

Getting Back on Track

Comparing the Effects of Online and Face-to-Face Credit Recovery in Algebra I

RESEARCH BRIEF 1



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THE BACK ON TRACK STUDY is an investigation about credit recovery in Algebra I for students who fail the course in ninth grade. Students who fail Algebra I are required to recover the credit during high school to earn a diploma, and online credit recovery courses have become a popular strategy in schools in districts around the country. The *Back on Track Study* examines the impact of an online credit recovery Algebra I course compared with a standard face-to-face version of the course; both courses were offered the summer after ninth graders failed Algebra I. The study was funded by the U.S. Department of Education's Institute of Education Sciences, and conducted by American Institutes for Research and the University of Chicago Consortium on School Research, in partnership with Chicago Public Schools (CPS). This study is a randomized controlled trial that was designed to address two types of questions:

- 1. What is the impact of online versus face-to-face Algebra I courses for credit recovery?**
- 2. What is the long-term effect of offering expanded credit recovery options early in high school?**

The study took place in 17 CPS high schools that offered both online and face-to-face Algebra I credit recovery courses in summer 2011 and summer 2012. A total of 1,224 ninth graders participated in the study by enrolling in a second-semester Algebra I course for credit recovery during the summer after failing the class. Students were randomly assigned to take the online or face-to-face course.

This research brief is one in a series for the *Back on Track Study* that presents the findings regarding the relative impact of online versus face-to-face Algebra I credit recovery on students' academic outcomes, aspects of implementation of the credit recovery courses, and the effects over time of expanding credit recovery options for at-risk students.

RESEARCH BRIEFS IN THIS SERIES

Getting Back on Track: Comparing the Effects of Online and Face-to-Face Credit Recovery in Algebra I

This brief compares educational outcomes through the second year of high school for students who took online credit recovery versus face-to-face credit recovery in 17 CPS high schools.

Getting Back on Track: The Role of In-Person Instructional Support for Students Taking Online Credit Recovery

This brief describes the role of in-class mentors who supervised students taking the online course and examines whether students benefited from additional instructional support from their in-class mentors."

Getting Back on Track: Who Needs to Recover Algebra Credit After Ninth Grade?

This brief describes the characteristics of students who failed Algebra I in ninth grade across CPS high schools, to better understand the population of students who are served by credit recovery courses.

Please visit www.air.org/CreditRecovery to access all of the research briefs and for more information about the *Back on Track Study*.

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Failing core academic courses during the first year of high school is a strong signal of trouble to come; course failures during ninth grade are associated with notable declines in four-year graduation rates.ⁱ To get back on track, students who fail classes need opportunities to recover credit. Historically, students retook required classes in summer school or during the school year in a face-to-face setting. Online learning has emerged as a popular strategy for credit recovery. Providing credit recovery opportunities is now one of the most common purposes for offering online courses in K–12 educational settings.^{ii, iii} Offering online credit recovery can provide flexibility for schools and students. Online courses are promoted as more engaging and interactive than face-to-face classes and providing individualized feedback and pacing. However, evidence about the efficacy of online credit recovery is lacking.

This brief summarizes findings from an experimental study that tested the impact of online Algebra I for credit recovery against the standard face-to-face version of the course for students in Chicago Public Schools (CPS) who failed the course during their first year of high school. The study was designed to provide information for districts around the country faced with decisions about offering credit recovery course options.

The study focused on Algebra I because in many districts, more students fail Algebra I than any other course,^{iv, v} and students who fail Algebra I in particular are unlikely to graduate. For example, in CPS approximately one third of ninth graders fail one or both semesters of Algebra I. Only 15% of students who failed both semesters of Algebra I in ninth grade during the 2005–06 school year graduated in four years. It is of utmost policy importance to examine the efficacy of different strategies that may help struggling students get back on track.

The *Back on Track Study*, conducted by American Institutes for Research and the University of Chicago Consortium on School Research, is an ongoing study designed to examine whether students who took an online Algebra I credit recovery course over the summer had different educational outcomes at the end of the course than students who took a face-to-face Algebra I credit recovery course. The study is also investigating whether early credit recovery helps at-risk students who fail Algebra I in Grade 9 get back on track for high school graduation.

