Making Connections

September 2015

Comparing success rates for general and credit recovery courses online and face to face: Results for Florida high school courses

John Hughes
Chengfu Zhou
Yaacov Petscher
Florida Center for Reading Research at Florida State University

Key findings

Grade 9–11 students in Florida were more likely to earn a grade of C or better when taking an academic course online rather than face to face for both general online courses and credit recovery courses. Most subgroups of students were also more likely to succeed in online courses. The success gap between online and face-to-face courses was highest in grade 9 and diminished through grade 12. However, English learner students showed no difference between online and face-to-face credit recovery courses. It is not possible to determine from this study whether differences in course outcomes are due to greater student learning or other factors.

ies NATIONAL CENTER FOR EDUCATION EVALUATION AND REGIONAL ASSISTANCE
Institute of Education Sciences
U.S. Department of Education

REL SOUTHEAST
Regional Educational Laboratory
At Florida State University

U.S. Department of Education
Arne Duncan, *Secretary*

Institute of Education Sciences
Ruth Neild, *Deputy Director for Policy and Research*
Delegated Duties of the Director

National Center for Education Evaluation and Regional Assistance
Joy Lesnick, *Acting Commissioner*
Amy Johnson, *Action Editor*
Sandra Garcia, *Project Officer*

REL 2015–095

The National Center for Education Evaluation and Regional Assistance (NCEE) conducts unbiased large-scale evaluations of education programs and practices supported by federal funds; provides research-based technical assistance to educators and policymakers; and supports the synthesis and the widespread dissemination of the results of research and evaluation throughout the United States.

September 2015

This report was prepared for the Institute of Education Sciences (IES) under Contract ED-IES-12-C-0011 by Regional Educational Laboratory Southeast administered by Florida Center for Reading Research, Florida State University. The content of the publication does not necessarily reflect the views or policies of IES or the U.S. Department of Education nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government.

This REL report is in the public domain. While permission to reprint this publication is not necessary, it should be cited as:

Hughes, J., Zhou, C., & Petscher, Y. (2015). *Comparing success rates for general and credit recovery courses online and face to face: Results for Florida high school courses* (REL 2015–095). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Southeast. Retrieved from http://ies.ed.gov/ncee/edlabs.

This report is available on the Regional Educational Laboratory website at http://ies.ed.gov/ncee/edlabs.

Summary

The perceived potential for online education to improve education outcomes and save money has led to substantial increases in its use. The number of school districts using online education and the total number of online courses have increased considerably, and there is no reason to expect that trend to reverse (Queen and Lewis, 2011; U.S. Department of Education, 2011). One major use for online courses is to provide K–12 students the opportunity to retake required courses to make up graduation credits for courses they failed previously, known as credit recovery (Andrie, 2012; Davis, 2011; Dessoff, 2009; Plummer, 2012). Many states, particularly in the Regional Educational Laboratory Southeast Region, identify credit recovery as a major objective for online courses (Queen and Lewis, 2011). However, little research has compared student outcomes in online courses with student outcomes in face-to-face courses, whether for credit recovery or more generally.

This study examined whether Florida high school students in online courses earned a grade of C or better at different rates from students in the same courses face to face. Course grades have limitations as an outcome measure because they are inherently subjective. However, grades are directly related to the accumulation of high school credits. The analyses include general online academic courses and credit recovery courses. Additionally, the study compared outcomes for key demographic subgroups.

In general, students were more likely to earn a C or better in online courses than in face-to-face courses. This held true in both general courses and credit recovery courses as well as for most subgroups. English learner students were an exception: their success in online and face-to-face courses was about the same. Grade 9 students in online courses were likely to outperform students in face-to-face courses by the widest margin, and the margin narrowed at each higher grade level. Grade 12 students typically had the smallest differences in success rates between online and face-to-face courses.

It is not possible to determine from this study whether the differences in course outcomes are attributable to greater student learning, other factors such as differences in student characteristics that were not measured, or differences in grading standards.

Contents

Summary i

Why this study? 1

What the study examined 2

What the study found 5

The most common online courses included such traditional academic courses as Spanish, English, history, and math 6

Students taking online courses were demographically different from students not taking online courses 7

For the 20 most common online academic courses, the likelihood of earning a C or better was higher when the student took the course online instead of face to face 8

The likelihood of earning a C or better in an online course was equal to or higher than that likelihood in a face-to-face course for most subgroups 9

Students who attempted credit recovery online had higher likelihoods of earning a C or better than those taking the same courses face to face 11

Among student subgroups, performance in credit recovery online courses differs only for English learner students 12

Limitations of the study and next steps 14

Appendix A. Data and methodology A-1

Appendix B. Detailed results B-1

References Ref-1

Boxes

1 What existing research has reported about student learning from online courses 2

2 Key terms 3

3 Data, sample, and methods 4

Figures

1 Students who took online courses were demographically different from those who did not, 2010/11 7

2 Students who took online courses typically performed higher on the prior year's Florida Comprehensive Assessment Test than those who did not, 2010/11 8

3 Students taking one of the 20 most common online academic courses generally had a higher likelihood of earning a C or better than students taking one of these courses face to face, 2010/11 9

4 Most subgroups had a higher likelihood of earning a C or better in online courses than in face-to-face courses, 2010/11 10

5 Students taking one of the 20 most common online credit recovery courses online had a higher likelihood of earning a C or better, 2010/11 12

6 For every subgroup except English learner students, the likelihood of earning a C or better in recovery courses online was higher than in face-to-face courses, 2010/11 13

B1 Percent chances of earning a C or better in all courses, all students B-6
B2 Percent chances of earning a C or better in all courses, Black students B-8
B3 Percent chances of earning a C or better in all courses, Hispanic students B-9
B4 Percent chance of earning a C or better in all courses, students eligible for the school lunch program B-11
B5 Percent chances of earning a C or better in all courses, students in special education B-12
B6 Percent chance of earning a C or better in all courses, English learner students B-14
B7 Percent chance of earning a C or better in credit recovery courses, all students B-16
B8 Percent chance of earning a C or better in credit recovery courses, Black students B-17
B9 Percent chance of earning a C or better in credit recovery courses, Hispanic students B-19
B10 Percent chance of earning a C or better in credit recovery courses, students eligible for the school lunch program B-20
B11 Percent chance of earning a C or better in credit recovery courses, students in special education B-22
B12 Percent chance of earning a C or better in credit recovery courses, English learner students B-23

Tables

1 Magnitude of online education by region 1
2 Enrollment in the 20 most common online academic courses in Florida, 2007/08–2010/11 6
3 Enrollment in the 20 most common online credit recovery courses in Florida, 2007/08–2010/11 11
A1 Count of students and courses in analyses A-2
B1 The 25 most commonly taken online courses with total enrollment, 2007/08–2010/11, and cumulative percentage B-1
B2 The 20 most commonly taken online credit recovery courses with total enrollment, 2007/08–2010/11, and cumulative percentage B-2
B3 Demographic characteristics of students who took online courses and those who did not, 2007/08–2010/11 B-3
B4 Percent of students scoring 3 or higher on the Florida Comprehensive Assessment Test who took online courses and those who did not, 2007/08–2010/11 B-4
B5 Logistic regression coefficients for all courses, all students B-5
B6 Contrast results for online and face-to-face courses for all courses, all students B-6
B7 Logistic regression coefficients for all courses, Black students B-7
B8 Contrast results for online and face-to-face courses for all courses, Black students B-7
B9 Logistic regression coefficients for all courses, Hispanic students B-8
B10 Contrast results for online and face-to-face courses for all courses, Hispanic students B-9
B11 Logistic regression coefficients for all courses, students eligible for the school lunch program B-10
B12 Contrast results for online and face-to-face courses for all courses, students eligible for the school lunch program B-10
B13 Logistic regression coefficients for all courses, students in special education B-11
B14 Contrast results for online and face-to-face courses for all courses, students in special education B-12
B15 Logistic regression coefficients for all courses, English learner students B-13
B16 Contrast results for online and face-to-face courses for all courses, English learner students B-13

