at home), information related to financial aid (e.g., adjusted gross income, expected family contribution), and CUNY placement examination scores used to determine if students had tested into remediation. We used these data to describe the sample and to construct covariates for the regression models used to estimate impacts.

College Outcomes

To construct the key outcome measures for the study's research questions, Abt needed data concerning students' full-time college enrollment one year after entering the study (Year 1 outcome), students' completion of an associate's degree or transfer to a four-year college with 60 or more credits (Year 2 outcome), and students' completion of an associate's degree or transfer to a four-year college with 60 or more credits (Year 3 outcome). We obtained these data from CUNY during each of the fall terms of the study: fall 2015, fall 2016, and fall 2017.

We review the three outcomes in chronological order.

The outcome variable for Year 1 was *Full-Time Persistence*. Based on information obtained from CUNY once fall enrollment closed in 2016, Abt constructed this indicator variable, which is 1 if the student was enrolled full-time in fall 2016 and zero otherwise. We marked a student as having persisted if she or he had enrolled full-time as of the "census date"—the date on which the CUNY colleges report their enrollments—or if he or she was marked as full-time at a non-CUNY campus according to National Student Clearinghouse (NSC) records. In fall 2016, CUNY obtained the NSC records on the study group and provided them to Abt. Students who did not appear in either the CUNY or NSC records were coded as not having persisted full-time. As a result, no students were missing data for the outcome variable.

The outcome variable for Year 2 was *Two-Year Completion*. Based on information obtained from CUNY once fall enrollment closed in 2017, Abt constructed this indicator variable, which is 1 if the student had a record of earning an associate's degree in CUNY's database and/or in the NSC database on or prior to August 31, 2017, or was enrolled in a four-year college in fall 2017 according to either CUNY or NSC records and had earned at least 60 prior credits, according to CUNY.⁵ If neither of these conditions was met, the indicator was zero. CUNY obtained the NSC records on the study group and provided them to Abt. Again, students who do not appear in either set of records were coded as not having earned an associate's degree or transferring; therefore, no students were missing data for this outcome variable.

The outcome variable for Year 3 was *Three-Year Completion*. Based on information obtained from CUNY once fall enrollment closed in 2018, Abt constructed this indicator variable, which is 1 if the student had a record of earning an associate's degree in CUNY's database and/or in the NSC database on or prior to August 31, 2018, or was enrolled in a four-year college in fall 2018 according to either CUNY or NSC records and had earned at least 60 prior credits, according to CUNY. If neither of these conditions was met, the indicator was zero. In fall 2018, CUNY obtained the NSC records on the study group and provided them to Abt. As we described for the other outcome variables, no students had

⁵ NSC does not maintain records of credits earned, so Abt was only able to analyze credits earned at CUNY.

missing data for this outcome, as they were coded as not having earned an associate's degree or transferring.

There were two treatment indicator variables, one for each of the finalist groups. *Kinvolved* is a variable that is 1 if the student was assigned to the Kinvolved treatment and 0 otherwise. *Beyond 12* is an analogous variable for the Beyond 12 group. If a student was in the control group, both of these variables were set to 0.

Characteristics of Study Group at Baseline

One important test of the effectiveness of randomization procedures is to assess the extent to which the treatment and control groups have similar means on observed characteristics at baseline. Randomization does not guarantee baseline equivalence on all characteristics, because there may be some variation from this due to chance. However, for large samples such as those in this study, significant differences should be relatively unusual and most differences should be small and insignificant.

Abt used data that CUNY⁶ provided on students' demographic and academic characteristics measured prior to random assignment to examine selected demographic and academic characteristics of the study group at baseline. We analyzed the characteristics of the study group separately for competition-eligible students (those who tested into at least one remedial course) and not-competition-eligible students (those who did not test into remediation). Within the two groups, we present summary statistics for all students and separately for Beyond 12, Kinvolved, and control groups. We ran an omnibus F-test to determine if there were any significant differences between Beyond 12, Kinvolved, and control groups, and include these results. In discussing the baseline characteristics, we provide information on how the study group compares to national data.

Characteristics of the Competition-Eligible Group

Exhibit 6 provides information on the baseline characteristics for the competition-eligible group. We present these data to test for baseline equivalence and to characterize the sample. More than half of the data are missing for race/ethnicity and for the two of the Regents math exams and the SAT tests. The extent of the missing academic data is likely due to students' non-participation in the Regents exams and in the SAT tests. Missing data at baseline do not affect the integrity of the RCT and do not affect testing for baseline equivalence. Due to randomization, data should be missing at approximately the same rates across groups. Appendix B presents the percentage of missing data for each study variable for the competition-eligible and the not-competition-eligible groups.

⁶ Data on relevant baseline characteristics were either collected by CUNY via student applications or provided to CUNY by the NYC Public Schools, for those graduates of NYC high schools.

Exhibit 6. Demographic and Academic Characteristics of Competition-Eligible Group Members at Baseline

| | All Students | Beyond 12 (MyCoach) | Kinvolved (Campus Kit) | Control | p (F-Test) |
|--|------------------------|------------------------|---------------------------|-----------------------|------------|
| Number of Students in Group | 1,728 | 575 | 587 | 566 | |
| Demographic Characteristics | | | | | |
| Age as of 9/1/2015 [mean (SD) Total N] ∻ | 20.5 (4.349) 1,728 | 20.6 (4.879) 575 | 20.3 (3.744) 587 | 20.7 (4.362) 566 | 0.36 |
| Sex: Female [% (N) Total N]♦ | 63.9% (893) 1,398 | 62.9% (291) 463 | 63.3% (297) 469 | 65.5% (305) 466 | 0.68 |
| Race and Ethnicity [% (N) Total I | ןא] | | | | |
| Hispanic◊ | 53.7% (689) 1,283 | 53.9% (229) 425 | 53.3% (232) 435 | 53.9% (228) 423 | 0.98 |
| White◊◊ | 24.0% (185) 771 | 24.2% (63) 260 | 24.0% (63) 262 | 23.7% (59) 249 | 0.99 |
| Black◊◊ | 52.0% (401) 771 | 52.7% (137) 260 | 51.5% (135) 262 | 51.8% (129) 249 | 0.96 |
| Asian◊◊ | 20.5% (158) 771 | 20.4% (53) 260 | 21.0% (55) 262 | 20.1% (50) 249 | 0.97 |
| American Indian or Alaska Native◊◊ | 5.7% (44) 771 | 6.2% (16) 260 | 4.6% (12) 262 | 6.4% (16) 249 | 0.62 |
| Pacific Islander/Native Hawaiian◊◊ | 3.5% (27) 771 | 2.7% (7) 260 | 3.4% (9) 262 | 4.4% (11) 249 | 0.57 |
| Academic Characteristics | | | | | |
| High School GPA [mean, 0-100 scale (SD) Total N] | 75.9 (7.310) 1,368 | 76.1 (7.094) 459 | 75.6 (7.362) 457 | 76.1 (7.475) 452 | 0.50 |
| New York High School Regents | Exams [mean sco | res (SD) Total N] | | | |
| English◊ | 73.3 (8.963) 1,174 | 73.0 (9.335) 397 | 73.0 (9.060) 398 | 73.9 (8.441) 379 | 0.28 |
| Algebra◊ | 70.7 (6.995) 1,158 | 70.5 (7.197) 397 | 70.8 (6.848) 393 | 70.6 (6.946) 368 | 0.82 |
| Geometry | 59.6 (11.964) 652 | 58.5 (12.193) 235 | 60.1 (11.834) 223 | 60.2 (11.800) 194 | 0.23 |
| Trigonometry | 44.3 (16.182) 177 | 45.4 (16.586) 67 | 46.6 (14.993) 56 | 40.5 (16.490) 54 | 0.11 |
| SAT [mean scores (SD) Total N] | | | | | |
| Verbal\00 | 382.2 (74.621) 731 | 378.9 (69.309) 246 | 383.2 (80.856) 248 | 384.6 (73.326) 237 | 0.68 |
| Writing◊◊ | 377.5 (71.164) 710 | 377.4 (71.470) 236 | 374.9 (75.735) 243 | 380.3 (65.894) 231 | 0.71 |
| Math00 | 377.5 (62.801) 732 | 374.3 (65.391) 246 | 381.8 (60.698) 248 | 376.3 (62.236) 238 | 0.34 |
| Initial Placement Exams [mean s | cores (SD) Total I | N] | | | |
| Reading◊ | 69.2 (16.135) 1,098 | 68.7 (15.878) 362 | 68.1 (16.154) 379 | 70.9 (16.276) 357 | 0.05** |
| Writing◊ | 50.6 (11.207) 1,094 | 51.0 (10.747) 363 | 49.7 (11.759) 377 | 51.1 (11.044) 354 | 0.19 |
| Math | 27.0 (12.314) 1.697 | 26.5 (11.677) 564 | 27.4 (12.832) 574 | 27.2 (12.400) 559 | 0.42 |

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| | All Students | Beyond 12 (MyCoach) | Kinvolved (Campus Kit) | Control | p (F-Test) |
|---|------------------------|------------------------|---------------------------|--------------------|------------|
| Prior Credits as of Fall 2015 | | | | | |
| Percent with any credits [% (N) Total N] | 4.1% (69) 1,694 | 4.6% (26) 566 | 3.0% (17) 573 | 4.7% (26) 555 | 0.26 |
| Credits among those with any [mean (SD) Total N] | 4.5 (2.593) 69 | 5.0 (3.225) 26 | 4.1 (1.853) 17 | 4.3 (2.290) 26 | 0.44 |
| Graduated from an NYC Public High School [% (N) Total N] | 72.9% (1,065) 1,461 | 74.7% (366) 490 | 73.2% (360) 492 | 70.8% (339) 479 | 0.39 |

Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; **= 5 percent; *= 10 percent. Notation for continuous variables: Mean, Standard Deviation, Total Number of respondents for that variable

Notation for non-continuous variables: Percentage of respondents, Number of respondents represented by percent, Total

Number of respondents for that variable

 $\diamond Variable$ with 25%-50% missing data

◊◊Variable with more than 50% missing data

Sixty-four percent of the competition-eligible students were female, slightly higher than the national level of 56 percent.⁷ The average age was 20.5, suggesting that some students did not enroll in college immediately after completing high school. The majority of these students were minority; about half identified as Hispanic or black (54 and 52 percent, respectively), and one-fifth identified as Asian.

Academically, the competition-eligible students' high school performance was similar to that of other community college students. For example, the mean high school GPA for competition-eligible students was 75.9, similar to that of other CUNY community colleges.⁸ Somewhat more than half the students in the competition-eligible sample had taken the CUNY reading and writing placement exams (not shown in exhibit); however, students with sufficiently high scores on the Regents exams or SAT tests could be exempted from taking such assessments. The mean scores for competition-eligible students' reading and writing placement exams were 69 and 51, respectively. A much larger proportion (91 percent) of the competition-eligible students had taken placement exams in math. The average math placement exam score across the competition- eligible group was 27. Note that the thresholds for placement in remedial reading, writing, and math courses are 56, 70, and 40 respectively; all students in the competition-eligible group tested into remedial courses in either reading or math.

Characteristics of Not-Competition-Eligible Group

We also analyzed the background and academic characteristics of the not-competition- eligible students (those who did not test into remediation), which are shown in Exhibit 7. We compared the characteristics of the not-competition-eligible students to those of the competition-eligible students to see if there were any unexpected differences. Because of the criterion for being competition-eligible, the two groups differed in terms of their academic characteristics. Compared to the competition-eligible students, the not-competition-eligible students had higher mean scores on their placement tests; higher mean scores of the SAT tests. All of these differences were statistically significant at the one-percent level.

We examined two other academic characteristics. More not-competition-eligible students (10 percent) had earned college credits as of fall 2015 compared to the competition-eligible students (4 percent). The

⁷ https://nces.ed.gov/fastfacts/display.asp?id=98

^{8 &}lt;u>http://www2.cuny.edu/wp-content/uploads/sites/4/page-</u> assets/admissions/undergraduate/counselor/Admission-Profile-Freshman.pdf

not-competition-eligible students also were more likely to have graduated from a New York City high school (82 percent) compared to competition-eligible students (73 percent). These differences also were statistically significant at the one-percent level.