Back on Track Study KEY FINDINGS

- The majority of students in the study successfully recovered credit in both types of courses, but students in the online course were less likely to pass than students in the face-to-face course (66% vs. 76%).
- At the end of the course, students in the online course reported that their class was more difficult and less clear regarding grading expectations than students in the face-to-face credit recovery course. Students in the online course also had lower liking of and confidence in math and lower algebra test scores than students in the face-to-face course.
- There were no significant differences between online and face-to-face students in pass rates in subsequent math classes or their likelihood of being on-track for graduation at the end of the second year of high school.

This brief describes study findings comparing online and face-to-face students on their educational outcomes at the end of the credit recovery course and at the end of their second year of high school. Specifically, this brief answers the following questions:

1. How do students' classroom experiences (engagement, perceived classroom personalization and academic demand) compare for students taking online and face-to-face summer credit recovery courses?
2. Compared with retaking Algebra I as a standard face-to-face summer course, what is the impact of taking online Algebra I for credit recovery on students':
 - a. Short-term academic outcomes (scores on an end-of-Algebra I course assessment, grades in the credit recovery course, and credit attainment)?
 - b. Longer-term academic outcomes (standardized mathematics assessment scores, credits and grades in subsequent mathematics courses, and whether students were on-track for graduation)?

About the Study

Typically, CPS students who fail one or both semesters of Algebra I enroll in the next mathematics course in the sequence (Geometry or Algebra II) in their second year of high school, but to earn a diploma they must eventually recover the Algebra I credit during high school. One option is for students to attend summer school. However, the rate of recovery the summer after failing the course is typically low. For example, during the year before the study started (2009–10), only 13% of CPS freshmen who failed their spring semester of Algebra I recovered the course credit over the summer. This study was conducted in partnership with the district to investigate whether offering online credit recovery was more effective at promoting credit recovery than traditional face-to-face summer classes, the summer after failing Algebra I in Grade 9.

RANDOM ASSIGNMENT

This study used a lottery to determine students' course assignments: All students had a 50/50 chance of taking the course online or face-to-face. This ensures that the groups of students are statistically comparable.

In this study, first-year high school students who failed second-semester Algebra I were encouraged to enroll in summer school.¹ Students who enrolled were randomly assigned to either an online course or a face-to-face course. By using random assignment and an experimental study design, this study provides a rigorous test of whether taking an online course resulted in better educational outcomes than taking a face-to-face course.

¹ The study focused on second-semester Algebra I because failure rates are historically higher than for the first semester.

The study took place in 17 CPS high schools that had large numbers of students who failed Algebra I relative to other schools in the district and that agreed to participate. The schools participated in the study in summer 2011, summer 2012, or both summers.

Each participating school offered at least two sections of second-semester Algebra I— one online and one face-to-face, for a total of 76 sections offered as part of the study (38 online and 38 face-to-face). Both courses were offered in a summer session lasting approximately three weeks and a total of 60 classroom hours for the one-semester course.

A total of 1,224 first-time freshmen participated in the study by enrolling in Algebra IB for credit recovery in summer 2011 or 2012. In total, 613 students were randomly assigned to take the online course and 611 were assigned to take the face-to-face class.

There were no differences in class sizes, student characteristics, or prior achievement levels for students in the online and face-to-face classes.

The results presented in this brief draw on CPS student administrative records for the participating students, as well as an end-of-course survey and algebra posttest administered by the study team to all students who persisted to the end of the summer session. The posttest consisted of 28 items that covered algebraic concepts from the National Assessment of Educational Progress and was used only as part of the study; students' scores did not factor into their course grades.

Credit Recovery Courses

Both the online and the face-to-face courses met daily for about four hours per day over the course of three to four weeks to meet the 60-hour requirement for a one-semester credit recovery course. The next two sections describe how the two courses were structured and the content that was covered. As the course descriptions demonstrate, when school administrators decide to use an online provider versus a traditional face-to-face teacher, they change not only the mode of delivery of the course content but also potentially the content itself.