B17 Differences in predicted probabilities of earning a C or better for online and face-to-face courses, 2010/11 B-14
B18 Logistic regression coefficients for credit recovery courses, all students B-15
B19 Contrast results for online and face-to-face credit recovery courses, all students B-15
B20 Logistic regression coefficients for credit recovery courses, Black students B-16
B21 Contrast results for online and face-to-face credit recovery courses, Black students B-17
B22 Logistic regression coefficients for credit recovery courses, Hispanic students B-18
B23 Contrast results for online and face-to-face credit recovery courses, Hispanic students B-18
B24 Logistic regression coefficients for credit recovery courses, students eligible for the school lunch program B-19
B25 Contrast results for online and face-to-face credit recovery courses, students eligible for the school lunch program B-20
B26 Logistic regression coefficients for credit recovery courses, students in special education B-21
B27 Contrast results for online and face-to-face credit recovery courses, students in special education B-21
B28 Logistic regression coefficients for credit recovery courses, English learner students B-22
B29 Contrast results for online and face-to-face credit recovery courses, English learner students B-23
B30 Differences in predicted probabilities of earning a C or better for online and face-to-face credit recovery courses, 2010/11 B-24

Why this study?

The perceived potential for online education to improve education outcomes and save money has led to considerable expansion of its use. Nationally, online course enrollment increased almost sixfold in 10 years, from 317,000 in 2002/03 to more than 1.8 million in 2009/10 (U.S. Department of Education, 2011). Growth has been greatest in the Southeast United States, where enrollment grew 876 percent and where 78 percent of school districts have at least one student enrolled in distance education courses (table 1).

Leading the national trend, Florida has actively embraced online learning. Florida established the country's first statewide virtual school in 1997, the Florida Virtual School, which remains the largest such program, accounting for 50 percent of nationwide enrollment in virtual schools (Watson, Pape, Murin, Gemin, and Vashaw, 2014). In 2011 Florida enacted legislation that expanded the range of blended and online learning options and required that all students complete at least one online course for high school graduation (Watson, Murin, Vashaw, Gemin, and Rapp, 2011). The continuing expansion of online learning led members of the Regional Educational Laboratory Southeast Blended and Online Learning Research Alliance to seek information comparing online and face-to-face course outcomes.

The perceived potential for online education to improve education outcomes and save money has led to considerable expansion of its use

This study examines whether Florida high school students in online courses earned a grade of C or better at different rates from students in the same courses face to face. Course grades have limitations as an outcome measure because they are inherently subjective. However, grades are directly related to the accumulation of high school credits and are therefore a critical aspect of high school graduation rates. The analyses began with general online academic courses to better understand what courses students take online and how outcomes in those courses might differ from outcomes in face-to-face versions. The study also examines outcomes in credit recovery courses. Finally, the study compares results for key demographic subgroups.

Credit recovery is a common reason for high school students to enroll in online courses. Online education is seen as a practical and flexible way to allow students to retake required courses that they had failed previously. In fact, most school districts say offering these credit recovery courses is a major reason for providing online courses (Queen and Lewis, 2011). Yet existing research has not shown that online courses produce better learning or better grades in either general or credit recovery courses (box 1).

Table 1. Magnitude of online education by region (percent)

Region	Increase in number of students enrolled in technology based distance education courses (2003–10)	Share of districts with students enrolled in distance education (2009–10)
Northeast	185	39
Southeast[a]	876	78
Central	653	62
West	479	51

a. Includes Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia.

Source: U.S. Department of Education, 2011, table 110; Queen and Lewis, 2011, table 1.

Box 1. What existing research has reported about student learning from online courses

Existing research provides theoretical reasons why online instruction could improve learning in general and enhance credit recovery efforts. Poor attendance and work effort were found to be strong predictors of grade 9 course failures (Allensworth and Easton, 2007). Online instruction, with its more flexible design and schedule, may improve attendance (Franco and Patel, 2011). Well-designed and personalized online courses could also lead to higher levels of student engagement (Heppen et al., 2012).

However, online instruction might not always enhance student learning, particularly for students who need credit recovery. These students, by definition, are struggling and are more likely to lack the self-regulatory skills, such as time management, needed for success (Franco and Patel, 2011; Roblyer and Marshall, 2002). Thus, while use of online courses for credit recovery presents opportunities for students, it is not certain that students will benefit from them.

Although using online courses for credit recovery is becoming increasingly common (Andrie, 2012; Davis, 2011; Dessoff, 2009; Plummer, 2012), analyses of its effectiveness are limited. One pilot study of 23 teacher-nominated students found positive results for a single high school with a self-paced summer program using online and traditional curricula (Franco and Patel, 2011). While the outcomes appear promising, the results are of limited use for three reasons. First, the sample size was small, and the teachers were instructed to nominate students likely to be successful. Second, the analysis did not contrast the online course with a similar face-to-face course. Finally, the fact that all students in the pilot passed the credit recovery course raises concerns that the standards for passing may not have been meaningful.

This study examines whether Florida high school students in online courses earned a grade of C or better at different rates from students in the same courses face to face

What the study examined

Using data from Florida, this study addressed two questions related to online learning in all academic courses generally and credit recovery courses specifically:

- Is the likelihood of earning a C or better in general academic courses statistically different between online courses and face-to-face courses?
- Is the likelihood of earning a C or better in credit recovery courses statistically different between online courses and face-to-face courses?

From a policy perspective it is important to examine whether the results obtained for the broader population of students also hold true for subgroups of students. This leads to a third research question:

- For both general and credit recovery courses, does the likelihood of earning a C or better differ for specific subgroups of students?

To answer this last question, the results for each research question are presented for key demographic subgroups: Black students, Hispanic students, students eligible for the federal school lunch program (a proxy for low-income status), students in special education (which the Florida Department of Education refers to as "exceptional education students"), and English learner students.

Results are also disaggregated based on whether students had passed both the reading and math portions of the prior year's Florida Comprehensive Assessment Test (FCAT), which

was given in grades 3–10 (box 2). Comparing results based on FCAT success allows for analysis of any differences in online course performance between higher and lower performing students. (See box 3 for a summary of the data, sample, and methods and appendix A for details.)

The results from this research are expected to inform discussions of online education for credit recovery at both the state and local levels. Considerable money and effort have been spent to increase the use of online courses and, in Florida, to mandate that students take them. Florida legislators and district leaders need information about the potential value of the courses in terms of content quality and student outcomes in order to better understand the consequences of the state's policies. They also need information to guide future implementation—for example, whether online courses are appropriate for different types of students. Even if students are successful on average, some student subgroups may not be as likely to succeed in online courses—especially important for credit recovery courses because they may be the final opportunity for students who have failed a course to graduate. Educators need to be able to recommend the options most likely to result in a successful outcome for that student or to provide support services when needed.

Florida legislators and district leaders need information about the potential value of online courses in terms of content quality and student outcomes in order to better understand the consequences of the state's policies

Box 2. Key terms

Course grade. The key outcome measure for this study. This is the only available outcome measure because end-of-course exams were not widely implemented during the years encompassed by this study. Despite Florida policies that require all courses, including online courses, to be based on the applicable state standards and graded on a standard 10-point scale, course grades necessarily retain elements of subjectivity.

For two-semester courses with two grades, this study used the grade for the first semester because it is most proximal to the failed course.

Course success and successful credit recovery. Defined for this study as earning a C or better. While "passing" a course requires only a grade of D, Florida high school graduation requires a 2.0 grade point average. In addition, students are eligible for grade forgiveness (see below) if they receive a grade of D. A grade of C was used as the cutoff to measure success in a course and in credit recovery because it reflects more stringent criteria for successful completion.