The not-competition-eligible students were younger with an average age of 19 years, compared to the competition-eligible students who had an average age of 20.5 years. This difference was significant at the one-percent level. Age was the only significantly different background characteristics between the two groups.

| | All Students | Beyond 12 (MyCoach) | Kinvolved (Campus Kit) | Control | p (F-Test) |
|--|----------------------|------------------------|---------------------------|----------------------|------------|
| Number of Students in Group | 438 | 153 | 128 | 157 | |
| Demographic Characteristics | 5 | | | | |
| Age as of 9/1/2015 [mean (SD) Total N] | 19.3 (2.923) 438 | 19.2 (2.605) 153 | 19.0 (1.856) 128 | 19.5 (3.794) 157 | 0.32 |
| Sex: Female [% (N) Total N] | 59.6% (229) 384 | 63.2% (86) 136 | 55.8% (63) 113 | 59.3% (80) 135 | 0.49 |
| Race and Ethnicity [% (N) Tota | l N] | | | | |
| Hispanic | 48.7% (174) 357 | 43.1% (56) 130 | 49.5% (51) 103 | 54.0% (67) 124 | 0.22 |
| White◊◊ | 29.3% (67) 229 | 31.9% (29) 91 | 25.0% (16) 64 | 29.7% (22) 74 | 0.65 |
| Black◊◊ | 38.4% (88) 229 | 36.3% (33) 91 | 37.5% (24) 64 | 41.9% (31) 74 | 0.75 |
| Asian | 31.4% (72) 229 | 31.9% (29) 91 | 34.4% (22) 64 | 28.4% (21) 74 | 0.75 |
| American Indian or Alaska Native◊◊ | 4.4% (10) 229 | 2.2% (2) 91 | 7.8% (5) 64 | 4.1% (3) 74 | 0.24 |
| Pacific Islander/Native Hawaiian◊◊ | 2.2% (5) 229 | 1.1% (1) 91 | 6.3% (4) 64 | 0.0% (0) 74 | 0.03** |
| Academic Characteristics | | | | | |
| High School GPA [mean, 0-100 scale (SD) Total N] | 80.0 (7.750) 390 | 80.4 (8.005) 136 | 79.7 (7.081) 115 | 79.9 (8.059) 139 | 0.77 |
| New York High School Regent | s Exams [mean sc | ores (SD) Total N |] | | |
| English | 79.4 (8.314) 341 | 79.9 (6.590) 114 | 79.0 (10.481) 104 | 79.4 (7.704) 123 | 0.75 |
| Algebra | 78.3 (5.706) 337 | 78.3 (5.919) 111 | 78.4 (5.719) 104 | 78.2 (5.539) 122 | 0.95 |
| Geometry◊ | 72.0 (9.533) 280 | 72.9 (8.810) 91 | 71.7 (9.676) 85 | 71.5 (10.045) 104 | 0.55 |
| Trigonometry | 60.5 (16.458) 166 | 60.4 (16.206) 55 | 59.5 (17.025) 50 | 61.4 (16.435) 61 | 0.83 |

Exhibit 7. Demographic and Academic Characteristics of Not-Competition-Eligible Group Members at Baseline

| | | Devend 12 | Kinyalyad | | | | |
|--|-----------------------|----------------------|----------------------|----------------------|------------|--|--|
| | All Students | (MyCoach) | (Campus Kit) | Control | p (F-Test) | | |
| SAT [mean scores (SD) Total N] | | | | | | | |
| Verbal◊ | 435.1 (73.293) 275 | 438.0 (75.500) 96 | 432.8 (82.730) 85 | 434.3 (61.705) 94 | 0.89 | | |
| Writing◊ | 424.7 (70.106) 268 | 424.6 (75.420) 93 | 412.3 (73.785) 84 | 436.2 (58.893) 91 | 0.08* | | |
| Math◊ | 459.9 (68.812) 277 | 461.0 (67.507) 97 | 459.4 (68.632) 85 | 459.2 (70.976) 95 | 0.98 | | |
| Initial Placement Exams [mean | scores (SD) Tota | I N] | | | | | |
| Reading◊◊ | 82.5 (11.353) 104 | 82.3 (11.170) 39 | 80.5 (11.797) 23 | 83.7 (11.383) 42 | 0.54 | | |
| Writing◊◊ | 59.8 (8.162) 105 | 60.4 (7.471) 40 | 58.9 (7.792) 23 | 59.8 (9.086) 42 | 0.80 | | |
| Math◊ | 52.9 (13.985) 267 | 52.4 (14.064) 94 | 51.7 (10.610) 76 | 54.2 (16.108) 97 | 0.80 | | |
| Prior Credits as of Fall 2015 | | | | | | | |
| Percent with any credits [% (N) Total N] | 9.7% (42) 433 | 13.9% (21) 151 | 7.9% (10) 126 | 7.1% (11) 156 | 0.09* | | |
| Credits among those with any [mean (SD) Total N] | 5.6 (4.746) 42 | 7.1 (6.074) 21 | 3.6 (1.897) 10 | 4.7 (2.412) 11 | 0.12 | | |
| Graduated from an NYC Public High School [% (N) Total N] | 82.5% (335) 406 | 79.6% (113) 142 | 84.2% (101) 120 | 84.0% (121) 144 | 0.52 | | |

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Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; **= 5 percent; *= 10 percent.

Notation for continuous variables: Mean, Standard Deviation, Total Number of respondents for that variable
Notation for non-continuous variables: Percentage of respondents, Number of respondents represented by percent, Total

Number of respondents for that variable

◊Variable with 25%-50% missing data

◊◊Variable with more than 50% missing data

Tests of Similarity of Groups at Baseline

Abt examined the baseline characteristics of the three experimental groups (Beyond 12's MyCoach, Kinvolved's Campus Kit, and the control group) for each group of competition-eligible and not-competition-eligible students.

Because of randomization, any differences between randomization groups are expected to occur by chance, and few statistically significant differences are expected between the groups. More precisely, if statistical tests of differences are performed at the five-percent level, one would expect roughly one significant test for every 20 tests of differences between the means of variables. Because there are three groups in this study, Abt conducted 35 global F-tests to determine whether any of the three means of a given baseline characteristic differed.

Results were as expected. For the student characteristics for the competition-eligible (Exhibit 6) and the not-competition-eligible (Exhibit 7) groups, there were:

- No statistically significant differences between Beyond 12's MyCoach and Kinvolved's Campus Kit groups in the competition-eligible and not-competition-eligible groups;
- No statistically significant differences between students assigned to the Beyond 12 MyCoach group and those assigned to the control group in the competition-eligible and notcompetition-eligible groups;

- A statistically significant difference between Kinvolved's Campus Kit group and the control group on the reading placement test mean scores for the competition-eligible group;
- A statistically significant difference between the Kinvolved group and the control group on the percent of Pacific Islander/Native Hawaiian students and on the SAT writing test mean score mean for the not-competition-eligible group; and
- A statistically significant difference between the Beyond 12 group and the control group on the percent of students with any college credits for the not-competition-eligible group.

C. Description of College Success Prize Apps

The attainment of a postsecondary degree is one of the key contributors to economic well-being and successful employment. However, persistence and completion rates for students who enroll in postsecondary institutions are low. Specifically, more than 40 percent of first-time, full-time two-year enrollees fail to return in their second year (Kena et al., 2014), and roughly one-fifth (22 percent) of students enrolled in two-year colleges earn degrees within three years (Shapiro et al., 2015).

The Prize competition was designed to address some of the common challenges experienced by firsttime community college students. The two finalists, Beyond 12 and Kinvolved, developed the MyCoach and Campus Kit apps, respectively, to address common barriers to college persistence and college completion. Described in this section is each app's theory of change and key features.

The Apps Theories of Change

The **MyCoach** app, developed by Beyond 12, is intended to serve as a coach or mentor to students who may lack the social capital and self-regulation skills that can help them succeed in college. The coaching and mentoring services are designed to help students organize and complete tasks, reflect on their learning and goals, connect with other students for support, and track their own progress. For example, the app's task organization feature is designed to minimize the chance that students miss a task or deadline that is essential to their academic progress. Other features help students reflect on the value of their education and think through tangible next steps in college-course taking and planning ahead for the remainder of the college experience. If students are able to monitor their progress on important tasks and engage meaningfully in their education, Beyond 12 expects persistence and graduation rates to improve. Beyond 12's theory of change for the MyCoach app had been that a live coach in combination with the use of the app is an effective strategy for assisting students to succeed in college. Since the rules for the Prize competition did not permit finalists' to conduct outreach to individual students, Beyond 12 was testing a new theory of change as part of the competition, one that did not involve customized coaching.

The **Campus Kit** app, developed by Kinvolved, is based on the assumption that students' class attendance and ready access to information on academic resources and support services will lead to improved academic performance. Campus Kit includes features that enable students to monitor class attendance and self-identify challenges that can affect class attendance, thereby minimizing barriers to accessing academic supports and class attendance, which in turn are expected to improve student persistence and graduation rates. Other features are designed to increase students' access to campus resources and supports, improve communications between students and advisors, and remind students of important academic calendar dates. Kinvolved's logic model is found in Appendix C.

Descriptions of the Apps

Beyond 12's MyCoach and Kinvolved's Campus Kit apps support students in different ways with different types of features. Each app was customized to both the LAGCC and BMCC campuses. This section provides details on the two apps' features and functionality.

MyCoach

Beyond 12 developed the MyCoach app to facilitate students' participating in activities and developing behaviors and habits that can lead to their success in college. The app was designed to coach students electronically by reminding them of deadlines and milestones, and by providing them with customized

tools and tips to help them carry out their responsibilities in college. Student users receive automated alerts that include links to campus resources. They are asked to record completion of tasks; are provided with messages that acknowledge their successes; are motivated to acquire skills and knowledge; and are encouraged to share their experiences with peers. The following features are offered as part of the MyCoach app:

- **Progress monitoring**: The progress monitoring feature enables students to track their progress on a variety of task modules and take quizzes that prompt them to reflect on their progress. The task modules can be categorized as: in progress (*Doing*), completed (*Done*), or *Dismissed*. Students can earn virtual badges for making progress on task modules. There are numerous task modules, each with a different focus, which include getting started with the MyCoach app, setting academic goals, and meeting deadlines. The meeting deadlines module helps students track progress on deadlines that are campus-specific (e.g., orientation, drop-add dates) and general (e.g., financial aid deadlines). Two examples of task modules that are monitored through this feature follow:
 - *Participate in Academic Advising*—making progress on this task module requires students to have met with an academic advisor to review their academic plans. In-app feedback reminds students that advisors can help them choose their courses and select a major. Students also are prompted to update their education plan and to take it with them.
 - *Obtain Class Materials*—this task module reminds students to obtain the syllabus and find the lists of books and supplies for each of their classes, and to buy the correct edition of each book. Students are encouraged to "comparison shop" and save receipts for possible refunds.
- Quizzes: In addition to the task modules, quizzes appear on the to-do list to further help students navigate college. For example, there is a fall enrollment quiz that asks the student how many courses he/she is taking, how many of these are remedial courses, and how many of his/her credits meet general education requirements. The app provides the student with feedback on his/her progress toward graduation. Other quiz topics include financial aid and employment. Each quiz provides the student with expert feedback after the quiz is completed.
- Social networking: The *Inspirations* feature connects students with other students on campus to share experiences, tips, campus resources, and concerns. This feature prompts students to share information with their peers, which is intended to motivate them to succeed in college. Responses to the inspiration prompts are made public to other students using the app on that campus. For example, one inspiration is "As a kid, I dreamed of growing up to be _____." Students can also post tips for other students on how to use the various app features. For example, one student offered information on how to add your own to-do item to the progress monitoring tool.
- **Campus resources**: This feature provides students with easy access to the resources available to them on campus. Students click on a resource and the app provides information on the resource's location and contact information.

Campus Kit

Kinvolved developed the Campus Kit app to provide students with access to campus resources and information, real-time communication, and progress monitoring. The app includes organizational tools, social networking, and a feature that encourages attendance. It is designed to help students stay on track during their early college career by encouraging their attendance in courses and facilitating their access to the support and information needed for success. The following features are offered as part of the Campus Kit app:

- Attendance monitoring: Students can receive reminders of upcoming classes. The *Check In* feature uses schedule information with GPS technology to track student attendance. This can be done by checking in manually or automatically by defining a fixed area as the class location (called "geofencing"). Students earn points each time they check in to class using the app. The *Portfolio* feature allows students to view their points and tracks progress on "leveling up" (i.e., as students accrue points, they progress through successive "levels"). When students miss a class, the app allows them to record explanations for their absence (e.g., illness, family or work responsibilities).
- Academic calendar reminders: The *Newsfeed* feature displays important campus deadlines, events, and tips. The app developer collected information from CUNY about these deadlines, resources (e.g. advising), and course schedule information for each student. The information is presented in the app in a way that is accessible to students. Students can "like" tips or campus events on the newsfeed, and their ratings are shared with other students.
- Social networking: Students can contact other students with this feature and share their experiences (e.g., about campus life, tips, and resources) without having to disclose personal information. The social networking feature also shows the badges and levels students have earned in the attendance monitoring feature, the number of points earned, the tasks they have already completed in the app, and a list of tasks that are to be completed.
- Campus resources: The *Support* feature presents information on campus resources organized by categories such as advising, money, jobs, tech help, and emergency services. Students can contact these resources through the app via email or telephone. Each resource has a description, a list of services offered, and location. Students' academic advisors can be designated as a resource and can be contacted through the app. Students can post reviews of these resources, which can be viewed by other students using the app on that campus.