STUDY STUDENTS

- Female: 38%
- Hispanic: 57%
- African American: 33%
- White: 8%
- Eligible for national school lunch program: 86%
- Eligible for special education services: 12%
- Spoke Spanish as their home or native language: 47%
- Failed first-semester Algebra I: 50%
- Failed second-semester Algebra I: 100%
- Average number of semester-long courses failed in the first year of high school: 4.5
 - More than two full-year courses failed, on average

Online Course

Aventa Learning/K12 (Aventa) provided the online course. CPS had started to use Aventa’s online credit recovery courses in some schools prior to the start of the study, and Aventa’s courses were in wide use nationally.² The Algebra I credit recovery course had been designed for students to take at school in a supervised setting. The course included Aventa’s complete Algebra I (second semester) curriculum, their Web-based course software, and an online teacher. The online teachers communicated individually with students through the learning management system, online chats, and online “whiteboard” demonstrations. The online course also had a platform that allowed teachers to talk to students, and students to talk with other students, in real time.

AVENTA’S ALGEBRA IB ONLINE COURSE UNITS

Unit	Lessons
Solving Systems	1-5
Polynomials	6-11
Quadratics and Radicals	12-16
Rational Expressions	17-21
Exponents	22-24

Students in the online course sections also had an in-class mentor, which is recommended and strongly encouraged by this and other online course providers. Participating schools selected school staff to serve as the in-class mentors, and Aventa provided training in how to provide in-person support. Mentor responsibilities included helping students navigate the curriculum, proctoring online assessments, troubleshooting technological issues, and communicating with online teachers about students’ progress. The in-class mentors were not required to provide instructional support but did to varying degrees. Approximately half of the in-class mentors were certified to teach high school mathematics.³

The online course was composed of five second-semester Algebra I units through which students progressed at their own pace. We tracked student-level content exposure in the online course and found that on average, students completed nearly two thirds of the material in the online course.

Face-to-Face Course

CPS teachers who were certified to teach high school mathematics taught the face-to-face classes. These teachers had discretion about what and how to teach. Although tracking student-level content exposure in the face-to-face classes was not possible, we analyzed the content covered in the face-to-face sections by collecting classroom materials from the face-to-face teachers. We found that:

- On average, approximately 50% of the content in the classes was aligned to the second-semester algebra content in the online course; the remaining 50% was a mix of prealgebra and first-semester algebra topics.

² Aventa Learning operated online courses in every state, and its Algebra I course was implemented for credit recovery in an estimated 500 schools around the country when this study began in 2011. Aventa was acquired by K12 during the study.

³ See companion brief in this series, “Getting Back on Track: The Role of In-Person Instructional Support for Students Taking Online Credit Recovery” for an analysis of the role of instructional support in students’ success in the online course.

- Topics in the face-to-face classes were not presented in a uniform sequence across the sections (in contrast to the online course, where topics were presented in the same sequence for all students).