Credit recovery. Retaking a previously failed course required for graduation. For example, a student who needs English 1 to graduate, but fails the course, may retake English 1 at a later date to "recover" that credit. Credit recovery is distinct from grade replacement or forgiveness (see below).

Face-to-face courses. Courses taken in person in a traditional classroom setting.

Florida Comprehensive Assessment Test (FCAT). The FCAT is administered in the spring of grades 3–10 for reading and math. Results translate into achievement levels of 1–5, with levels 3 and above considered at grade level or "passing" for the purposes of these analyses. The FCAT results were collapsed into a single score where 1 means that the student has passed both the reading and math sections and 0 means that the student has failed one or more sections. The FCAT score used for each student was either the score from the year prior to the online course or, if the student was in grade 12, the grade 10 score.

(continued)

Box 2. Key terms *(continued)*

Grade replacement or forgiveness. Retaking a course that a student passes with a low grade, such as a D, to earn a higher grade.

Online courses or distance education courses. Defined by the Florida Department of Education (2015) as a course in which "instruction is delivered using distance learning technology in an interactive learning environment with some element of student control over time, place, path, and/or pace." For the purposes of this report, distance education courses and online courses are the same.

Online course identification. Used to identify all courses provided by a district virtual program or through the Florida Virtual School. Because the Florida Department of Education database does not contain an online course identifier for each year covered by the study, the state's master school identification number was used.

Credit recovery course identification. Process used to identify when a student retakes a course. Identifying a credit recovery course relied on the Florida Department of Education database field indicating whether a course was included or excluded from the high school transcript for graduation. The include/exclude flag is found in the transcript designator file. When a student first takes a course, it is designated as "include" for the final transcript. But if a student retakes a course, the first course is switched to "exclude," and the replacement course is included in the final transcript. A credit recovery course was defined as the second course if the first course had a grade of F and was excluded and if the second course was included. Because this method requires reviewing repeated courses, most often across years, and the transcript data begin with 2007/08, the credit recovery course analyses were limited to 2008/09–2010/11.

Box 3. Data, sample, and methods

Data. This study used Florida Department of Education data including a statewide dataset of de-identified transcripts for students taking high school courses for 2007/08–2010/11. The dataset included information on each course: the course name and number, grade, year and term, credit earned, and school of instruction. The department also provided demographic information on each student, including scores on the statewide reading and math assessments for students in grades 3–10 (see discussion of the FCAT in box 2).

Sample. This study presents results for the 20 most common academic courses from two samples. The first sample represents all high school courses taken between 2007/08 and 2010/11. Because this sample includes all courses, credit recovery and any other types of course are included. The second sample is a smaller one that includes only credit recovery courses (see appendix B).

Both samples were limited to a subset of the 20 most common academic courses to ensure that the grades used for defining course success (see box 2 for definition) come from similar courses. For example, including online grades from courses that were substantially different from the courses that face-to-face grades were from would introduce a potential source

(continued)

Box 3. Data, sample, and methods *(continued)*

of error. In addition, physical education and driver's education courses were excluded to focus the analyses on the kinds of academic courses targeted by credit recovery policies.

Methodology. The likelihood of a student earning a C or better was determined using a common statistical approach (logistic regression) to estimate the odds of an event occurring when that event has two possible outcomes—such as a student earning a C or better versus earning a D or F. The odds were then converted to a percentage chance of the event occurring. The same approach was used for the overall student population and then for five key subgroups—Black students, Hispanic students, students eligible for the federal school lunch program, students in special education, and English learner students (see appendix B for full results).

The difference in the likelihood of success between online and face-to-face courses was calculated using a dummy variable (a variable with two possible values: 0 for a face-to-face course and 1 for an online course). A positive coefficient for the dummy variable means that taking the course online increases the student's probability of earning a C or better, and a negative coefficient means that it decreases the probability of earning a C or better. See appendix A for details and appendix B for the estimated coefficients.

The findings are noted as statistically significant or not statistically significant. There is an unavoidable margin of error for all results. Although the margin of error is not explicitly indicated, when results are statistically significant, it is unlikely that they are due to random error. For the purposes of this study, a value of $p < .05$ is used to determine statistical significance, meaning there is a 5 percent or less chance of the results being due to random error.

In general academic courses students were more likely to earn a C or better in online courses than in face-to-face courses in grades 9–11

What the study found

In general academic courses students were more likely to earn a C or better in online courses than in face-to-face courses in grades 9–11. The differences were largest in grade 9 and shrank in each higher grade level. In grade 12 the differences were the smallest. The differences were also largest for students with prior-year FCAT scores below 3. The increase in the likelihood of success in online courses was larger for students with lower prior-year test scores than for students with higher prior-year test scores.

For students in most subgroups, the likelihood of receiving higher grades in general academic courses was higher in online courses than in face-to-face courses in grades 9–11, though differences diminished with each grade level. In grade 12 the online advantage disappeared or was negative (meaning that students would do better in face-to-face courses) for some subgroups (Black students with FCAT scores over 3, English learner students with FCAT scores less than 3, and students eligible for the federal school lunch program). Students eligible for the school lunch program were likely to do slightly better or the same in online courses as in face-to-face courses in grades 9–11, if their FCAT score was 3 or greater, but were more likely to do better in face-to-face courses than in online courses in grade 12.

In credit recovery courses students were more likely to succeed in online courses than in face-to-face courses in grades 9–11. Grade 9 students showed the largest difference in likely success rates (33–36 percentage points). The success gap narrowed in grades 10 and 11 and nearly disappeared in grade 12.

Students in all subgroups except English learner students were more likely to earn a C or better in online credit recovery courses than in face-to-face ones in grades 9–11. In grade 12 there were small or no differences for most subgroups.

In credit recovery courses students were more likely to succeed in online courses than in face-to-face courses in grades 9–11

English learner students were the only subgroup that did not show a positive difference in the likelihood of earning a C or better in online versus face-to-face courses for any grade level in either general academic courses or credit recovery courses.

The most common online courses included such traditional academic courses as Spanish, English, history, and math

This report focuses on traditional academic high school courses. While such courses were among the most common online courses, nonacademic courses such as driver's education and physical education accounted for five of the six most common courses (see box 3 for a description of how courses were categorized and appendix B for counts of all courses). Those nonacademic courses were excluded from the analyses since they are not the focus of credit recovery policies. The 20 most common online courses included in the analyses are presented in table 2.

Table 2. Enrollment in the 20 most common online academic courses in Florida, 2007/08–2010/11

Course	2007/08	2008/09	2009/10	2010/11	Total, 2007/08–2010/11
Spanish 1	3,458	4,578	5,126	6,857	20,019
Spanish 2	2,490	3,204	3,671	4,572	13,937
Geometry	2,655	2,843	3,474	4,818	13,790
English 1	2,922	3,317	3,292	3,761	13,292
World History	2,346	2,847	3,136	4,008	12,337
English 3	2,287	2,837	3,029	3,920	12,073
U.S. History	2,353	2,826	2,918	3,826	11,923
English 2	2,052	2,547	2,646	3,340	10,585
Algebra 2	1,843	2,192	2,666	3,861	10,562
Algebra 1	2,987	3,567	3,925	[a]	10,479
Economics	2,507	2,445	2,170	3,003	10,125
Biology 1	2,100	2,277	2,427	3,158	9,962
American Government	2,043	2,359	2,283	3,198	9,883
Computing for College and Careers	2,174	2,284	2,422	2,404	9,284
English 4	1,799	1,956	2,012	2,457	8,224
Earth and Space Science	1,685	1,956	2,159	2,418	8,218
Liberal Arts Math	798	939	1,773	3,527	7,037
Algebra 2 Honors	994	989	1,454	2,159	5,596
Critical Thinking and Study Skills	1,474	966	1,200	1,491	5,131
Chemistry 1	1,027	1,207	1,361	1,509	5,104
Total for 20 most common online academic courses	41,994	48,136	53,144	64,287	207,561

a. Excluded in 2010/11 because the course grading was changed to include results from an end-of-course exam.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Students taking online courses were demographically different from students not taking online courses