D. Impact Analysis and Results

We discuss Abt's procedures for determining the impacts on the outcomes for each of the three years of the Prize competition and the results from the competition in this section. The outcomes that were the focus of the competition are students':

- First-to second-year full-time persistence in fall 2016 (Year 1);
- Completion of an associate's degree or transfer to a four-year college in fall 2017 with 60 or more credits prior to fall 2017 (Year 2); and
- Completion of an associate's degree or transfer to a four-year college in fall 2018 with 60 or more college credits prior to fall 2018 (Year 3).

Estimation Method for Impact Analysis

Linear Probability Model

To estimate the impacts for each year of the competition, Abt applied a linear probability model (LPM) that uses ordinary-least-squares (OLS) regression with a binary outcome. The outcomes for each year of the competition are binary (either a student met one of these criteria, or did not). While probit or logit models can be used with a binary outcome, a linear model will yield unbiased estimates of the effects of the two apps, and prior research has shown that linear and nonlinear models with binary outcomes yield very similar estimates of effects (Angrist and Pischke, 2008).

Abt estimated the linear probability model using treatment indicator variables and covariates. CUNY provided Abt with data on approximately 20 covariates about the study group. CUNY also sent Abt retrospective data on the same covariates for prior cohorts of students to help inform the selection of the most appropriate covariates to use in the model, and therefore to help improve the precision of the impact estimates by maximizing the explanatory power of the regression model. The covariate selection model used is discussed in Appendix D. In summary, for each group (competition-eligible and not-competition- eligible students), we fit three models, one for each of the three outcomes, which included the treatment indicator variables for each of the two treatment groups (Beyond 12 and Kinvolved), and eight covariates. Thus, we have six models, given that there are two groups and three outcomes.

Impact Results

Competition-Eligible Students

Exhibit 8 provides the impact results for the competition-eligible students for each of the three outcomes of the competition, which correspond to the three years of the competition. The exhibit also displays the results from the treatment on the treated analysis. The full model estimates, including coefficients on covariates, are provided in Appendix D. The coefficients for the regression model for each of the three years are found in Appendix D. L., Exhibit D.2, and Exhibit D.3, respectively.

For the competition-eligible students, there were no significant impacts on any of the three outcomes. Overall differences with the control group were small and usually slightly negative (on the point estimates), and none of these differences are significantly different from zero. **Thus neither finalist was awarded a prize**. The TOT estimates are uniformly slightly higher in magnitude than the ITT estimates, but still are not as high as the targeted impact needed to be awarded a prize.

Exhibit 8. Impacts Associated with Each of the Three Outcomes for Competition-Eligible Students: Intent-to-Treat (ITT) and Treatment-on-the-Treated (TOT) Results

| Outcome | Control Group % | Beyond 12 Group % | Difference: ITT | Difference: TOT | Kinvolved Group % | Difference: ITT | Difference: TOT |
|--------------------------------------|-----------------------|-------------------------|--------------------|--------------------|-------------------------|--------------------|--------------------|
| Full-time Persistence (Year 1) | 59.0 | 55.8 | -3.2 | -3.8 | 54.1 | -4.9 | -5.6 |
| Two-year Completion | 6.5 | 5.8 | -0.7 | -0.8 | 6.8 | 0.3 | 0.3 |
| Three-year Completion | 29.2 | 26.4 | -2.7 | -3.3 | 27.5 | -1.7 | -2.0 |

N=1,728. Source: Abt calculations based on CUNY and National Student Clearinghouse data.

Note: ITT and control group means may not add to treatment group mean in each case due to rounding. Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; **= 5 percent; *= 10 percent.

Not-Competition-Eligible Students

Exhibit 9 shows the impact results for the not-competition-eligible students. We found significant results for these students in Years 1 and 3. The Beyond 12 students in this group experienced significant positive impacts (at the one-percent level) both for the first outcome of full-time persistence and the third outcome of three-year completion or equivalent. For the three-year completion outcome, the impact is quite large; almost 14 percentage points. Beyond 12 students experienced this outcome at a rate of about 51 percent, as opposed to about 37 percent for the control group. No significant difference was found for the second outcome of two-year completion, but the positive point estimates are consistent with the other results. It appears that the Beyond 12 students in this subgroup just needed more time to get significantly ahead, on the completion measure, of the control group.

For the Kinvolved students in this subgroup, there was a significant impact (at the five-percent level) for the first outcome of full-time persistence. However, the estimates for all three outcomes are consistent in that they are uniformly positive. If there was an effect for Kinvolved, it was weaker than that observed for Beyond 12. The lack of a significant finding does not mean there was no effect; just that we cannot say that there was one with a particular level of certainty.

These results suggest that these interventions might have been more appropriately targeted at students with no remedial need, rather than students with such a need.

Exhibit 9. Impacts Associated with Each of the Three Outcomes for Not-Competition-Eligible Students: Intent-to-Treat (ITT) and Treatment-on-the-Treated (TOT) Results

| Outcome | Control Group % | Beyond 12 Group % | Difference: ITT | Difference: TOT | Kinvolved Group % | Difference: ITT | Difference: TOT |
|--------------------------|-----------------------|-------------------------|--------------------|--------------------|-------------------------|--------------------|--------------------|
| Full-time Persistence | 56.7 | 70.4 | 13.7*** | 16.3*** | 70.2 | 13.6** | 16.4** |
| Two-year Completion | 15.9 | 23.1 | 7.2 | 8.5 | 18.8 | 2.9 | 3.4 |
| Three-year Completion | 36.9 | 50.7 | 13.7*** | 16.3*** | 46.1 | 9.1 | 10.5 |

N=438. Source: Abt calculations based on CUNY and National Student Clearinghouse data.

Note: ITT and control group means may not add to treatment group mean in each case due to rounding. Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; *= 5 percent; *= 10 percent.

Secondary Year-Three Outcome

To determine whether there were any impacts of the interventions on a broader measure of success, we defined a secondary outcome for Year 3: whether study participants had graduated with an associate's degree (or higher) by fall 2018 or were still enrolled in fall 2018 at either a two-year or a four-year college (at CUNY or in the NSC records). Other than the change in the outcome, the models were the same. This outcome treats continued persistence as a type of success. The results for each of the two groups are shown in Exhibit 10.

Exhibit 10. Impacts Associated with a Secondary Outcome of Graduated or Still Enrolled as of Fall 2018: Intent-to-Treat (ITT) and Treatment-on-the-Treated (TOT) Results

| Group | Control Group % | Beyond 12 Group % | Difference: ITT | Difference: TOT | Kinvolved Group % | Difference: ITT | Difference: TOT |
|----------------------------------|-----------------------|-------------------------|--------------------|--------------------|-------------------------|--------------------|--------------------|
| Competition- Eligible | 59.5 | 56.3 | -3.2 | -3.8 | 59.4 | -0.1 | -0.1 |
| Not- Competition- Eligible | 65.6 | 66.9 | 1.3 | 1.5 | 73.9 | 8.3 | 9.6 |

N=1,228 competition-eligible and 438 not-competition-eligible students. Source: Abt calculations based on CUNY and National Student Clearinghouse data.

There were no significant impacts on this secondary outcome for either group. However, given the results in Exhibit 9, more students in the not-competition-eligible Beyond 12 group than in the control group had graduated or transferred to a four-year college by Year 3, but more students in the control group were still enrolled in the community college. Therefore, when continued enrollment in community college was analyzed as a measure of success, the groups no longer appeared to differ.

Impacts by College

Presented in Exhibit 11 is the distribution of study students for each of the participating colleges— LAGCC and BMCC. More students from BMCC participated in the study: 1,369 students from BMCC compared to 797 students from LAGCC. We also analyzed the impacts for each of the three years of the years of the competition for each of the participating colleges. The results from the individual colleges are compatible with the overall results. These results are in Appendix D, Exhibits D.4 to D.9.

Exhibit 11. Distribution of College Success Prize Study Participants by Experimental Group, Competition Eligibility, and College

| Group | Beyond 12 N=728 | Kinvolved N=715 | Controls N=723 | Total N=2,166 | | | |
|-------------------------------|-----------------------------------|--------------------|-------------------|------------------|--|--|--|
| Competition | Competition-Eligible Participants | | | | | | |
| BMCC | 354 | 368 | 363 | 1,085 | | | |
| LAGCC | 221 | 219 | 203 | 643 | | | |
| Total | 575 | 587 | 566 | 1,728 | | | |
| Not-Compet | ition-Eligible Pa | articipants | | | | | |
| BMCC | 101 | 78 | 105 | 284 | | | |
| LAGCC | 52 | 50 | 52 | 154 | | | |
| Total | 153 | 128 | 157 | 438 | | | |
| Total Participants by College | | | | | | | |
| BMCC | 455 | 446 | 468 | 1,369 | | | |
| LAGCC | 273 | 269 | 255 | 797 | | | |

E. App Usage Analysis

Introduction

To better understand the impact results for the competition, Abt conducted analyses of the apps' usage data. Beyond 12 and Kinvolved provided Abt with data on students' usage of their respective apps.

This section of the report first provides the results for the overall usage of each of the two apps for the three years of the study, as well as each app's usage by the groups of competition-eligible and not-competition-eligible students. We examined the number of days students used their app at least once during each of the three years, and the number of unique users per week during Year 1 of the competition. The next section describes the usage of each app's specific features. Because the features of each app differed and the availability of data recorded on those features also differed, the analysis of app features provides comparisons between competition-eligible and not-competition-eligible students, rather than between users of one app and users of the other.

The analyses of app usage—by number of days, number of weeks, and feature—are descriptive and not causal, in contrast with the primary impact analysis, which is experimental and allows for causal conclusions. By definition, the analysis of app usage is limited to students in either treatment group who had access to one of the two apps. This analysis is not intended to establish causal relationships between usage and any of the study's three primary outcomes.

App Usage by Number of Days (All Years) and Unique Users by Week in Year 1

Exhibit 12 presents statistics on competition-eligible and not-competition-eligible treatment students' app usage during each year of the competition. Almost all of the app usage occurred during Year 1. Approximately 85 percent of both groups of students used their app at least one day during Year 1. Both groups of Kinvolved students used their app during an average of 14 days, while Beyond 12 students used their app significantly less often—an average of seven days for competition-eligible students and nine days for not-competition-eligible students.

Exhibit 13 shows the number of unique app users for each week in Year 1. As shown in the graph, slightly more Kinvolved students used their app during Year 1. There was one week where there was a surge in app usage at the beginning of the winter term.

Details on the numbers of days during which students used their apps for each of the three years are presented in Appendix Exhibit E.1, Exhibit E.2., and Exhibit E.3, respectively. As shown in Appendix Exhibit E.1, 38 percent of Kinvolved students accessed their app's features more than ten times during Year 1, compared to about 20 percent of Beyond 12 students. For each app, there were only slight differences between competition-eligible and not-competition-eligible students. Overall, the Kinvolved students used their app more than the Beyond 12 students, but the total amount of use for both groups was limited.