Cost

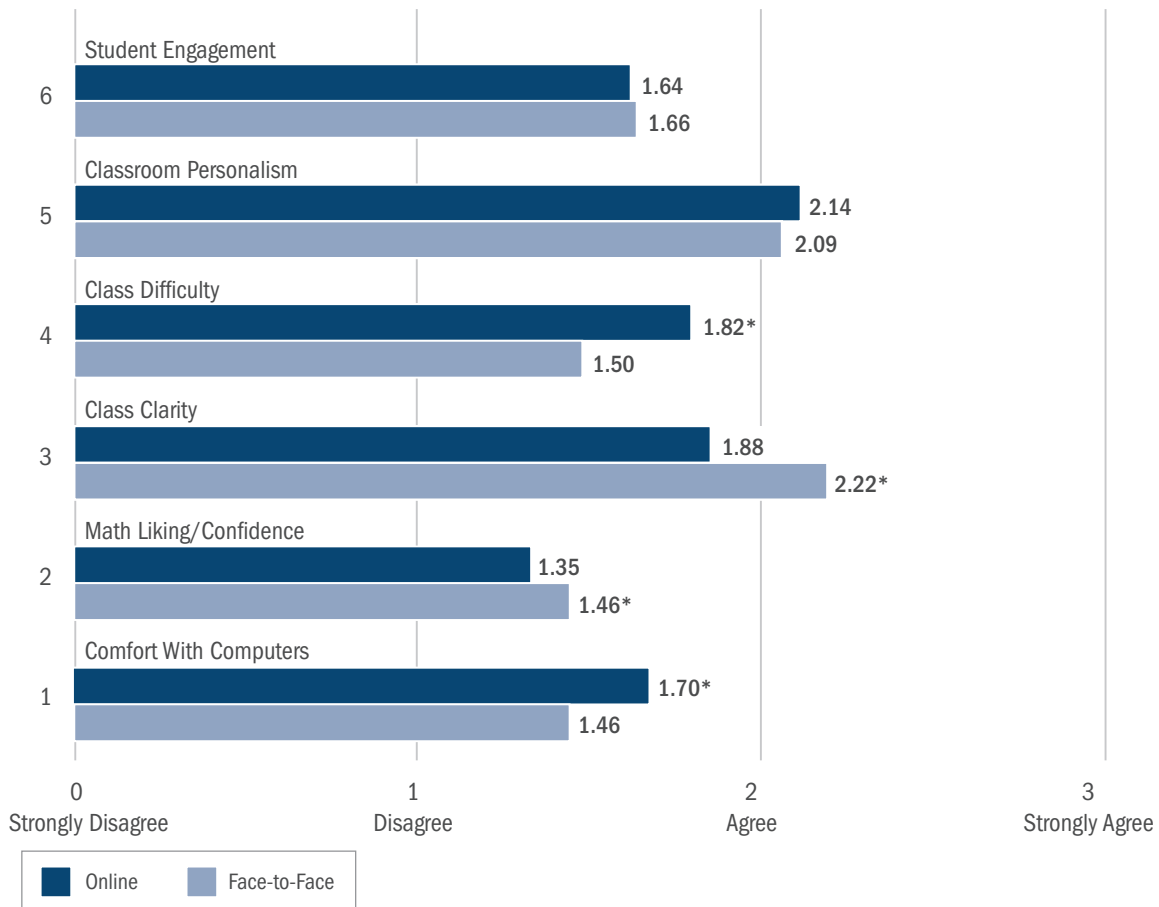
The study grant paid for both the online and face-to-face classes. Costs for the online course included mentors paid their standard teaching rates and students' "seats" in the Aventa course, at the standard rate typical for Aventa and CPS at the time. Costs for the face-to-face classes included teachers paid their standard teaching rates, for the same number of hours (60 hours per course). Therefore, under the implementation model used for the study—which is the model recommended by many online course providers throughout the country—the online course cost more than the face-to-face course.

Study Findings

Students found the online course more difficult and had more negative attitudes about mathematics than students in the face-to-face course

Students' responses to a survey they completed at the end of the course showed a few differences between those who took the online course and those who took the face-to-face course. Students in the online credit recovery course perceived their course to be significantly more difficult and less clear regarding grading expectations than students in the face-to-face course. The online students also reported significantly lower liking of math and less confidence in math than students in the face-to-face course. The one area in which students in the online course reported a more positive experience was comfort with computers; they reported significantly more comfort and enjoyment when using computers in a classroom at the end of the summer session than their face-to-face counterparts did. There were no differences between the two groups of students in their reports of how engaged they were in the course or the extent to which they received personalized support from their teachers (Figure 1).

Figure 1. Student Classroom Experiences and Attitudes, by Type of Credit Recovery Course



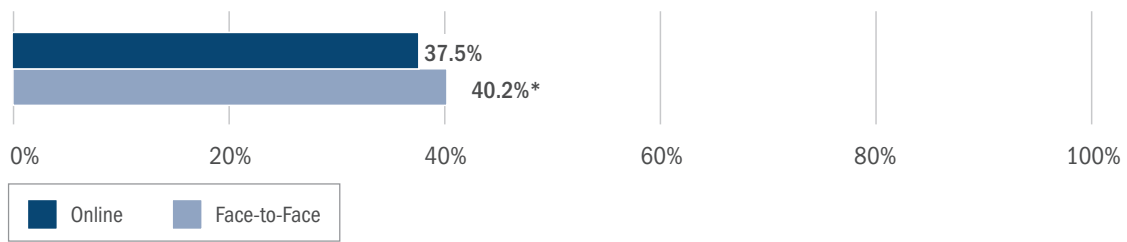
Note. F2F = face-to-face.