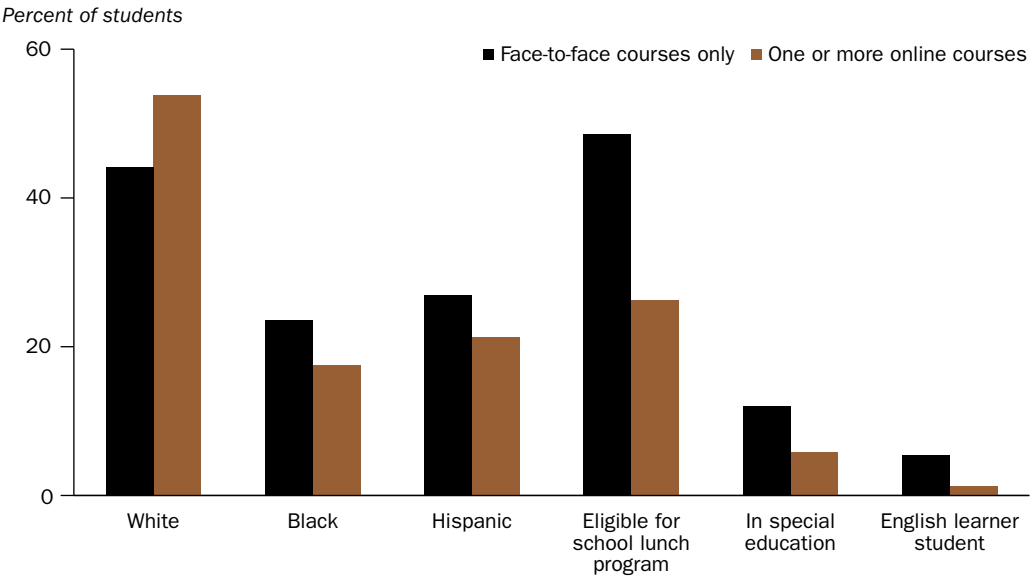
Because online enrollment reflects a choice on the part of students and their advisors, students who enroll in online courses may differ from those who do not. Some of these differences, such as motivation, technological confidence, and self-regulatory skills cannot be measured with the available data. Demographic differences, however, can be measured. Students who enrolled in one or more online courses were more likely to be White and less likely to be Black or Hispanic compared with students who took only face-to-face courses. Students taking online courses were also less likely to be eligible for the school lunch program and less likely to be in special education or to be English learner students (figure 1).

In addition, the percentage of students scoring 3 or higher on the prior year's FCAT (see box 2) was higher for students selecting online courses than for students taking only face-to-face courses, both overall and within the same demographic subgroups (figure 2; see appendix B for additional years of data). These results suggest that students who either independently selected online courses or were counseled to take them tended be somewhat higher performing on the FCAT than students who only took face-to-face courses.

Students who enrolled in one or more online courses were more likely to be White and less likely to be Black or Hispanic compared with students who took only face-to-face courses

Some of the differences shown in figures 1 and 2, particularly prior-year FCAT scores, are likely to be related to a student's chances of earning a C or better. For example, students with higher FCAT scores are probably also more likely to earn higher grades. That students taking online courses were more likely to pass the FCAT should be taken into

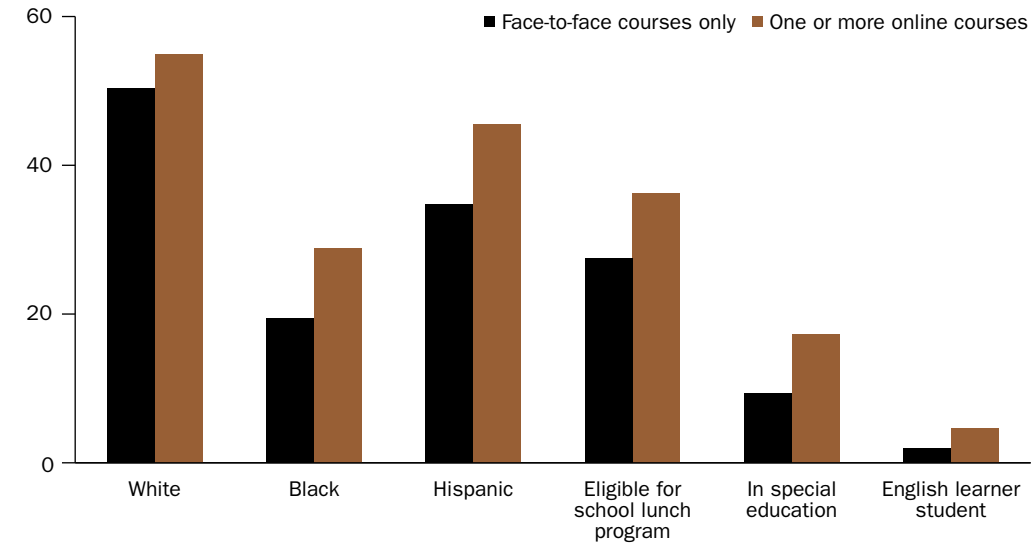
Figure 1. Students who took online courses were demographically different from those who did not, 2010/11



Note: The bars reflect the percentage of students in each category—those who took one or more online courses and those who took only face-to-face courses. The taller bar for White students who took one or more online courses indicates that among White students a larger percentage took online courses than took face-to-face courses; among the other subgroups a larger percentage took face-to-face courses than online courses. All differences are statistically significant.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Figure 2. Students who took online courses typically performed higher on the prior year's Florida Comprehensive Assessment Test than those who did not, 2010/11 (percent of students scoring 3 or higher)



Note: Scores of 3 or higher on the Florida Comprehensive Assessment Test (FCAT) are considered on grade level or "passing" for the purposes of these analyses. The bars reflect the percentage of students in each category who passed the FCAT—those who took one or more online courses and those who took only face-to-face courses. The taller bar for White students who took one or more online courses indicates that among White students pass rates on the FCAT were higher for students who took online courses than for students who took face-to-face courses; the same held true for all student subgroups. All differences are statistically significant.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

The percentage of students scoring 3 or higher on the prior year's Florida Comprehensive Assessment Test was higher for students selecting online courses than for students taking only face-to-face courses, both overall and within the same demographic subgroups

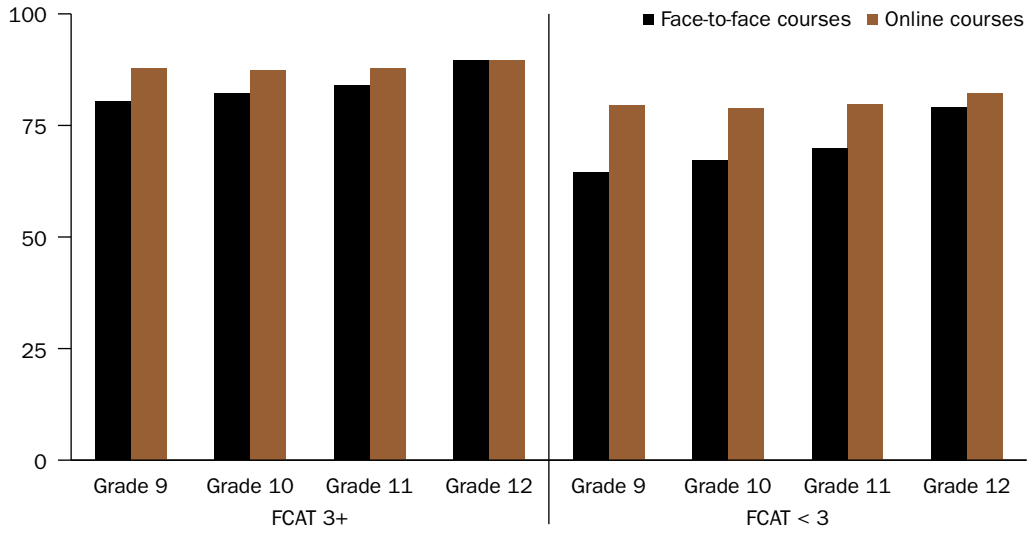
account in comparing face-to-face and online outcomes. The above factors were statistically controlled for in the following analyses, and each subgroup was analyzed separately to make it easier to see how individual subgroups performed in online courses compared with face-to-face courses.