After Year 1, students' use of their app decreased considerably. During Year 2, less than 10 percent of competition-eligible and not-competition eligible used their app at least one day (Exhibit 12). As was the case in Year 1, a higher percentage of Kinvolved students (8 percent) accessed their app at least one day during Year 2 compared to Beyond 12 students (5 percent).

| | Beyo | ond 12's My Co | ach Student | s | Kinvolved's Campus Kit Students | | | s |
|---|-----------------------------------|---|-----------------------------------|----------------|-----------------------------------|--|-----------------------------------|----------------|
| | Competition- Eligible N=575 | Not- Competition -Eligible N=153 | Test by Eligibility P-Value | Total N=728 | Competition- Eligible N=587 | Not- Competition- Eligible % N=128 | Test by Eligibility P-Value | Total N=715 |
| Never activat | ed app (% of s | tudents) | | | | | | |
| | 16.0 | 11.8 | | 15.1 | 12.9 | 11.7 | | 12.7 |
| Activated and | d used app on | at least 1 day | during yea | ar subsequ | ent to the day | of activation | (% of stude | ents) |
| Year 1 | 84.0 | 88.2 | 0.74 | 85.5 | 87.1 | 88.3 | 0.54 | 88.3 |
| Year 2 | 4.5 | 5.1 | 0.17 | 4.7 | 8.2 | 9.4 | 0.55 | 8.4 |
| Year 3 | 2.1 | 1.4 | 0.38 | 1.9 | 3.3 | 2.4 | 0.62 | 3.0 |
| Mean numbe | r of days used | among all stu | udents | | | | | |
| Year 1 | 6.7 | 8.7 | 0.03** | 7.1 | 14.2 | 14.2 | 0.97 | 14.2 |
| Year 2 | 0.3 | 0.6 | 0.10* | 0.3 | 0.4 | 0.4 | 0.75 | 0.4 |
| Year 3 | 0.04 | 0.1 | 0.48 | 0.1 | 0.1 | 0.1 | 0.82 | 0.1 |
| Mean number of days used among students who used app at all | | | | | | | | |
| Year 1 | 7.9 | 9.9 | 0.07* | 8.4 | 16.3 | 16.1 | 0.95 | 16.2 |
| Year 2 | 5.8 | 11.9 | 0.09* | 7.2 | 5.3 | 3.9 | 0.48 | 5.1 |
| Year 3 | 1.9 | 5.5 | 0.08* | 2.4 | 2.4 | 2.7 | 0.91 | 2.5 |

Exhibit 12. Number of Days Each App Was Used at Least Once during Years 1, 2 and 3

Source: Abt calculations based on Beyond 12 and Kinvolved data

Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; **= 5 percent; *= 10 percent.



Exhibit 13. Unique Users by Week for Each App during Year 1

Within the Beyond 12 group, the not-competition-eligible students used the app on more days than their competition-eligible peers—about twice as many days, on average. This difference is statistically significant at the ten-percent level.

During Year 3, students' app usage continued to decrease. Three percent of Kinvolved students and 2 percent of Beyond 12 students used their used their app at least one day. The competition-eligible students in each group used their app more frequently than did the not-competition-eligible students, but the differences were not significant. The mean number of days that Kinvolved and Beyond 12 students used their app was 0.1. The Beyond 12 competition-eligible students used the apps less than the other student groups (Exhibit 12).

In the sections below, we describe the usage of the two apps' features in more detail. To better distinguish the relative use of app features, the following sections are focused on students who activated the app on their devices. Proportions of usage cited in this section are based on the number of students who activated the app.

Beyond 12's MyCoach Usage by Feature

Beyond 12's MyCoach app organizes content into more than 100 modules for students. The modules address a range of topics related to college knowledge, persistence, and success, and each consists of a series of steps. For example, the placement exam modules include steps in which users learn about how to register for placement exams and how to understand their results.

Exhibit 14 provides the results for the Beyond 12 students who used the app at least once during the three years of the study. Almost half (48 percent) of Beyond 12's competition-eligible students completed at least one module, compared to slightly more than half (56 percent) of the not-competition-eligible students. Also, the mean number of modules (5) that the not-competition-eligible students completed was significantly higher than the mean number of modules (3) that the competition-eligible students completed.

| | Competition- Eligible Students N=483 | Not- Competition- Eligible Students N=135 | Test by Eligibility P-Value | Total Students N=618 |
|---|---|---|-----------------------------------|-------------------------|
| Modules Completed | | | | |
| Number of modules completed | # (%) of Students | # (%) of Students | 0.44 | # (%) of Students |
| 0 | 251 (52.0%) | 60 (44.4%) | | 311 (50.3%) |
| 1 | 72 (14.9%) | 23 (17.0%) | | 95 (15.4%) |
| 2-5 | 89 (18.4%) | 30 (22.2%) | | 119 (19.3%) |
| 6-10 | 35 (7.2%) | 11 (8.1%) | | 46 (7.4%) |
| 11-20 | 19 (3.9%) | 3 (2.2%) | | 22 (3.6%) |
| 21+ | 17 (3.5%) | 8 (5.9%) | | 25 (4.0%) |
| Mean number of modules completed, among all students who used the app | 3.2 | 5.3 | 0.04** | 3.6 |

| Exhibit 14. | Students | Completing | Beyond | 12 MyCoach | Actions | during | Years | 1-3 |
|-------------|----------|------------|--------|------------|---------|--------|-------|-----|
| | | J | | , | | | | |

| | Competition- Eligible Students N=483 | Not- Competition- Eligible Students N=135 | Test by Eligibility P-Value | Total Students N=618 |
|--|---|---|-----------------------------------|-------------------------|
| Mean number of modules completed, among students who completed at least one module | 6.6 | 9.5 | 0.11 | 7.3 |
| Badges Earned | | | | |
| Number of students earning any badges | 202 (41.8%) | 63 (46.7%) | 0.03** | 265 (42.9%) |
| Mean number of badges earned, among students who earned at least one badge | 2.9 | 3.2 | 0.44 | 3.0 |
| Completed a Quiz | | | | |
| Any quiz (# of students) | 120 (24.8%) | 37 (27.4%) | 0.55 | 157 (25.4%) |
| Competency quiz (# of students) | 88 (18.2%) | 29 (21.5%) | 0.39 | 117 (18.9%) |
| Survey quiz (# of students) | 119 (24.6%) | 36 (26.7%) | 0.63 | 155 (25.1%) |
| Inspiration Responses and Social Interactions | | | | |
| Responded to an inspiration prompt | 91(18.8%) | 27 (20.0%) | 0.76 | 118 (19.1%) |
| Seconded an inspiration response | 67 (13.9%) | 19 (14.1%) | 0.95 | 86 (13.9%) |
| Indicated that a tip was helpful | 46 (9.5%) | 6 (4.4%) | 0.06* | 52 (8.4%) |

Source: Abt calculations based on Beyond 12 data

Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; *= 5 percent; *= 10 percent.

The types of modules that the students were more likely to complete also were similar between the two competition eligibility groups. Exhibit 15 provides the categories of modules that were most frequently used by study participants. These modules addressed time management and goal setting, academic assistance, and administrative issues such as adding and dropping classes and paying bills. Of note is that the not-competition-eligible students were significantly more likely to complete the academic advising module than were the competition-eligible students.

The MyCoach app rewards students for making progress on certain modules by distributing virtual "badges." As shown in Exhibit 14, of students who earned a badge, a significantly higher percentage of MyCoach not-competition-eligible students earned at least one badge compared to competition-eligible students.

Other features available on the app include quizzes and social networking functions. About a quarter of students using the MyCoach app completed at least one quiz (25 percent and 27 percent of students, respectively of competition-eligible and not-competition-eligible-students).

| Module Category | Competition- Eligible Who Used at Least 1 Module N=232 | Not- Competition- Eligible Who Used at Least 1 Module N=75 | Test by Eligibility P-Value | Total Students |
|--------------------|--|---|-----------------------------------|----------------|
| | % of Students | % of Students | | |
| Placement Exams | 20.6 | 18.9 | 0.68 | 120 |
| Map Out Your Time | 18.4 | 22.2 | 0.32 | 119 |
| Set Smart Goals | 18.2 | 23.7 | 0.16 | 120 |
| Visit Tutoring | 15.3 | 18.5 | 0.37 | 99 |
| Academic Advising | 13.0 | 21.5 | 0.02** | 92 |
| Add & Drop Classes | 11.0 | 10.4 | 0.84 | 67 |
| Pay College Bill | 6.8 | 11.1 | 0.10 | 48 |

Exhibit 15. Categories of Modules Most Used by Study Participants

Source: Abt calculations based on Beyond 12 data

Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; *= 5 percent; *= 10 percent.

Kinvolved's Campus Kit Usage by Feature

Exhibit 16 provides the descriptive data for the competition-eligible and not-competition-eligible students who used the Campus Kit app at least once during the three years of the study.

Kinvolved's theory of change highlights the importance of attendance to college success. A key feature of the app enables students to check in to class, confirming their attendance. Approximately 35 percent of competition-eligible students used this feature during the study compared to 43 percent of not-competition-eligible students. Students who missed a class could also record a note in the app explaining their absence. Competition-eligible students were twice as likely (16 percent) to use this feature than not-competition-eligible students (9 percent), and this difference was significant.

To promote students' engagement with campus events and support resources, Kinvolved offers a newsfeed and list of campus resources. The newsfeed displays campus deadlines, events, and tips. This feature of the Campus Kit app was the one most used by students over the three years of the study. Approximately 46 percent of competition-eligible students and 53 percent of not-competition-eligible students who used the app during the study viewed the newsfeed. Kinvolved tracks both whether a student views a list of support resources and whether the student clicks on a resource within that list to view detailed information on it. The two groups had similar rates of use of this feature. Approximately 15 percent of both groups viewed a resource list at least once. The resource viewed by the largest percentage of competition-eligible students (4 percent) was the FWS Employment Opportunities resource, while 4 percent of not-competition-eligible students viewed the Academic Advisement and Transfer Center resource as well as the Helpful Career Resources.

| Action | Competition- Eligible Students N=511 | Not- Competition- Eligible Students N=113 | T-Test by Eligibility P-Value | All Students N=624 |
|--|---|---|-------------------------------------|-----------------------|
| | # (%) of Students | # (%) of Students | | # (%) of Students |
| Attendance | | | | |
| Checked in automatically to class | 178 (34.8%) | 49 (43.4%) | 0.09* | 227 (36.4%) |
| Recorded a note explaining why the student was absent | 84 (16.4%) | 10 (8.8%) | 0.04** | 94 (15.1%) |
| Communication | | | | |
| Sent a message to another app user | 56 (11.0%) | 12 (10.6%) | 0.92 | 68 (10.9%) |
| Newsfeed | | | | |
| Liked a campus event | 21 (4.1%) | 4 (3.5%) | 0.78 | 25 (4.0%) |
| Viewed the newsfeed | 236 (46.2%) | 60 (53.1%) | 0.18 | 296 (47.4%) |
| Support | | | | |
| Clicked on a support resource to view its detailed information | 75 (14.7%) | 17 (15.0%) | 0.92 | 92 (14.7%) |
| Liked a tip | 20 (3.9%) | 3 (2.7%) | 0.52 | 23 (3.7%) |
| Rated a support resource | 32 (6.3%) | 12 (10.6%) | 0.10 | 44 (7.1%) |
| Reviewed a support resource | 22 (4.3%) | 7 (6.2%) | 0.39 | 29 (4.6%) |
| Viewed a list of support resources | 102 (20.0%) | 25 (22.1%) | 0.61 | 127 (20.4%) |
| Unknown Category/Other | | | | |
| Viewed the portfolio | 187 (36.6%) | 49 (43.4%) | 0.18 | 236 (37.8%) |

Exhibit 16. Percent of Students Using Kinvolved Campus Kit Features at Least Once During Years 1-3

Source: Abt calculations based on Kinvolved data

Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; *= 5 percent; *= 10 percent.

F. Summary and Discussion

Summary

In this section we summarize and discuss the results for the three years and corresponding three outcomes of the Robin Hood Foundation's College Success Prize competition. **Based on the impact results for the competition-eligible group for each of the three years of the study, neither finalist was awarded a prize.**

Year 1 Results

Impact Results. The Year 1 impact analyses indicated that for competition-eligible students, there were no significant differences in one-year persistence between either treatment group (Beyond 12's MyCoach and Kinvolved's Campus Kit) and the control group. We analyzed the impacts for the not-competition-eligible sample and there were large, statistically significant impacts on one-year persistence for each of the treatment apps.

App Usage. We analyzed the finalists' apps usage data in terms of days that treatment group students from each of the competition-eligible and not-competition-eligible groups and experimental groups (Beyond 12 and Kinvolved) accessed each of the apps. We also examined treatment group students' use of each of the apps' features. We could not compare the features of the app, as their features are different.

Overall, the students' use of the apps was limited. About three-quarters of the competition-eligible treatment group students used their apps for more than one day. Students assigned to the Kinvolved treatment group used their app more often than students assigned to the Beyond 12 treatment group. Among all competition-eligible students, those assigned to the Kinvolved group used their app for an average of 14 days over the course of Year 1, compared to 7 days for Beyond 12 students. The same trend was observed among not-competition-eligible students; the average was 14 days for the Kinvolved group and 9 days for the Beyond 12 group.

Within the Beyond 12 group, the not-competition-eligible students used the app on more days than their competition-eligible peers did—about two more days on average. This difference was statistically significant at the five-percent level (Appendix Exhibit E.1).