* Difference between online and face-to-face is statistically significant at the .05 level, two-tailed test.

Online course students had lower algebra assessment scores, grades, and credit recovery rates than face-to-face course students

Students in the online course had significantly lower scores on the end-of-course algebra posttest than students in the face-to-face classes. The assessment consisted of items used previously in the National Assessment of Educational Progress covering prealgebra and algebra topics. On average, students in the online course answered 38% of the items correctly and students in the face-to-face course answered 40% of the items correctly (Figure 2). Again, these scores did not factor into students' grades.

Figure 2. Percentage Correct on End-of-Course Algebra Posttest

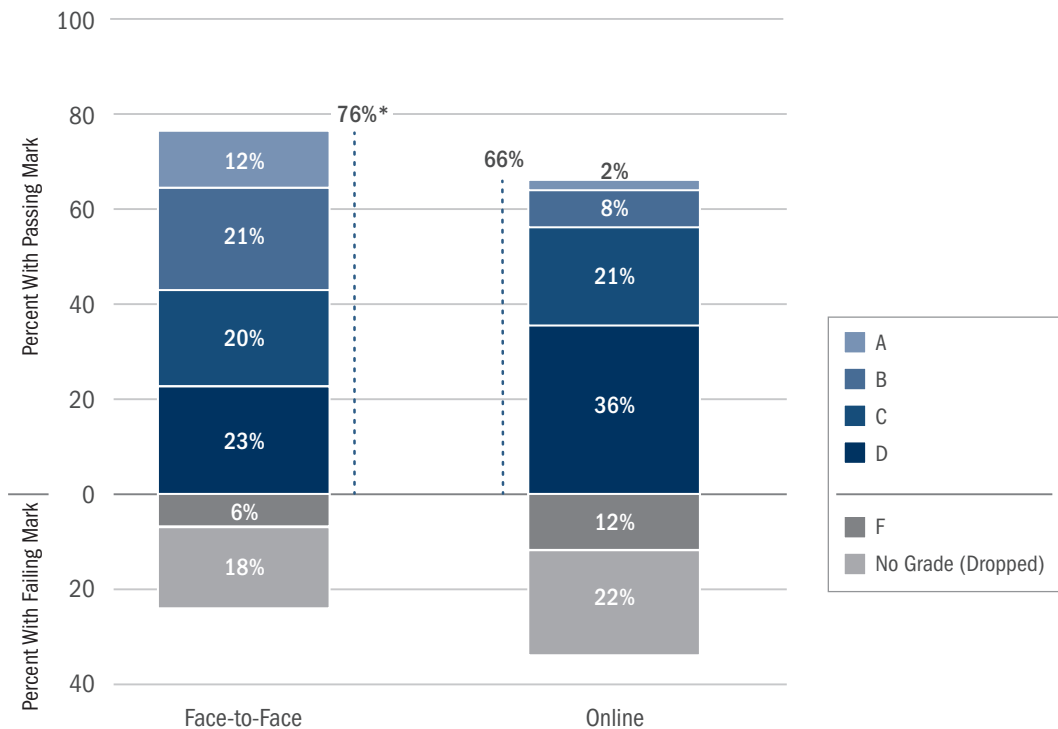


* Difference between online and face-to-face is statistically significant at the .05 level, two-tailed test.

Consistent with students' self-reports that the online course was more difficult and had less clarity regarding grading expectations, students in the online course earned lower grades than students in the face-to-face classes. Figure 3 shows the percentage of students who received different grades in the course and shows, for example, that only 31% of students in the online course, in contrast to 53% of students in the face-to-face course, earned an A, a B, or a C.

To successfully recover credit, students needed to earn a grade of D or higher. The majority of all study participants (71%) across the two types of courses successfully recovered credit. However, the lower grades for online students translated into significantly lower credit recovery rates than face-to-face students: 66% of students in the online course, compared with 76% of students in the face-to-face course, successfully recovered credit for second semester Algebra I (Figure 3).