For the 20 most common online academic courses, the likelihood of earning a C or better was higher when the student took the course online instead of face to face

Three patterns were found in the results shown in figure 3. First, except for grade 12 students with prior-year FCAT scores of 3 or higher, students taking online courses had a higher probability of earning a C or better than students taking the same courses face to face. Among students with an FCAT score of 3 or higher, the likelihood of success online compared with face to face was 7.3 percentage points higher in grade 9, 5.2 percentage points higher in grade 10, and 3.9 percentage points higher in grade 11. In grade 12 the difference was negative, –0.1 percentage point, meaning that the predicted likelihood of earning a C or better was slightly higher in face-to-face than in online classes. The difference was statistically significant, meaning that it was not likely due to chance, but very small, indicating little substantive difference from a policy perspective. Among students who scored less than 3 on the FCAT, the differences in the likelihood of success between online and face-to-face courses were even larger: 14.9 percentage points in grade 9, declining to 3.1 percentage points in grade 12.

Figure 3. Students taking one of the 20 most common online academic courses generally had a higher likelihood of earning a C or better than students taking one of these courses face to face, 2010/11

Predicted likelihood of earning a C or better (percent)



Note: FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test (FCAT), which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT. All differences are statistically significant. This figure uses results from the most recent year of data (2010/11), which were consistent with the results across all years.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Among students with an FCAT score of 3 or higher, the likelihood of success online compared with face to face was 7.3 percentage points higher in grade 9, 5.2 percentage points higher in grade 10, and 3.9 percentage points higher in grade 11

Second, students with lower FCAT scores tended to have lower probabilities of earning a C or better, whether in face-to-face or in online courses.

Third, probabilities of success increased at each grade level, especially for face-to-face course students. For example, face-to-face course students with FCAT scores of 3 or higher had a predicted likelihood of earning a C or better that ranged from 80.4 percent in grade 9 to 89.5 percent in grade 12. Similarly, face-to-face course students with FCAT scores below 3 had predicted likelihoods of earning a C or better that ranged from 64.5 percent in grade 9 to 79.1 percent in grade 12 (see appendix B for more information).

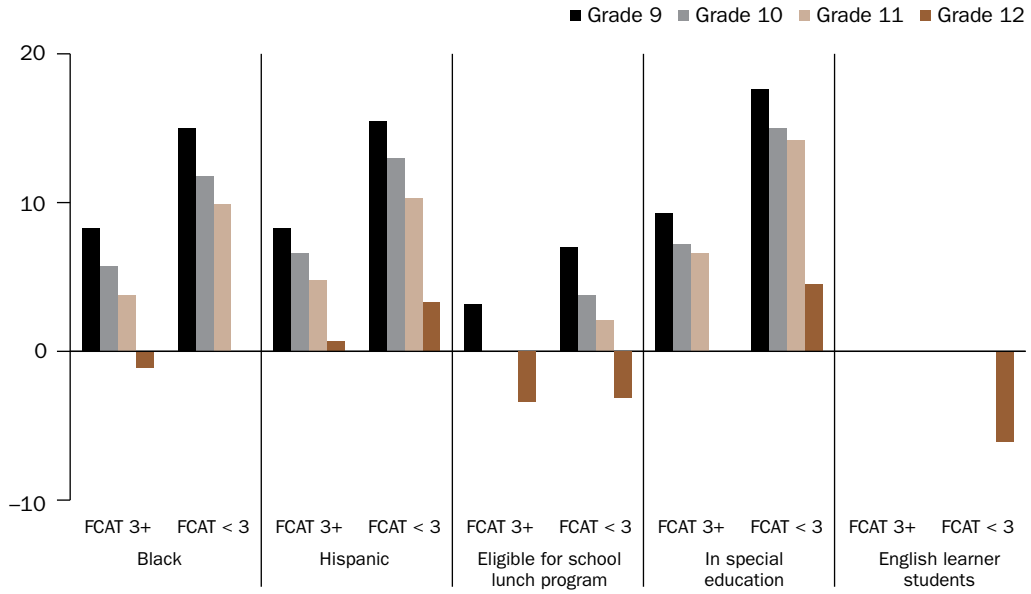
The likelihood of earning a C or better in an online course was equal to or higher than that likelihood in a face-to-face course for most subgroups

Results were also analyzed separately for Black students, Hispanic students, students eligible for the school lunch program, students in special education, and English learner students (see appendix B for more subgroup-specific graphs and details).

For most subgroups, the likelihood of earning a C or better was higher in an online course than in a face-to-face course, as shown by a positive difference between online and face-to-face courses in figure 4 (and evidenced by the positive coefficients for online courses in appendix B). Exceptions were in grade 12 and among English learner students. However, the differences grew smaller in higher grade levels (see appendix B), and some differences emerged across subgroups. The pattern for each subgroup and whether each comparison is statistically significant are shown in figure 4.

Figure 4. Most subgroups had a higher likelihood of earning a C or better in online courses than in face-to-face courses, 2010/11

Difference in predicted likelihood of earning a C or better between online and face-to-face courses (percentage points)



Note: Results that are not statistically significant are not displayed. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT. The bars represent the difference in predicted likelihood of success between online and face-to-face courses, where a positive difference means the chances of earning a C or better were higher in online courses. This figure uses results from the most recent year of data (2010/11), which were consistent with the results across all years.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

For Black students, success rates were higher in online courses than in face-to-face courses for grades 9–11, and the differences were statistically significant

The analyses also showed that:

- For Black students, success rates were higher in online courses than in face-to-face courses for grades 9–11, and the differences were statistically significant. In grade 12, students scoring 3 or higher on the FCAT performed worse in online courses than in face-to-face courses. Grade 12 students scoring less than 3 on the FCAT had an equal likelihood of earning a C or better in online and face-to-face courses.
- For Hispanic students, success rates were higher in online courses than in face-to-face courses, and the differences were statistically significant in every grade level, though the difference was much smaller in grade 12.
- Among students eligible for the school lunch program with FCAT scores of 3 or higher, only grade 9 students showed a positive and statistically significant difference in the rate of earning a C or better in online courses compared with face-to-face classes; grade 12 students showed a statistically significant lower success rate in online courses than in face-to-face courses. For students scoring less than 3 on the FCAT, the success rates in grades 9–11 were higher in online than in face-to-face courses, and the differences were statistically significant. In grade 12 the difference was negative and statistically significant, meaning that the probability of earning a C or better was lower in online than in face-to-face courses.
- Students in special education had a statistically significant higher likelihood of success in online courses in every case except grade 12 students who scored 3 or higher on the FCAT; their likelihood of earning a C or better was the same in online and face-to-face courses.

- English learner students had the most distinct pattern of results. Students scoring 3 or higher on the FCAT showed no difference between online and face-to-face course outcomes. Students with FCAT scores below 3 in grades 9–11 also showed no differences. However, grade 12 students who had not passed the FCAT had a statistically significant 6.1 percent lower likelihood of earning a C or better in online courses compared with face-to-face courses.