Year 2 Results

Impact Results. The Year 2 impact analyses indicated that for competition-eligible students, there were no significant differences in students' completion of an associate's degree or transfer to a four-year college with at least 60 credits between either treatment group (Beyond 12 or Kinvolved apps) and the control group. We also analyzed the impacts for the not-competition-eligible group.

These analyses indicated no significant differences in impacts on students' completion of an associate's degree or alternative for each of the treatment apps. However, the point estimates of the impacts for each of the two not-competition-eligible treatment groups were both positive. The not-competition-eligible Beyond 12 group earned an associate's degree or transferred with 60 or more credits at a rate of 23.1 percent, 7.2 percentage points higher than the control group did. The not-competition-eligible Kinvolved group earned an associate's degree or transferred at a rate of 18.8 percent for an impact of 2.9 percentage points. However, neither of these differences is statistically significant.

App Usage. Abt analyzed the finalists' Year 2 apps usage data in terms of number of days that students from each of the competition eligibility groups (competition-eligible and not-competition-eligible) and

treatment groups (Beyond 12 or Kinvolved) accessed each of the apps. We also analyzed students' use of each of the apps' features.

Overall, students' use of the apps during Year 2 was very limited. Just 5 percent of the competitioneligible students used their apps at least one day during the year. The competition-eligible students who were assigned to the Kinvolved group used their app for an average of 0.4 day over the course of Year 2, compared to 0.3 day for the Beyond 12 students. A different trend was observed among notcompetition-eligible students; the average was 0.6 day for the Beyond 12 group and 0.4 day for the Kinvolved group. Within the Beyond 12 group, the not-competition-eligible students used the app about twice as many days, on average, than their competition-eligible peers. This difference was statistically significant at the ten-percent level (Appendix Exhibit E.2).

The percentage of students in all groups who used the apps decreased from Year 1 to Year 2. For the competition-eligible group, 5 percent of Beyond 12 students used the app in Year 2 compared to 84 percent in Year 1; and 8 percent of Kinvolved students used the app in Year 2 compared to 87 percent in Year 1. For the not-competition eligible group, 5 percent of Beyond 12 students used the app in Year 2 compared to 88 percent in Year 1; and 9 percent of the Kinvolved students used the app in Year 2 compared to 88 percent in Year 1; and 9 percent of the Kinvolved students used the app in Year 2 compared to 88 percent in Year 1.

Year 3 Results

Impact Results. The results for Year 3 show no significant impacts on competition-eligible students' attainment of an associate's degree or transfer to a four-year college. Overall differences versus the control group were small and usually slightly negative (on the point estimates). None of these differences is significantly different from zero. The TOT estimates are uniformly slightly higher in magnitude than the ITT estimates.

For the not-competition-eligible group, the Beyond 12 students experienced a significant impact (at the one-percent level) for the three-year associate's degree completion or equivalent outcome. This impact is quite large at almost 14 percentage points. Though the impact for the Kinvolved students was not significant, it was positive at 9 percentage points.

App Usage. The usage of both apps continued to decrease in Year 3. During this year, 2 percent of Beyond 12's competition-eligible students used the app at least one day, and the mean days of use was only 0.04. Approximately 3 percent of Kinvolved's competition-eligible students used the app at least one day, and the mean days of use for these students was 0.08.

There were similar results for the not-competition-eligible students. Only 1 percent of Beyond 12 students and 2 percent of Kinvolved's students used the app at least one day in Year 3 (Appendix Exhibit E.3).

We ran four regression models of three-year degree attainment or enrollment in a four-year college (the outcome for Year 3) on days of app usage using the same covariates that were in the impact model. These regressions are an attempt to see how usage affected persistence. For the competition-eligible students who used the Beyond 12 app, there was a correlation between days of usage of the app and the likelihood of completing an associate's degree or transferring to a four-year college (Appendix Exhibit E.4). However, we cannot draw any causal conclusions from these results.

College Success Prize Competition Results

Based on the impact results for the competition-eligible group for each of the three years of the study, neither finalist was awarded a prize.

Discussion

We found no impacts of the apps on persistence and attainment of an associate's degree or transferring to a four-year college for students who tested into remediation. That is, the results for competition-eligible students indicated no significant impacts of either app on their outcomes for any of the three years of the competition. Though the Kinvolved competition-eligible students used their app at a slightly higher rate than their Beyond 12 counterparts for each of the three years, the mean days of use for both apps ranged between 14 (Kinvolved) and 8 (Beyond 12) during the first year of the competition and less than one day in the second and third years.

We discuss below possible factors affecting these results for students who participated in the Prize competition.

Competition-Eligible Students

One explanation for these results might be that the competition-eligible students, who had tested into remediation during Year 1 of the competition and who had lower placement test scores than the not-competition-eligible students at the time they entered college, did not find the apps to be helpful in addressing their immediate need to succeed in credit-bearing courses. The features of the apps were designed to address student retention and other challenges faced by college students, but the apps were not focused on addressing students' academic needs.

Another factor that might have influenced competition-eligible students' results is the limited number of push notifications that were sent by the apps to study treatment group participants. Emerging research on the use of mobile apps to increase higher education students' engagement, retention, and academic achievement point to the importance of having frequent push notifications and other prompts to encourage students' use of apps (Pechenkina et al., 2017).

Not-Competition-Eligible Students

The significant impacts for the not-competition-eligible students suggest that some features of the apps were helpful to students. The not-competition-eligible students had a slightly higher rate of app use than the competition-eligible students did. This difference was statistically significant (at the five-percent level) for the Beyond 12 students. A higher percentage of the Beyond 12 not-competition-eligible students also completed modules and earned badges compared to the competition-eligible students. The combination of greater use and the appeal of some of the Beyond12 app's features for these students may have contributed to their better outcomes.

Both Groups of Students

The results from focus groups of 16 study participants that CUNY conducted at LAGCC and BMCC in January 2016 provide anecdotal data that are insightful about students' use of the apps. Students reported that the apps were most helpful in supporting their time management and planning, prompting them to go to class, locate resources, and schedule activities. Some focus group participants commented on the value of the points and badge features as motivating them. Students viewed the apps as not helpful in supporting their academic development or enabling them to customize information that facilitated their activities or communication. They also noted that some features were useful the first time they were accessed and then were not used again. Students using Kinvolved's app also indicated that there were a number of "glitches" with this app, which was a deterrent to its use. While the focus groups involved a very limited number of study participants, their comments align with the app usage data and provide some understanding of participants' perceptions of the apps and their role in assisting them in college.

Abt's RCT was designed to test the impacts of the finalists' apps on the Prize outcomes. The study did not include an implementation study to examine the academic and supportive environment at the two colleges participating in the Prize. Thus we do not know whether the academic activities and support services were similar at each college and the extent to which study students accessed these services. It might be the case that the differential availability of services and their use by students affected students' college completion outcomes.

Implications for Further Research

The Prize competition is a significant effort to rigorously test the efficacy of a technology-based intervention on community college students' persistence and completion. Abt's experience in conducting the RCT was that the Prize's well-structured competition with strong leadership and collaborative partners made it possible to implement a successful experiment. Our work on the study suggests some implications for future competitions of technology-based interventions, particularly mobile apps.

- Plan the schedule for the competition so that the phases of intervention development or adaptation and pilot testing can be implemented with time for a pilot test and modifications after the pilot test. The Prize had included a pilot-test phase, but due to the finalists' schedule in preparing their apps for a launch in fall 2015, the pilot test was not able to be conducted. Given the issues that are likely to occur in the initial use of any technological tool, it would be better to ensure that the intervention is working well before beginning a large-scale experiment.
- Include representatives from the intended group of users in the pilot test to ensure that the design and content of the intervention is aligned with users' needs and preferences. Particularly with technology that is evolving, it is critical to determine the types of user needs that the intervention can adequately address. For the Prize, the competition-eligible students needed assistance in developing their academic and psychosocial skills in order to achieve their academic goals. The finalists' apps were able to address some aspects of psychosocial skills, such as time management and planning, but did not have the range of content that students needed for college success.
- In specifying an intervention to test, consider the plausibility of any one intervention, particularly a technology-based tool, being able to affect a high-stakes academic outcome in individuals with different backgrounds. Because of the range of academic and other needs that students have and the limitations of any one intervention to address these needs, the specification of outcomes expected from an intervention is a critical point. Especially in testing technology interventions, such as the use of mobile apps and text messages to prompt students' behavior and facilitate their activities, it might be more reasonable to set interim outcomes that are key benchmarks leading to a high-stakes academic outcome. In the Prize competition, the persistence from year one to year two is an example of an interim outcome for students. Another example, though not aligned to the Prize apps, would be successfully completing developmental education courses and enrolling in credit courses. The point is to ensure that the intervention is well aligned to the expected outcomes.
- Anticipate that there may be heterogeneity of effects across the groups of individuals participating in an intervention, and plan for a systematic study of the factors that may contribute to these effects. Further research could explore how similar interventions offer services that align to the needs of different groups of students and the ways in which these

interventions affect more proximal outcomes, such as college persistence and credit accumulation.

The lessons from the Prize competition come at an important time in education as large investments are being made in tests of technology to address important societal issues, such as the need to improve the rates of adult literacy that can result in increased worker productivity, decreased health costs, and increased overall well-being. The Prize's structure and successful execution provide important lessons for future endeavors.

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Appendix A. Study Eligibility Determination

During the summer of 2015, CUNY provided Abt with data files on students who consented to be part of the study. CUNY transferred these files to Abt on a weekly basis over a 12-week period. We used the files to assess whether students met the eligibility criteria for the study.

To be eligible for the study, students had to meet the following four criteria:

- 1. Enrolled at LaGuardia Community College or Borough of Manhattan Community College;
- 2. Enrolled in an associate's degree program;
- 3. Enrolled full-time; and
- 4. Is a first-year student (i.e., a first-time freshman, as defined by each campus).

Some students who were found to be ineligible in earlier data files were subsequently found to be eligible in later data files (e.g., because they registered for classes in the interim). Other students found to be eligible in earlier data files no longer met the eligibility criteria in later data files (e.g., because they withdrew from classes and were no longer full time). *However, all students found to be eligible in any one of the data files provided by CUNY were considered to be eligible for the study.* All but 18 of the eligible students were invited to participate in the study. Abt did not send invitations to these 18 students because they withdrew from their college before they were scheduled to receive an invitation to participate.⁹

In addition, for each data file that CUNY provided, Abt assessed whether the student was competitioneligible (see Section B, Study Design). Competition eligibility was determined at the point when a student was deemed eligible for the study.

Exhibit A.1 provides details on how we used the CUNY data to apply the four eligibility criteria for the study and one additional criterion for competition eligibility. The last column provides the algorithm used in identifying students who met each criterion. The variables from CUNY data used in these algorithms are denoted in italics.

⁹ These students were excluded because they could not benefit from receiving one of the apps.

| Criterion | Description | Student Satisfied Eligibility Criterion if: |
|---------------------------------------|---|---|
| Study Eligibil | ity | |
| Campus (fall 2015) | LaGuardia Community College or Borough of Manhattan Community College | <i>ir_college_name</i> = "BMCC" or "LaGuardia" |
| Full-time (fall 2015) | Enrolled in 12 or more credits | Either of the following conditions was true: (1) <i>ir_full_part_type_desc</i> = "FULL-TIME" (2) <i>cf_unt_taken_prgrss</i> (total number of equated credits, including remedial coursework, permit, and study abroad) >= 12 |
| First-time Freshman (fall 2015) | First-year student (i.e., a first-time freshman, as defined by each campus) | All of the following conditions were true: (1) <i>ir_new_student_desc</i> = "First-time Freshmen" (2) <i>irdb_ftf_term</i> (term enrolled as First-time Freshman prior to fall 2015) contains a missing value (3) <i>irdb_ftf_coll</i> (college enrolled as First-time Freshman prior to fall 2015) contains a missing value |
| Degree Program (fall 2015) | Enrolled in an associate's degree program | <i>ir_degree_pursued_desc</i> = "AA", "AAS", "AS", or "ASSOCIATE" (For the 7/14, 7/16, 7/28, 8/4, and 8/11 files) <i>ir_degree_pursued_level_desc</i> = "ASSOCIATE" OR <i>ir_degree_pursued_desc</i> = "AA", "AAS", "AS", or "ASSOCIATE" (For the 8/17, 8/24, 8/25, 9/1, 9/8, and 9/15 files) |
| Competition I | Eligibility | |
| Remedial Need (fall 2015) | If the student failed at least one of the initial subject placement tests (math, reading, or writing) from which s/he was not exempt | Any of the following conditions were true: (1) <i>mt_status_i</i> (initial math status) = "F" (failed and not exempt) (2) <i>rd_status_i</i> (initial reading status) = "F" (failed and not exempt) (3) <i>wr_status_i</i> (initial writing status) = "F" (failed and not exempt) |