Figure 3. Summer Course Grades and Credit Recovery Rates



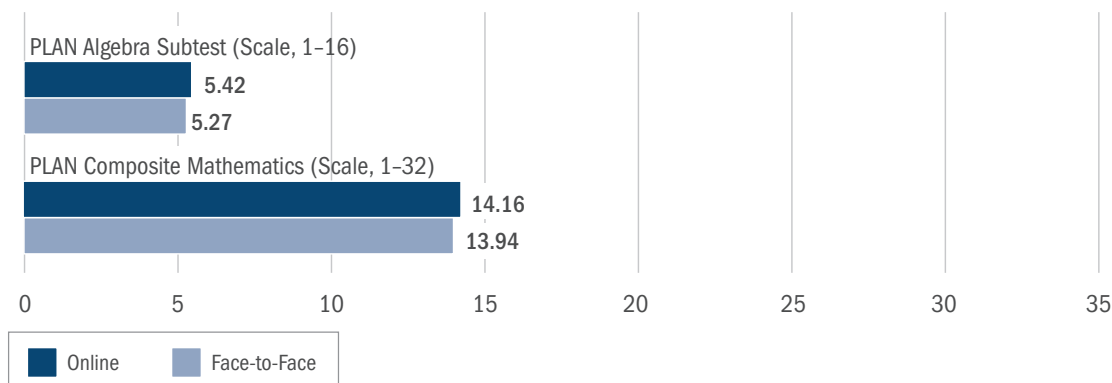
Note. F2F = face-to-face.

* Difference between online and face-to-face is statistically significant at the .05 level, two-tailed test.

Longer-term academic outcomes were not significantly different for students in the online and face-to-face credit recovery courses

At the time, CPS students took the PLAN assessment in the fall of Grade 10. The PLAN is part of the ACT battery of assessments. We examined scores for composite mathematics (possible range, 1–32) and the algebra subtest (possible range, 1–16). We found no significant differences in PLAN scores by type of credit recovery course (Figure 4).

Figure 4. Grade 10 Mathematics Standardized Test Scores



Note. Differences between online and face-to-face courses not statistically significant at the .05 level, two-tailed test.

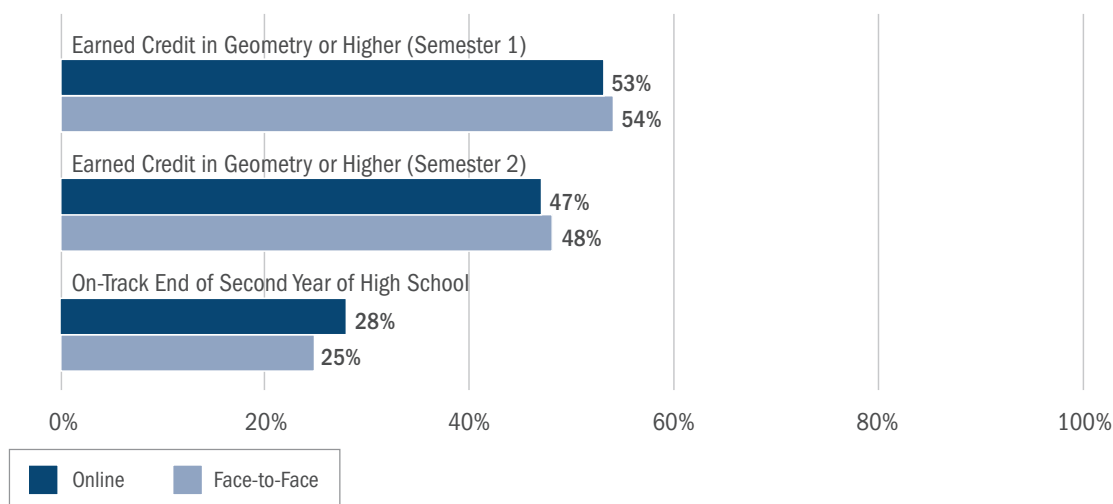
Although students in the face-to-face course were more likely to recover Algebra IB credit than students in the online course, they did not have higher rates of enrolling in or passing Geometry or a higher mathematics course in their second year of high school. Approximately half of the students who took either the online or the face-to-face credit recovery course earned credit in Geometry or higher the following year (Figure 5).