Students who attempted credit recovery online had higher likelihoods of earning a C or better than those taking the same courses face to face

The previous analysis used a sample of students taking all academic courses, including both credit recovery courses and courses not used for credit recovery (see boxes 2 and 3 for definitions and details). To examine the differences in online and face-to-face courses for credit recovery in greater depth, a separate analysis was conducted. The 20 most common online academic courses taken for credit recovery were identified, and the face-to-face course sample was limited to these courses to ensure that grades for similar courses were being compared (table 3).

Table 3. Enrollment in the 20 most common online credit recovery courses in Florida, 2007/08–2010/11

Course	2007/08	2008/09	2009/10	2010/11	Total, 2007/08–2010/11
English 1	32	273	397	501	1,203
Geometry	30	172	345	478	1,025
Biology 1	24	225	260	347	856
English 2	20	171	274	385	850
Algebra 2	10	117	232	364	723
World History	16	116	234	356	722
English 3	18	173	215	279	685
Algebra 1	33	250	366	[a]	649
U.S. History	13	140	140	206	499
Spanish 1	7	67	130	200	404
Chemistry 1	9	69	107	112	297
Algebra 2 Honors	10	48	69	167	294
Spanish 2 Honors	14	61	100	102	277
Biology 1 Honors	3	29	59	111	202
Liberal Arts Math	4	24	56	101	185
Chemistry 1 Honors	3	30	62	87	182
Geometry Honors	1	22	47	89	159
English 1 Honors	8	23	46	69	146
English 2 Honors	4	26	43	63	136
Earth and Space Science	0	17	54	46	117
Total for 20 most common online credit recovery courses	259	2,053	3,236	4,063	9,611

a. Excluded in 2010/11 because the course grading was changed to include results from an end-of-course exam.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Students taking one of the 20 most common online credit recovery courses had a much higher likelihood of earning a C or better than students taking the same courses face to face (figure 5).

As with the sample of all courses described in the last section, the likelihood of earning a C or better increased by grade level for face-to-face courses, where success rates climbed from lows around 60 percent for grade 9 to highs around 90 percent for grade 12. In contrast, the likelihood of earning a C or better in online courses was stable in the 94–96 percent range across grade levels. Thus the success gap between online and face-to-face courses was 36.6 percentage points in grade 9, the largest difference found in the study, falling to 4.3 percentage points in grade 12. These differences were statistically significant and positive across all grades and years.

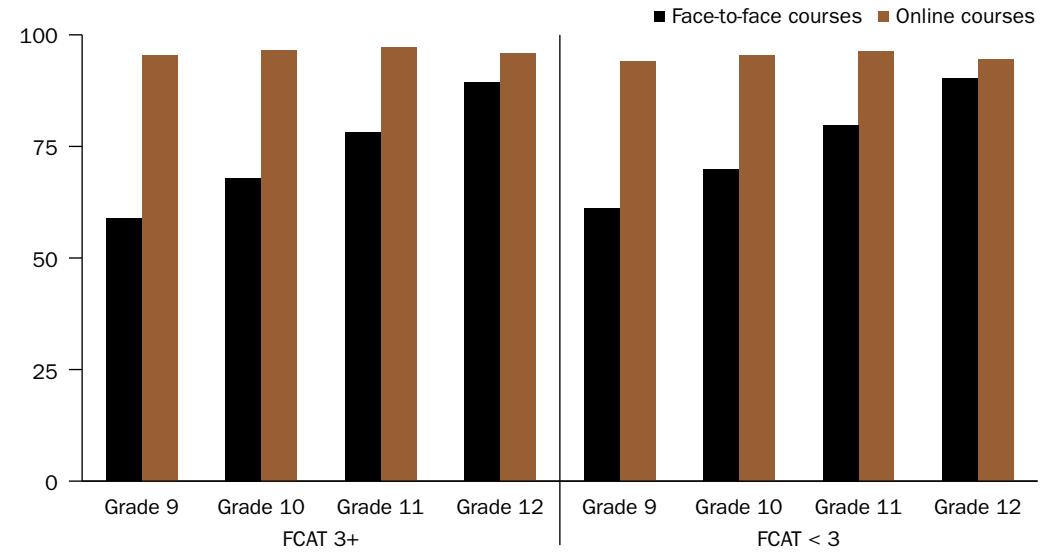
Prior-year FCAT success was not as strongly related to grades in credit recovery courses as it was in the sample of all courses. The difference between the likelihood of earning a C or better for students who had scored a 3 or higher on the FCAT and those scoring below a 3 differed by only 2–3 percentage points. Although this difference was statistically significant (meaning that it was not likely due to chance), it was relatively small, indicating little substantive difference from a policy perspective.

The success gap between online and face-to-face credit recovery courses was 36.6 percentage points in grade 9, the largest difference found in the study, falling to 4.3 percentage points in grade 12

Among student subgroups, performance in credit recovery online courses differs only for English learner students

All student subgroups other than English learner students showed a higher likelihood of earning a C or better in online credit recovery courses than in face-to-face courses.

Figure 5. Students taking one of the 20 most common online credit recovery courses online had a higher likelihood of earning a C or better, 2010/11



Note: FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT. All differences are statistically significant. This figure uses results from the most recent year of data (2010/11), which were consistent with the results across all years.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

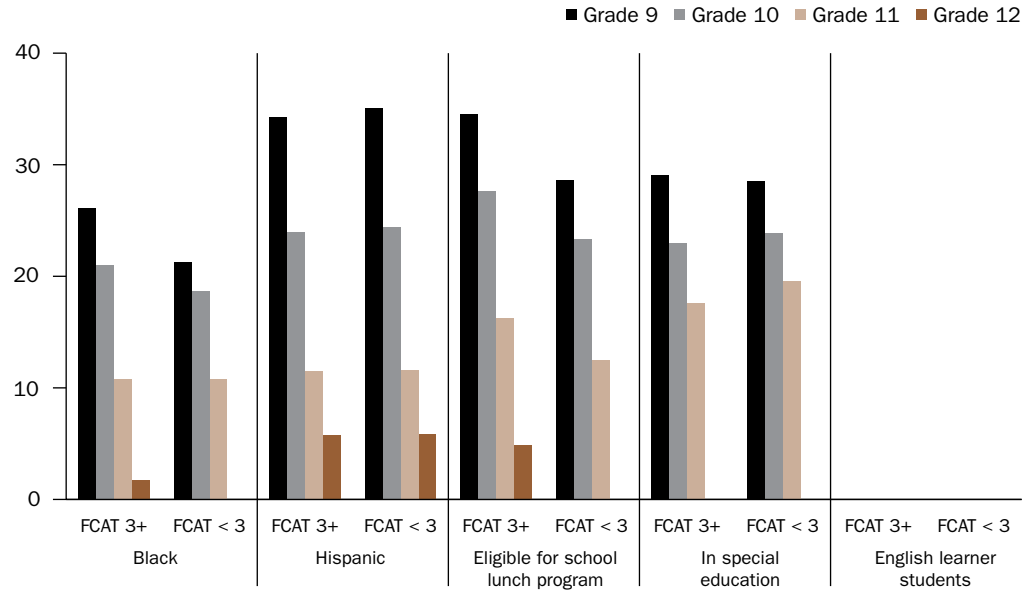
English learner students' success rates in online and face-to-face credit recovery courses were not significantly different (figure 6), meaning that they were about as likely to earn a C or better in an online course as a face-to-face course. This finding mirrors the result for English learner students in grades 9–11 in general courses (see figure 4). In all, English learner students consistently evidenced a different pattern from other subgroups, generally having similar predicted likelihoods of success online and face to face where other subgroups tended to perform better online. Future research should examine this more closely.