Appendix Exhibit A.1. Detailed Eligibility Criteria for the RCT

Appendix B. Missing Data on Baseline Characteristics

Appendix Exhibit B.1. Percent Missing of Demographic and Academic Characteristics of Students at Baseline, by Competition-Eligibility Status

| Characteristic | Competition-Eligible % Missing | Not-Competition-Eligible % Missing |
|--|-----------------------------------|---------------------------------------|
| Number of Students | 1,728 | 438 |
| Demographic Characteristics | | |
| Age as of 9/1/2015 | 0.0 | 0.0 |
| Sex | 19.1 | 12.3 |
| Race and Ethnicity | | |
| Hispanic | 25.8 | 18.5 |
| White | 55.4 | 47.7 |
| Black | 55.4 | 47.7 |
| Asian | 55.4 | 47.7 |
| American Indian or Alaska Native | 55.4 | 47.7 |
| Pacific Islander or Native Hawaiian | 55.4 | 47.7 |
| Academic Characteristics | | |
| High School GPA | 20.8 | 11.0 |
| New York High School Regents Exams | | |
| English | 32.1 | 22.1 |
| Algebra | 33.0 | 23.1 |
| Geometry | 62.3 | 36.1 |
| Trigonometry | 89.8 | 62.1 |
| SAT Scores | | |
| Verbal | 57.7 | 37.2 |
| Writing | 58.9 | 38.8 |
| Math | 57.6 | 36.8 |
| Initial Placement Exam Scores | | |
| Reading | 36.5 | 76.3 |
| Writing | 36.7 | 76.0 |
| Math | 1.8 | 39.0 |
| Prior Credits as of Fall 2015 | | |
| Percent with any credits | 2.0 | 1.1 |
| Mean credits among those with any | 0.0 | 0.0 |
| Graduated from an NYC Public High School | 15.5 | 7.3 |

Appendix C: Exhibit C.1. Kinvolved Logic Model

The Problem: Over 70% of CUNY students enrolled fail to receive their Associates Degree within six years. 68,000 students, who are currently enrolled, will drop out before they receive their Associates Degree. Graduation rates are linked with classroom attendance, which our technology aims to help student monitor and self-identify early indicators of challenges prohibiting them from attending class.



Assumptions:

- 1. Chronic absenteeism is tied to lower graduation rates; attendance is an early warning indicator of other challenges a student experiences academically
- 2. Community college students lack efficient and easy-to-understand resources/support/advisement which prohibits persistence and graduation

External Factors:

- 1 Social and economic factors on the student and CUNY system
- Personal and professional (job) obligations 2. 3.
- CUNY resources (advisors, online website, etc.)
- Alternative support programs (SEEK, Green City Force, etc.) 4.

Appendix D. Regression Analysis

This section provides the specifications of the regression models that Abt used to estimate the impact of each app on each of the outcomes specified for the competition. Described are: the construction of the dependent or outcome variables; the construction of the independent variables, and the impacts that were estimated with these models.

Dependent or Outcome Variables

The dependent variable for the analysis is defined below. Abt constructed this variable (identified in **bold**) from student-level data provided by CUNY or the NSC (identified in *italics*): The dependent variables were measured in fall 2016, fall 2017, and fall 2018 respectively.

FT_persistence. We constructed this binary indicator variable, which captures full-time enrollment (i.e., enrollment in 12 or more credits) in a CUNY college on the census date for fall 2016 (i.e., approximately three weeks after the start of the fall term),¹⁰ as follows:

= 1 if *IR_FULL_TIME_TYPE_DESC* = "FULL-TIME" on the census date in fall 2016.

= 0 otherwise.

Two-year_completion. We constructed this binary indicator variable, which captures (1) completion of an associate's degree at CUNY or non-CUNY college or university *or* (2) transfer to a CUNY senior college and completion of 60 or more college credits in the CUNY system within two years, as follows:

= 1 if the student had a record in the CUNY credential completions database between the fall 2015 term and the summer 2017 term, inclusive, for which DEGREE_EARNED_DESC="A," "AAS," or "AS."

= 1 if the student had a record in the NSC's StudentTracker data for which *Degree Title* indicates an associate's degree (using the NSC's free SAS code) and *Graduation Date* was on or before August 31, 2017.

=1 if the student had a record of enrollment at a CUNY senior college during the fall 2017 term (COLLEGE_TYPE_DESC = "senior") and the cumulative number of credits earned prior to the fall 2017 term was greater than or equal to 60 (IR_CUM_EARNED_TOTAL>=60).

= 1 if the student had a record in the NSC's Student Tracker data for attendance at a four-year college (2-year/4-year = "4") in the fall 2017 term and the cumulative number of credits earned prior to the fall 2017 was greater than or equal to 60 (IR_CUM_EARNED_TOTAL>=60).

=0 otherwise.

Three_year_completion. We constructed this binary indicator variable, which captures (1) completion of an associate's degree at a CUNY or non-CUNY college or university *or* (2) transfer to a CUNY senior college or other four-year college and completion of 60 college credits in total within three years, as follows:

¹⁰ The implicit denominator for the full-time persistence rate calculated for the RCT included all students who participated in the study. In contrast, the denominator for CUNY's own measure of the full-time persistence rate includes all students who were enrolled full-time at CUNY.

= 1 if the student had a record in the CUNY credential completions database between fall 2015 and summer 2018, inclusive, for which *DEGREE_EARNED_DESC* = "AA," "AAS," or "AS."

= 1 if the student had a record in the NSC's StudentTracker data for which *Degree Title* indicates an associate's degree (using the NSC's free SAS code) and *Graduation Date* was on or before August 31, 2018.

= 1 if the student had a record of enrollment at a CUNY senior college during the fall 2018 term ($COLLEGE_TYPE_DESC$ = "senior") and the cumulative number of credits earned prior to the fall 2018 term was greater than or equal to 60 ($IR_CUM_EARNED_TOTAL >= 60$).

= 1 if the student had a record in the NSC's StudentTracker data for attendance at a four-year college (2-year/4-year = "4") in the fall 2018 term and the cumulative number of credits earn prior to the fall 2018 term was greater than or equal to 60 ($IR_CUM_EARNED_TOTAL >= 60$).

= 0 otherwise.

Independent Variables

The key independent variables in the regression model are indicators for the two treatment groups to which students were assigned:

- **Kinvolved.** We constructed this indicator variable as follows:
 - = 1 if the study participant was randomly assigned to receive Kinvolved's Campus Kit app.
 - = 0 otherwise.
- **Beyond12.** We constructed this indicator variable as follows:
 - = 1 if the study participant was randomly assigned to receive Beyond 12's MyCoach app.
 - = 0 otherwise.

We set to zero both of the two indicators above, *Kinvolved* and *Beyond12*, for students in the control group.

We included four other independent variables to improve the precision of the estimates. We selected these four variables using the lasso (Tibshirani, 1996), a common technique to avoid model overfitting, in conjunction with cross-validation (Shao, 1993), to determine the performance of different sets of independent variables. The variables selected by this procedure have been found to be strongly associated with college persistence and completion (e.g., Belfield & Crosta, 2012; Geiser & Santelices, 2007):¹¹

• **HS_english_score.** This continuous variable, which captures the student's score on the latest version of the New York State High School Regents Examination in English Language Arts, was constructed as follows:

= *regents_english_new* if *regents_english_new* contains a non-missing value (i.e., the score is available in CUNY's administrative records).

¹¹ Variables that were not selected by this procedure (e.g., standard demographic characteristics and other test scores) did not contribute to the model's predictive ability after accounting for the variables selected by the procedure.

= 0 otherwise.

• **HS_GPA.** This continuous variable, which translates the student's cumulative Grade Point Average in high school to a scale from 50-100, was constructed as follows:

= *college_admissions_average* if *college_admissions_average* contains a non-missing value (i.e., high school GPA is available in CUNY's administrative records).¹²

= 0 otherwise.

• **CUNY_writing_score.** This continuous variable, which captures the student's initial score on CUNY's placement test in writing, was constructed as follows:

= *initial_writing_score* if *initial_writing_score* contains a non-missing value (i.e., the score is available in CUNY's administrative records).

= 0 otherwise.

• **CUNY_math_score.** This continuous variable, which captures the student's initial score on CUNY's placement test in mathematics (part II), was constructed as follows:

= *initial_math_pt2_score* if *initial_math_pt2_score* contains a non-missing value (i.e., the score is available in CUNY's administrative records).

= 0 otherwise.

We also included four additional independent variables to address the fact that CUNY's administrative data used to construct the previous four variables listed above contained some missing values:

- **HS_english_score_missing.** This indicator variable was constructed as follows:
 - = 1 *regents_english_new* contains a missing value.
 - = 0 otherwise.
- **HS_GPA_missing.** This indicator variable was constructed as follows:

= 1 if *college_admissions_average* contains a missing value.

- = 0 otherwise.
- **CUNY_writing_score_missing.** This indicator variable was constructed as follows:
 - = 1 if *initial_writing_score* contains a missing value.

= 0 otherwise.

• **CUNY_math_score_missing.** This indicator variable was constructed as follows:

¹² The variable *college_admissions_average* is constructed by CUNY and is not the student's actual high school Grade Point Average.

- = 1 if *initial_math_pt2_score* contains a missing value.
- = 0 otherwise.

Estimation of Regression Models

To estimate the impact of the two apps, Abt used a linear probability model (LPM)—that is, a linear regression model with binary outcomes—for the outcome variable. We used ordinary least squares (OLS) to estimate the effects of each app and the standard error of those effects. Note that nonlinear models, like logistic or probit models, are often used for binary outcomes because the distribution assumptions are more plausible. However, linear models yielded unbiased estimates of the effects of the two apps, and prior research has shown that linear and nonlinear models with binary outcomes yield similar estimates of effects (Angrist & Pischke, 2008). Judkins' and Porter's (2016) research, which was based on simulations, has shown that OLS yields accurate confidence intervals even for binary outcomes that are very prevalent or very uncommon (e.g., two-year graduation at community colleges), as long as the sample size is large and the RCT compares equal-sized groups. As a consequence, the analysis yielded valid statistical inferences about the effects of the two apps, their statistical significance, and whether they are significantly different from each other.

To maximize the precision of the impact estimates, we used the lasso covariate selection method (Tibshirani, 1996), along with cross-validation (Shao, 1993). To address missing data, we used an indicator variable method that has been shown to have desirable characteristics in the context of an RCT (Puma et al., 2009). We also analyzed the retrospective data, which included outcome variables analogous to the ones in the current study, to identify eight covariates for the LPM estimation of the impacts.

To estimate the impacts of the two apps on each of the three outcomes, we estimated the following LPMs:

FT_persistence

 $= \alpha_{0} + \alpha_{1}Kinvolved + \alpha_{2}Beyond12 + \alpha_{3}HS_English_Score + \alpha_{4}HS_GPA + \alpha_{5}CUNY_Writing_Score + \alpha_{6}CUNY_Math_Score + \alpha_{7}HS_English_Score_Missing + \alpha_{8}HS_GPA_Missing + \alpha_{9}CUNY_Writing_Score_Missing + \alpha_{10}CUNY_Math_Score_Missing + e_{1}$

Two_year_completion

 $= \beta_0 + \beta_1 Kinvolved + \beta_2 Beyond12 + \beta_3 HS_English_Score + \beta_4 HS_GPA$

+ $\beta_5 CUNY_Writing_Score + \beta_6 CUNY_Math_Score$

- $+ \beta_7 HS_English_Score_Missing + \beta_8 HS_GPA_Missing$
- $+\beta_9 CUNY_Writing_Score_Missing + \beta_{10} CUNY_Math_Score_Missing + e_2$

Three_year_completion

 $= \gamma_{0} + \gamma_{1}Kinvolved + \gamma_{2}Beyond12 + \gamma_{3}HS_English_Score + \gamma_{4}HS_GPA + \gamma_{5}CUNY_Writing_Score + \gamma_{6}CUNY_Math_Score + \gamma_{7}HS_English_Score_Missing + \gamma_{8}HS_GPA_Missing + \gamma_{9}CUNY_Writing_Score_Missing + \gamma_{10}CUNY_Math_Score_Missing + e_{3}$

The intent-to-treat (ITT) effects of Kinvolved's Campus Kit app relative to the control group on persistence are expressed by α_1 , β_1 , and γ_1 , respectively. The ITT effects of Beyond 12's MyCoach app relative to the control group on persistence, two-year completion, and three-year completion are

expressed by α_2 , β_2 , and γ_2 , respectively. We refer to the estimated ITT effects for Campus Kit as $\hat{\alpha}_1$, $\hat{\beta}_1$, and $\hat{\gamma}_1$; we refer to the estimated ITT effects for MyCoach as $\hat{\alpha}_2$, $\hat{\beta}_2$, and $\hat{\gamma}_2$.