Despite the difference in summer Algebra IB credit recovery rates, online and face-to-face students' total mathematics credits at the end of the second year of high school were not significantly different. Online students had an average of 2.39 credits and face-to-face students had an average 2.51 credits—both groups had fewer credits on average than the total of four that would reflect successful passing of two mathematics courses in each of the first two years of high school.⁴

Students in CPS were considered “on-track for graduation” at the end of their second year in high school if they earned at least 11 full-year course credits (22 semester credits) during their first two years of high school, with no more than one failing grade in a semester-long core academic course during the year. There were no significant differences between online and face-to-face credit recovery students in the likelihood of being on-track for graduation at the end of the second year of high school (Figure 5).

⁴ However, the slight difference in favor of the face-to-face students' math credit accrual was marginally significant ($p < .09$).

Figure 5. Subsequent Mathematics Course Performance and On-Track Status at the End of the Second Year of High School



Note. Differences between online and face-to-face courses are not statistically significant at the .05 level, two-tailed test.

Summary of Study Findings and Their Implications for Education Practice

The study findings show that students benefited more from face-to-face than online credit recovery in Algebra I, in the short term. For low-performing students in need of credit recovery, this study found that an online Algebra I course was not better than traditional face-to-face instruction. Compared with students receiving face-to-face instruction, students in the online course had lower grades, lower pass rates, and lower scores on an end-of-course algebra assessment. In addition, students in the online course reported less confidence in their mathematical skills than their counterparts in face-to-face classes. For schools that can offer summer credit recovery through either mode, this study suggests that they are likely to see more favorable short-term educational outcomes with face-to-face classes.

However, most students recovered credit in both online and face-to-face settings, and there were no differences between online and face-to-face Algebra I credit recovery in educational outcomes during the second year of high school. More than two thirds of students successfully recovered their Algebra IB credit across both types of courses. Furthermore, there were no differences in outcomes measured during the following academic year—including scores on the PLAN mathematics assessment and PLAN algebra subtest, students' likelihood of earning credit in Geometry or higher, and their likelihood of being on-track for graduation at the end of the second year of high school.

For highly at-risk, generally low-achieving students, this study provides some important cautions about online credit recovery. It is possible that alternative online course models that provide more instructional support and opportunities for remediation of earlier content would benefit at least some students who fail second-semester Algebra I. Consideration of these possibilities, however, raises important questions about the balance between remediation and rigor in credit recovery situations. Instruction that matches students' skill levels may not correspond well with the expectations for the content of the courses required for high school graduation or college readiness, especially within the constricted timeframe of a summer course.

In addition, the study results suggest that both online and face-to-face credit recovery courses allow students to recover credit, but these courses do not appear to change students' generally low-performing trajectories. Although most students did recover credit, there was little evidence of algebra learning, based on two different assessments. On the study's algebra posttest, composed of National Assessment of Educational Progress items, students in the study answered, on average, 39% of the items correctly. On the district-administered PLAN mathematics assessment, the average score was 14, which puts them five points behind the ACT's benchmark score of 19—a difference that is equivalent to about five years' worth of growth.⁵ Even without a measure of growth in algebra knowledge from pre-to post-credit recovery, the study findings demonstrate that *content* recovery among students in the study was likely minimal. Given these observations, many students could probably benefit from much earlier intervention, with a focus on increasing their chances of mastering the content students need to be successful in Algebra I.

In absence of immediately effective early interventions, it is clear that schools and districts need to continue to find ways to offer credit recovery opportunities to students who fail courses. Online courses provide flexibility and convenience for schools (although they may actually be more expensive to run than face-to-face classes, as in this study). In many schools, it is difficult to find qualified mathematics teachers to cover courses and to estimate in advance how many sections of any given class to offer. Online courses may also provide more rigorous content and interactive instruction to students. In some schools, online courses may be seen as the better or the only viable option for credit recovery. **Continued improvement of online courses, particularly for highly at-risk students, is essential for fulfilling the great need for flexible alternatives for students whose futures depend on opportunities to get back on track in school.**

⁵ On average, students gain about 1 point per year on the ACT's assessments (EXPLORE, PLAN, ACT).

Endnotes

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