A similar pattern repeated for the other subgroups; there was always a higher likelihood of success in online recovery courses than in the sample of all courses, but the difference declined at higher grade levels. In a few cases, the differences were not significant. Specifically, grade 12 Black students and students eligible for the school lunch program scoring less than 3 on the FCAT and grade 12 students in special education (regardless of FCAT score) showed no difference in predicted likelihood of earning a C or better in online courses than in face-to-face recovery courses. For the other subgroups (except for English learner students), the success gap between online and face-to-face courses was 21–36 percentage points in grade 9, dropping to 2–6 percentage points in grade 12.

English learner students consistently evidenced a different pattern from other subgroups, generally having similar predicted likelihoods of success online and face to face where other subgroups tended to perform better online

Figure 6. For every subgroup except English learner students, the likelihood of earning a C or better in recovery courses online was higher than in face-to-face courses, 2010/11

Difference in predicted likelihood of earning a C or better between online and face-to-face courses (percentage points)



Note: Results that are not statistically significant are not displayed. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. The bars represent the difference in predicted likelihood of success between online and face-to-face courses, where a positive difference means the chances of earning a C or better were higher in online courses. This figure uses results from the most recent year of data (2010/11), which were consistent with the results across all years.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Limitations of the study and next steps

It is critical to note that this study does not provide causal evidence that online learning is better than face-to-face instruction. The study design does not allow for causal inferences and none should be made on the basis of these results. It is possible that students who choose to enroll in online courses or whose advisors recommend online courses have differences that could affect their chances of earning a C or better. It is clear, for example, that students who took online courses were demographically different from those who did not. While demographics were taken into account in these models, it is possible that the students differ in other ways not captured in this study, such as being more self-motivated or better at self-regulation. Such differences are not measurable in the available data but could contribute to the observed differences in success rates.

Another limitation is that this analysis was conducted at the student level and did not attempt to cluster students into multiple levels based, for example, on shared teachers or shared schools/virtual programs. A multilevel modeling approach might be considered as part of a more causal research design.

In addition, the rigor of these courses and the level of student learning cannot be measured with the available data. Course grades themselves are inherently subjective and are not a direct measure of student learning because of the absence of an objective assessment. The majority of the online courses in these analyses came from the Florida Virtual School, and the results may not be applicable to other online settings. Finally, the administrative data did not explicitly identify online courses or credit recovery courses, and the process of identifying that data could have introduced errors or omissions.

The results presented in this analysis do, however, lay the groundwork for additional study. Future research could focus on courses with end-of-course exams to better compare levels of face-to-face and online student learning. Additional research is also needed to look more closely at performance among different student groups. Why do English learner students respond differently to online instruction? Is it a function of language literacy or something else? Are there other groups of students, perhaps not identifiable by a demographic characteristic, who are less suited to online instruction? What supports might be needed for students who are less prepared for online instruction? Are there academic or self-regulatory skills that lend themselves differently to success in an online environment? Finally, research designs that provide stronger causal connections would greatly add to the strength of the research base on this topic.

The results presented in this analysis lay the groundwork for additional study. Future research could focus on courses with end-of-course exams to better compare levels of face-to-face and online student learning

Appendix A. Data and methodology

This appendix provides details on the data sources and the study methodology.

Data

The data for these analyses were provided by the Florida Department of Education (FLDOE) through its Education Data Warehouse (EDW). The EDW provided a statewide dataset of de-identified transcripts for students taking high school courses in 2006/07–2010/11. The dataset included information on each course: the course name and number, grade, year and term, credit earned, and school of instruction. The FLDOE also provided demographic and academic information on each student, including scores on the statewide reading and math assessments. Specifically, the EDW provided the following data files:

- Student demographics.
- Whether student is in special education.
- Florida Comprehensive Assessment Test (FCAT) scores.
- Transcript table.
- Transcript designator.
- Course record.
- Institution/school.

Methodology

Identifying online courses. The FLDOE administrative database does not contain an online course identifier for each of the years covered by the study. However, the state's master school identification number (MSID) was used to identify all courses provided by a district virtual program or through the Florida Virtual School. The MSID, which is found in the institution file, is a six-digit number in which the first two digits denote the school district and the last four digits denote the specific school. The Florida Virtual School is designated as school district 71 so all of its courses start with "71" as in 71xxxx. The district virtual school program courses are given "school codes" of 7001, 7004, 7006, or 7023. A course from those programs would end with one of those school codes as in xx7001, xx7004, xx7006, or xx7023. All courses identified by these numbers were coded as online and became the population for the online course analyses.

These identification numbers were created to track legislatively mandated virtual programs offered by districts or third-party providers. A virtual program is a systematic collection of online course offerings, typically covering a number of courses. Prior to creation of a virtual program identified through an MSID, a district may have offered individual online courses. However, this is unlikely because there was no legislative mandate or funding mechanism for such courses and the Florida Virtual School was created largely to provide that service. The number of previously created courses would likely be very small. Thus, the MSIDs are the most appropriate and only feasible way to identify the online courses for the period of this study.

Identifying credit recovery courses. Identifying a credit recovery course relied on a FLDOE database field that reports whether a course is included or excluded from the high school transcript for graduation purposes. The include/exclude flag is found on the transcript designator file. When a student takes and passes a course, the course is designated as "include"

for the final transcript. When a student fails a course and then retakes it, the first course is "excluded" and the second course is included in the final transcript. This can happen for credit recovery or for grade replacement where a student is simply seeking a higher grade. Therefore, credit recovery courses are identified as repeated courses where the first course had a grade of F; in this case, the first course was excluded and the second was included. Because credit recovery requires repeating courses and because the transcript data begin in 2007/08, the credit recovery course analyses are limited to 2008/09–2010/11.

Definition of course success. Success in a course is defined as earning a C or better. While "passing" a course requires only a grade of D, Florida high school graduation requires a 2.0 grade point average. Students are eligible to retake a course for a higher grade if they receive a grade of F or D. The grade of C, therefore, is used as the cutoff because a grade of C reflects more stringent criteria for successful completion.

Determination of course grade. Many courses are two semesters long and thus have two grades. The analyses used the first grade (or first semester) as the outcome for the course because it is most proximal to the failed courses.

Sample. This study presents results for the 20 most common academic courses from two samples. The first sample represents all high school courses taken between 2007/08 and 2010/11. This sample includes both credit recovery courses and other academic courses. The sample of all courses includes about 4,000–4,500 face-to-face courses each year while the number of online courses ranges from 223 to 328 and grew each year (table A1). Five common but nonacademic courses in physical education and driver's education were eliminated from this sample to focus on comparing academic courses.

The second sample includes only credit recovery courses and is much smaller. Because credit recovery courses take place after the student fails a prior course, there were very few such courses in 2007/08 and they were removed from the analyses.

The analyses were limited to a subset of the most common courses to ensure that the grades used for defining course success came from similar courses. Using online grades from courses that were substantially different from the courses that face-to-face grades were from would introduce a potential source of error.

Table A1. Count of students and courses in analyses

	All courses			Credit recovery courses		
School year	Total enrollment	Face-to-face courses	Online courses	Total enrollment	Face-to-face courses	Online courses
2007/08	879,166	4,084	223	—	—	—
2008/09	871,797	4,258	225	39,251	618	57
2009/10	867,494	4,434	299	45,983	672	73
2010/11	845,933	4,488	328	41,065	635	70

— is not available because transcript data begin in 2007/08.