We constructed estimates of the effects of the treatment-on-the-treated (TOT) effects. To construct these estimates, we used Bloom's correction (Bloom, 1984), which divides the estimated ITT effects by the intervention take-up rate—here, the activation rate. The activation rate for competition-eligible students was 86.9 percent for Campus Kit and 84.0 percent for MyCoach. Therefore, the estimated TOT effects for these students are $\hat{\alpha}_1/.869$, $\hat{\beta}_1/.869$, and $\hat{\gamma}_1/.869$ for Campus Kit and $\hat{\alpha}_2/.840$, $\hat{\beta}_2/.840$, and $\hat{\gamma}_2/.840$ for MyCoach.¹³

Impact Models

Appendix Exhibit D.1, D.2, and D.3 show the details of the two impact models for each of the study's three outcomes: full-time persistence, two-year completion, and three-year completion, respectively. In each exhibit, the first column shows the regression coefficient and standard errors of the coefficients for the impact model for the competition-eligible students and the second column shows the model for the not-competition-eligible students. Each coefficient is followed by its standard error in parentheses. The first two rows list the coefficients for the treatment indicator variable for each of the two finalists; these coefficients are the main impacts and are described in the main narrative of the report. The remaining rows contain the coefficients and standard errors for the eight covariates in the model and the constant term. Finally, in the last row, the sample size and the R-squared for each model are given. Statistical significance is marked in the table with three stars for coefficients that are significant at the one-percent level, two stars for coefficients that are significant at the ten-percent level.

¹³ The activation rate for not-competition-eligible students was 88.3 percent for Campus Kit and 88.2 percent for MyCoach. Therefore, the estimated TOT effects for these students are â₁/.883, β₁/.883, and ŷ₁/.883 for Campus Kit and â₂/.882, β₂/.882, and ŷ₂/.882 for MyCoach.

Appendix Exhibit D.1. College Success Prize Impact Analysis: Coefficients, Standard Errors, and Statistical Significance for Two Regression Models for the Outcome of Full-Time Persistence (Year-One Outcome)

| | Competition-Eligible | Not-Competition-Eligible |
|----------------------------------|----------------------|--------------------------|
| Beyond12 | -0.032 | 0.137*** |
| | (0.029) | (0.053) |
| Kinvolved | -0.049* | 0.136** |
| | (0.029) | (0.055) |
| New (2010) English Regents Score | 0.002 | 0.002 |
| | (0.002) | (0.003) |
| New (2010) English Regents Score | 0.160 | 0.116 |
| Missing | (0.148) | (0.003) |
| High School GPA | 0.012*** | 0.014*** |
| | (0.002) | (0.003) |
| High School GPA Missing | 0.843*** | 1.147*** |
| | (0.145) | (0.259) |
| Initial Writing Placement Score | -0.003** | -0.005 |
| | (0.001) | (0.006) |
| Initial Writing Placement Score | -0.155* | -0.317 |
| Missing | (0.080) | (0.348) |
| Initial Math Placement Score | 0.004*** | 0.003 |
| | (0.001) | (0.002) |
| Initial Math Placement Score | 0.273*** | 0.220* |
| Missing | (0.093) | (0.119) |
| Constant | -0.435** | -0.568 |
| | (0.200) | (0.467) |
| Observations | 1728 | 438 |
| R2 | 0.054 | 0.079 |

Note: Standard errors are in parentheses.

Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; **= 5 percent; *= 10 percent.

Appendix Exhibit D.2. College Success Prize Impact Analysis: Coefficients, Standard Errors, and Statistical Significance for Two Regression Models for the Outcome of Two-Year Completion (Year-Two Outcome)

| | Competition-Eligible | Not-Competition-Eligible |
|----------------------------------|----------------------|--------------------------|
| Beyond12 | -0.007 | 0.072 |
| | (0.014) | (0.044) |
| Kinvolved | 0.003 | 0.029 |
| | (0.014) | (0.046) |
| New (2010) English Regents Score | 0.001 | 0.002 |
| | (0.001) | (0.003) |
| New (2010) English Regents Score | 0.108 | 0.201 |
| Missing | (0.073) | (0.221) |
| High School GPA | 0.003*** | 0.010*** |
| | (0.001) | (0.003) |
| High School GPA Missing | 0.194*** | 0.840*** |
| | (0.072) | (0.214) |
| Initial Writing Placement Score | 0.001** | 0.004 |
| | (0.001) | (0.005) |
| Initial Writing Placement Score | 0.097** | 0.263 |
| Missing | (0.039) | (0.289) |
| Initial Math Placement Score | 0.002*** | 0.003* |
| | (0.000) | (0.002) |
| Initial Math Placement Score | 0.0278 | 0.091 |
| Missing | (0.046) | (0.098) |
| Constant | -0.363**8 | -1.224*** |
| | (0.099) | (0.387) |
| Observations | 1728 | 438 |
| R2 | 0.025 | 0.077 |

Note: Standard errors are in parentheses.

Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; **= 5 percent; *= 10 percent.

Appendix Exhibit D.3. College Success Prize Impact Analysis: Coefficients, Standard Errors, and Statistical Significance for Two Regression Models for the Outcome of Three-Year Completion (Year-Three Outcome)

| | Competition-Eligible | Not-Competition-Eligible |
|----------------------------------|----------------------|--------------------------|
| Beyond12 | -0.027 | 0.137*** |
| | (0.026) | (0.053) |
| Kinvolved | -0.017 | 0.0914 |
| | (0.025) | (0.056) |
| New (2010) English Regents Score | 0.004** | 0.002 |
| | (0.002) | (0.003) |
| New (2010) English Regents Score | 0.278** | 0.197 |
| Missing | (0.131) | (0.267) |
| High School GPA | 0.013*** | 0.023*** |
| | (0.002) | (0.003) |
| High School GPA Missing | 0.906*** | 1.814*** |
| | (0.129) | (0.260) |
| Initial Writing Placement Score | 0.002* | -0.006 |
| | (0.001) | (0.006) |
| Initial Writing Placement Score | 0.134* | -0.397 |
| Missing | (0.071) | (0.350) |
| Initial Math Placement Score | 0.004*** | 0.001 |
| | (0.001) | (0.002) |
| Initial Math Placement Score | 0.268*** | -0.002 |
| Missing | (0.083) | (0.012) |
| Constant | -1.182*** | -1.329*** |
| | (0.178) | (0.469) |
| Observations | 1728 | 438 |
| R2 | 0.074 | 0.150 |

Note: Standard errors are in parentheses. Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; **= 5 percent; *= 10 percent.

Appendix Exhibit D.4. College Success Prize Impact Analysis: Coefficients, Standard Errors, and Statistical Significance for Two Regression Models for the BMCC Outcome of Full-Time Persistence (Year-One Outcome)

| | Competition-Eligible | Not-Competition-Eligible |
|---|----------------------|--------------------------|
| Beyond12 | -0.016 (0.0356) | 0.010 (0.064) |
| Kinvolved | -0.025 (0.035) | 0.153** (0.069) |
| New (2010) English Regents Score | 0.002 (0.003) | 0.002 (0.004) |
| New (2010) English Regents Score Missing | 0.165 (0.178) | 0.130 (0.297) |
| High School GPA | 0.012*** (0.002) | 0.016*** (0.004) |
| High School GPA Missing | 0.870*** (0.176) | 1.382*** (0.316) |
| Initial Writing Placement Score | -0.005** (0.002) | -0.001 (0.006) |
| Initial Writing Placement Score Missing | -0.225* (0.118) | -0.137 (0.389) |
| Initial Math Placement Score | 0.003** (0.001) | 0.003 (0.002) |
| Initial Math Placement Score Missing | 0.146 (0.109) | 0.272** (0.137) |
| Constant | -0.317 (0.240) | -0.974* (0.543) |
| Observations R2 | 1086 0.054 | 284 0.099 |

Note: Standard errors are in parentheses.

Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; **= 5 percent; *= 10 percent.

Appendix Exhibit D.5. College Success Prize Impact Analysis: Coefficients, Standard Errors, and Statistical Significance for Two Regression Models for the LAGCC Outcome of Full-Time Persistence (Year-One Outcome)

| | Competition-Eligible | Not-Competition-Eligible |
|----------------------------------|----------------------|--------------------------|
| Beyond12 | -0.048 | 0.211** |
| | (0.047) | (0.097) |
| Kinvolved | -0.085* | 0.115 |
| | (0.048) | (0.097) |
| New (2010) English Regents Score | 0.004 | -0.002 |
| | (0.004) | (0.008) |
| New (2010) English Regents Score | 0.263 | -0.069 |
| Missing | (0.266) | (0.602) |
| High School GPA | 0.012*** | 0.010* |
| | (0.003) | (0.006) |
| High School GPA Missing | 0.887*** | 0.573 |
| | (0.254) | (0.476) |
| Initial Writing Placement Score | -0.003* | -0.011 |
| | (0.002) | (0.013) |
| Initial Writing Placement Score | -0.247** | -0.543 |
| Missing | (0.120) | (0.805) |
| Initial Math Placement Score | 0.005*** | 0.004 |
| | (0.001) | (0.004) |
| Initial Math Placement Score | 0.520*** | 0.211 |
| Missing | (0.180) | (0.246) |
| Constant | -0.638* | 0.258 |
| | (0.363) | (1.006) |
| Observations | 642 | 154 |
| R2 | 0.078 | 0.097 |

Note: Standard errors are in parentheses.

Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; **= 5 percent; *= 10 percent.

Appendix Exhibit D.6. College Success Prize Impact Analysis: Coefficients, Standard Errors, and Statistical Significance for Two Regression Models for the BMCC Outcome of Two-Year Completion (Year-Two Outcome)

| | Competition-Eligible | Not-Competition-Eligible |
|---|----------------------|--------------------------|
| Beyond12 | -0.010 | 0.076 |
| Kinvolved | 0.005 | 0.023 |
| New (2010) English Regents Score | 0.001 (0.001) | 0.002 (0.003) |
| New (2010) English Regents Score Missing | 0.103 (0.087) | 0.240 (0.250) |
| High School GPA | 0.003*** (0.001) | 0.010*** (0.003) |
| High School GPA Missing | 0.239*** (0.086) | 0.890*** (0.266) |
| Initial Writing Placement Score | 0.000 (0.001) | 0.005 (0.005) |
| Initial Writing Placement Score Missing | 0.050 (0.058) | 0.382 (0.327) |
| Initial Math Placement Score | 0.001 (0.001) | 0.004** (0.002) |
| Initial Math Placement Score Missing | 0.023 (0.053) | 0.150 (0.116) |
| Constant | -0.338*** (0.117) | -1.443*** (0.457) |
| Observations R2 | 1086 0.027 | 284 0.087 |

Note: Standard errors are in parentheses.

Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; *= 5 percent; *= 10 percent.

Appendix Exhibit D.7. College Success Prize Impact Analysis: Coefficients, Standard Errors, and Statistical Significance for Two Regression Models for the LAGCC Outcome of Two-Year Completion (Year-Two Outcome)

| | Competition-Eligible | Not-Competition-Eligible |
|---|----------------------|--------------------------|
| Beyond12 | -0.004 (0.024) | 0.067 (0.079) |
| Kinvolved | 0.001 (0.025) | 0.038 (0.080) |
| New (2010) English Regents Score | 0.003 (0.002) | -0.002 (0.006) |
| New (2010) English Regents Score Missing | 0.158 (0.136) | -0.097 (0.491) |
| High School GPA | 0.001 (0.002) | 0.012*** (0.005) |
| High School GPA Missing | 0.112 (0.130) | 0.839** (0.389) |
| Initial Writing Placement Score | 0.002** (0.001) | -0.003 (0.011) |
| Initial Writing Placement Score Missing | 0.103* (0.061) | -0.179 (0.658) |
| Initial Math Placement Score | 0.003*** (0.001) | 0.001 (0.004) |
| Initial Math Placement Score Missing | 0.003 (0.092) | -0.050 (0.201) |
| Constant | -0.377** (0.186) | -0.439 (0.821) |
| Observations R2 | 642 0.035 | 154 0.092 |

Note: Standard errors are in parentheses.

Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; **= 5 percent; *= 10 percent.

Appendix Exhibit D.8. College Success Prize Impact Analysis: Coefficients, Standard Errors, and Statistical Significance for Two Regression Models for the BMCC Outcome of Three-Year Completion (Year-Three Outcome)

| | Competition-Eligible | Not-Competition-Eligible |
|----------------------------------|----------------------|--------------------------|
| Beyond12 | -0.050 | 0.191*** |
| | (0.033) | (0.065) |
| Kinvolved | -0.028 | 0.108 |
| | (0.032) | (0.070) |
| New (2010) English Regents Score | 0.004* | 0.004 |
| | (0.002) | (0.004) |
| New (2010) English Regents Score | 0.309* | 0.250 |
| Missing | (0.162) | (0.303) |
| High School GPA | 0.014*** | 0.025*** |
| | (0.002) | (0.004) |
| High School GPA Missing | 1.013*** | 1.960*** |
| | (0.160) | (0.322) |
| Initial Writing Placement Score | 0.003 | -0.005 |
| | (0.002) | (0.007) |
| Initial Writing Placement Score | 0.150 | -0.315 |
| Missing | (0.108) | (0.396) |
| Initial Math Placement Score | 0.004*** | 0.003 |
| | (0.001) | (0.002) |
| Initial Math Placement Score | 0.237** | 0.0722 |
| Missing | (0.099) | (0.140) |
| Constant | -1.329*** | -1.710*** |
| | (0.219) | (0.554) |
| Observations | 1086 | 284 |
| R2 | 0.088 | 0.169 |

Note: Standard errors are in parentheses.

Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; *= 5 percent; *= 10 percent.

Appendix Exhibit D.9. College Success Prize Impact Analysis: Coefficients, Standard Errors, and Statistical Significance for Two Regression Models for the LAGCC Outcome of Three-Year Completion (Year-Three Outcome)

| | Competition-Eligible | Not-Competition-Eligible |
|----------------------------------|----------------------|--------------------------|
| Beyond12 | 0.008 | 0.061 |
| | (0.041) | (0.095) |
| Kinvolved | -0.007 | 0.093 |
| | (0.042) | (0.096) |
| New (2010) English Regents Score | 0.003 | -0.004 |
| | (0.003) | (0.008) |
| New (2010) English Regents Score | 0.232 | -0.066 |
| Missing | (0.232) | (0.591) |
| High School GPA | 0.009*** | 0.023*** |
| | (0.003) | (0.005) |
| High School GPA Missing | 0.688*** | 1.594*** |
| | (0.221) | (0.468) |
| Initial Writing Placement Score | 0.001 | -0.011 |
| | (0.002) | (0.013) |
| Initial Writing Placement Score | 0.088 | -0.643 |
| Missing | (0.104) | (0.791) |
| Initial Math Placement Score | 0.004*** | -0.003 |
| | (0.001) | (0.004) |
| Initial Math Placement Score | 0.364** | -0.195 |
| Missing | (0.156) | (0.242) |
| Constant | -0.899*** | -0.326 |
| | (0.316) | (0.988) |
| Observations | 642 | 154 |
| R2 | 0.057 | 0.152 |

Note: Standard errors are in parentheses.

Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; *= 5 percent; *= 10 percent.

Appendix E. Data on App Usage

| | | Beyond 12 Stu | dents | Kinvolved Students | | | | |
|--|-----------------------------------|---|-----------------------------------|--------------------|-----------------------------------|--|-----------------------------------|----------------|
| | Competition- Eligible N=575 | Not- Competition- Eligible N=153 | Test by Eligibility p-Value | Total N=728 | Competition- Eligible N=587 | Not- Competition- Eligible % N=128 | Test by Eligibility p-Value | Total N=715 |
| Number of days | % of Stud. | % of Stud. | 0.74 | % of Stud. | % of Stud. | % of Stud. | 0.54 | % of Stud. |
| 0 (never activated) | 16.0 | 11.8 | | 15.1 | 12.9 | 11.7 | | 12.7 |
| Activated and u | ised in Year 1 | | | | | | | |
| 1 | 10.4 | 9.8 | | 10.3 | 10.6 | 7.0 | | 9.9 |
| 2-5 | 33.7 | 35.3 | | 34.1 | 23.3 | 26.6 | | 23.9 |
| 6-10 | 20.4 | 21.6 | | 20.6 | 14.8 | 19.5 | | 15.7 |
| 11-20 | 13.6 | 13.1 | | 13.5 | 17.4 | 15.6 | | 17.1 |
| 21-30 | 2.9 | 3.2 | | 3.0 | 8.5 | 5.5 | | 7.9 |
| 31+ | 2.9 | 5.2 | | 3.4 | 12.4 | 14.1 | | 12.7 |
| Mean number of days, among all students | 6.7 | 8.7 | 0.03** | 7.1 | 14.2 | 14.2 | 0.97 | 14.2 |
| Mean number of days, among students who used the app at all | 7.9 | 9.9 | 0.07* | 8.4 | 16.3 | 16.1 | 0.95 | 16.2 |

Appendix Exhibit E.1. Number of Days Each App Was Used at Least Once during Year 1

Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; **= 5 percent; *= 10 percent.

| | Beyond 12 Students | | | | | Kinvolved Stu | Idents | |
|--|-----------------------------------|---|-----------------------------------|----------------|-----------------------------------|--|-----------------------------------|----------------|
| | Competition- Eligible N=575 | Not- Competition- Eligible N=153 | Test by Eligibility p-Value | Total N=728 | Competition- Eligible N=587 | Not- Competition- Eligible % N=128 | Test by Eligibility p-Value | Total N=715 |
| Number of days | % of Stud. | % of Stud. | 0.17 | % of Stud. | % of Stud. | % of Stud. | 0.55 | % of Stud. |
| 0 (never activated) | 16.0 | 11.8 | | 15.1 | 12.9 | 11.7 | | 12.7 |
| 0 (activated but not used in Year 2) | 79.5 | 83.0 | | 80.2 | 78.9 | 78.9 | | 78.9 |
| 1 | 1.2 | 1.9 | | 1.4 | 2.6 | 3.9 | | 2.8 |
| 2-5 | 1.6 | 0.7 | | 1.4 | 3.1 | 4.7 | | 3.4 |
| 6-10 | 1.0 | 0.0 | | 0.8 | 1.2 | 0.0 | | 1.0 |
| 11-20 | 0.5 | 1.3 | | 0.7 | 1.0 | 0.0 | | 0.8 |
| 21-30 | 0.2 | 0.6 | | 0.3 | 0.3 | 0.8 | | 0.4 |
| 31+ | 0.0 | 0.6 | | 0.1 | 0.0 | 0.0 | | 0.0 |
| Mean number of days, among all students | 0.3 | 0.6 | 0.10* | 0.3 | 0.4 | 0.4 | 0.75 | 0.4 |
| Mean number of days, among students who used the app at all | 5.8 | 11.9 | 0.09* | 7.2 | 5.3 | 3.9 | 0.48 | 5.1 |

Appendix Exhibit E.2. Number of Days Each App Was Used at Least Once during Year 2

Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; **= 5 percent; *= 10 percent.

| | | Beyond 12 St | udents | Kinvolved Students | | | | |
|---|-----------------------------------|---|-----------------------------------|--------------------|-----------------------------------|--|-----------------------------------|----------------|
| | Competition- Eligible N=575 | Not- Competition -Eligible N=153 | Test by Eligibility p-Value | Total N=728 | Competition- Eligible N=587 | Not- Competition- Eligible % N=128 | Test by Eligibility p-Value | Total N=715 |
| Number of days | % of Stud. | % of Stud. | 0.38 | % of Stud. | % of Stud. | % of Stud. | 0.62 | % of Stud. |
| 0 (never activated) | 16.0 | 11.8 | | 15.1 | 12.9 | 11.7 | | 12.7 |
| 0 (activated but not used in Year 3) | 81.9 | 86.9 | | 83.0 | 83.3 | 85.9 | | 84.2 |
| 1 | 1.2 | 0.7 | | 1.1 | 2.4 | 0.8 | | 2.1 |
| 2-5 | 0.7 | 0.0 | | 0.5 | 0.7 | 1.6 | | 0.8 |
| 6-10 | 0.2 | 0.7 | | 0.3 | 0.0 | 0.0 | | 0.0 |
| 11-20 | 0.0 | 0.0 | | 0.0 | 0.2 | 0.0 | | 0.1 |
| 21-30 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | | 0.0 |
| 31+ | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | | 0.0 |
| Mean no. of days among all students | 0.04 | 0.1 | 0.48 | 0.1 | 0.1 | 0.1 | 0.82 | 0.1 |
| Mean no. of days among students who used app at all | 1.9 | 5.5 | 0.08* | 2.4 | 2.4 | 2.7 | 0.91 | 2.5 |

Appendix Exhibit E.3. Number of Days Each App Was Used at Least Once during Year 3

Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; **= 5 percent; *= 10 percent.

Regression Analysis of Three-Year Graduation or Equivalent Outcome on App Usage and Other Covariates

Appendix Exhibit E.4 shows the details of four regression models of three-year degree attainment or enrollment in a four-year college (the outcome for Year 3) on days of app usage and the same covariates that were used in the impact model that was described in detail in sections in Appendix D. For example, the first column is a regression that was run only on the students who received the Beyond 12 app (MyCoach) and were competition-eligible. Each column contains coefficients and standard errors. These regressions are only on treated students, and were done separately on the four groups of treated students defined by competition-eligibility and the two apps. Thus, these regressions are an attempt to see how usage affected persistence. However, we cannot draw any causal conclusions from these results.

The first row is of greatest interest and contains the coefficient on days of use and its standard error. For the competition-eligible students who opened the Beyond 12, there was a correlation between days of usage of the app and the likelihood of completing an associate's degree or enrollment in a four-year college. The remaining rows contain the coefficients and standard errors for the eight covariates in the model and the constant term. Finally, in the last row, the sample size and the R-squared for each model are given. Statistical significance is marked in the table with three stars for coefficients that are

significant at the one-percent level, two stars for coefficients that are significant at the five-percent level, and one star for coefficients that are significant at the ten-percent level.

| | (1) | (2) | (3) | (4) |
|--|---------------------------------|-------------------------------|---------------------------------|----------------------|
| | Associate's Degree | Associate's Degree | Associate's Degree | Associate's Degree |
| | or Equivalent, | or Equivalent, | or Equivalent, | or Equivalent, |
| | Beyond 12, | Beyond 12, | Kinvolved, | Kinvolved, |
| | Competition | Not-Competition | Competition | Not-Competition |
| | Eligible | Eligible | Eligible | Eligible |
| Number of Days of Use (Years 1, 2, and 3 Combined) | 0.007 ^{***} (0.002) | 0.002 (0.002) | 0.001 (0.001) | 0.002 (0.002) |
| New (2010) English | 0.003 | 0.013 [*] | 0.010 ^{***} | -0.003 |
| Regents Score | (0.003) | (0.008) | (0.003) | (0.005) |
| New (2010) English Regents Score Missing | 0.260 (0.203) | 1.090 [*] (0.606) | 0.604 ^{***} (0.223) | -0.266 (0.388) |
| High School GPA | 0.014 ^{***} | 0.027 ^{***} | 0.012 ^{***} | 0.025 ^{***} |
| | (0.003) | (0.005) | (0.003) | (0.006) |
| High School GPA | 0.997 ^{***} | 2.004 ^{***} | 0.848 ^{***} | 2.037 ^{***} |
| Missing | (0.219) | (0.433) | (0.220) | (0.535) |
| Initial Writing | 0.001 | -0.010 | 0.001 | -0.022 |
| Placement Score | (0.002) | (0.011) | (0.002) | (0.013) |
| Initial Writing Placement Score Missing | 0.063 (0.120) | -0.679 (0.690) | -0.042 (0.117) | -1.280 (0.810) |
| Initial Math | 0.007 ^{***} | -0.002 | 0.002 | 0.001 |
| Placement Score | (0.002) | (0.003) | (0.001) | (0.006) |
| Initial Math Placement Score Missing | 0.009 (0.133) | -0.203 (0.196) | 0.272 ^{**} (0.129) | -0.054 (0.296) |
| Constant | -1.321 ^{***} | -1.919 ^{**} | -1.390*** | -0.095 |
| | (0.286) | (0.851) | (0.304) | (1.019) |
| Observations | 575 | 153 | 587 | 128 |
| <i>R</i> ² | 0.150 | 0.235 | 0.080 | 0.169 |

Appendix Exhibit E.4. Regressions of Degree Attainment or Equivalent on Days of App Usage and Control Variables by App and Competition-Eligibility

Note: Standard errors are in parentheses.

Statistical significance levels for two-sided tests are indicated as follows: ***= 1 percent; *= 5 percent; *= 10 percent.