Note: Because students can be in more than one course, the table presents the total number of students in the analyses—not the number in each group of courses.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

FCAT scores. The FCAT is given in reading and math in the spring of grades 3–10. Scores on the FCAT take several forms. There is a scale score, a developmental scale score, and an achievement level. The scale score ranges from 100–500 for each grade. The developmental scale score is designed to measure growth from grade to grade. Both of these scores translate into achievement levels that range from 1 to 5; scores of 3 and above are considered on grade level or "passing" for the purposes of these analyses. The FCAT scores were collapsed into a single score where 1 = student has passed both the reading and math sections and 0 = the student has failed one or more sections. This was done to facilitate reporting the results for differential FCAT performance. The FCAT score used for each student is either the prior-year score or, if the student is in grades 11 or 12, his or her grade 10 score.

Analyses. The main results presented the percentage chances of earning a C or better in a course. These results were calculated from the odds produced by logistic regression models. Logistic regression produces a predicted probability of an event occurring for each case or student in the data based on the predictor variables.

In these analyses a dummy variable was used to indicate whether a student took the course online or face to face. Online was coded as 1, and face to face was coded as 0, so a positive coefficient for that dummy variable indicates that the predicted probability of a student earning a C or better was higher online than face to face (see appendix B for full results). The same models were run for the overall student population and then for five key subgroups: Black students, Hispanic students, students eligible for the school lunch program, students in special education, and English learner students.

The basic models also included several control variables. First, each academic year was dummy-coded with the first academic year as the reference group. This made it possible to produce a percent chance of earning a C or better for each year and to track trends over time. Second, each grade level was dummy-coded with grade 9 as the reference group. Third, the FCAT passing dummy variable was included. Finally, interaction terms for the online variable of interest and the other control variables were used to make it possible to generate contrasts testing whether differences in specific grades or years were statistically significant. See appendix B for the contrast results.

For the analyses of all courses, no other control variables were included. For the analyses of credit recovery courses, an additional dummy code was included to reflect whether the failed course was taken online. For the purposes of this study, only chances of earning a C or better for students who did not initially fail online are included.

A threshold of $p < 0.05$ was used in all analyses to determine statistical significance. The standard errors were not clustered at any level and the variances were assumed to be equal across levels.

Missing data. Some students were missing FCAT scores in reading or math. When data are missing on a key variable like FCAT scores, rather than discard those cases (students) it is possible to "impute" the missing data. Imputation is a process of filling in the missing data with plausible values generated from analyzing students with complete data. In this case, academic year, grade level, earning a grade C or higher, and demographic variables, including ethnicity, eligibility for the school lunch program, English learner student status,

and special education status, were used. Those variables were used to predict FCAT scores that could then be validated against students with FCAT scores to ensure the predictions are reasonable. The imputation method used was Markov Chain Monte Carlo (Enders, 2010). Using the variables above generated 10 imputations, and the imputed data set had 391,610,760 (39,161,076 × 10) observations.

Appendix B. Detailed results

This appendix lists the courses included in the two samples of all courses and credit recovery courses and the demographic differences and Florida Comprehensive Assessment Test (FCAT) score differences among students who took online versus face-to-face courses. Figures display the chance of earning a C or better in online and face-to-face courses for various groups and subgroups of students for each grade over four years. Logistic regression coefficients and contrast results are given for results in each figure.

Table B1. The 25 most commonly taken online courses with total enrollment, 2007/08–2010/11, and cumulative percentage

Course	Total enrollment 2007/08–2010/11	Cumulative percentage of all online enrollments for courses included in the analyses
Personal Fitness	27,170	na
Driver's Education	26,822	na
Spanish 1	20,019	6.7
Fitness Lifestyle Design	19,048	na
Health—Life Management Skills	17,020	na
Health Opportunities through Physical Education	14,370	na
Spanish 2	13,937	11.3
Geometry	13,790	15.9
English 1	13,292	20.4
World History	12,337	24.5
English 3	12,073	28.5
U.S. History	11,923	32.5
English 2	10,585	36.1
Algebra 2	10,562	39.6
Algebra 1[a]	10,479	43.1
Economics	10,125	46.5
Biology 1	9,962	49.8
American Government	9,883	53.1
Computing for College and Careers	9,284	56.2
English 4	8,224	58.9
Earth and Space Science	8,218	61.7
Liberal Arts Math	7,037	64.0
Algebra 2 Honors	5,596	65.9
Critical Thinking and Study Skills	5,131	67.6
Chemistry 1	5,104	69.3

na is not applicable, because these course were excluded from the analyses.

Note: Entries in bold were included in the analyses.

a. Excluded in 2010/11 because the course grade was changed to include results from an end-of-course exam.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B2. The 20 most commonly taken online credit recovery courses with total enrollment, 2007/08–2010/11, and cumulative percentage

Course	Total enrollment	Cumulative percentage of all online enrollments for courses included in the analyses
English 1	1,203	11.1
Geometry	1,025	20.5
Biology 1	856	28.4
English 2	850	36.2
Algebra 2	723	42.8
World History	722	49.5
English 3	685	55.8
Algebra 1[a]	649	61.8
U.S. History	499	66.4
Spanish 1	404	70.1
Chemistry 1	297	72.8
Algebra 2 Honors	294	75.5
Spanish 2 Honors	277	78.1
Biology 1 Honors	202	79.9
Liberal Arts Math	185	81.6
Chemistry 1 Honors	182	83.3
Geometry Honors	159	84.8
English 1 Honors	146	86.1
English 2 Honors	136	87.3
Earth and Space Science	117	88.4

Note: These are the courses included in the credit recovery course sample analyses.

a. Excluded in 2010/11 because the course grade was changed to include results from an end-of-course exam.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B3. Demographic characteristics of students who took online courses and those who did not, 2007/08–2010/11 (percent)

School year and student characteristics	Face-to-face course only	One or more online courses	Difference (online minus face to face)
2007/08			
White students	46.8	61.4	14.6
Black students	24.3	14.2	–10.1
Hispanic students	23.9	16.1	–7.8
Other students	5.0	8.4	3.4
Not eligible for school lunch program	63.6	83.0	19.4
Eligible for school lunch program	36.5	17.0	–19.5
Not in special education	89.1	94.6	5.5
In special education	10.9	5.4	–5.5
Not an English learner student	94.5	98.5	4.0
English learner student	5.5	1.5	–4.0
2008/09			
White students	46.6	57.7	11.1
Black students	24.0	16.2	–7.8
Hispanic students	24.1	17.7	–6.4
Other students	5.4	8.4	3.0
Not eligible for school lunch program	59.2	78.5	19.3
Eligible for school lunch program	40.8	21.6	–19.2
Not in special education	87.7	94.3	6.6
In special education	12.3	5.7	–6.6
Not an English learner student	94.7	98.5	3.8
English learner student	5.3	1.5	–3.8
2009/10			
White students	45.6	55.8	10.2
Black students	23.9	17.1	–6.8
Hispanic students	25.1	18.6	–6.5
Other students	5.4	8.5	3.1
Not eligible for school lunch program	54.2	75.5	21.3
Eligible for school lunch program	45.8	24.5	–21.3
Not in special education	87.9	94.1	6.2
In special education	12.1	5.9	–6.2
Not an English learner student	94.6	98.6	4.0
English learner student	5.4	1.4	–4.0
2010/11			
White students	44.2	53.8	9.6
Black students	23.6	17.5	–6.1
Hispanic students	26.9	21.3	–5.6
Other students	5.3	7.4	2.1
Not eligible for school lunch program	51.4	73.7	22.3
Eligible for school lunch program	48.6	26.3	–22.3
Not in special education	88.0	94.1	6.1
In special education	12.0	5.9	–6.1
Not an English learner student	94.6	98.7	4.1
English learner student	5.4	1.3	–4.1

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B4. Percent of students scoring 3 or higher on the Florida Comprehensive Assessment Test who took online courses and those who did not, 2007/08–2010/11

Student characteristics	Face-to-face courses only	One or more online courses	Difference (online minus face to face)
2007/08			
White students	43.9	47.9	4.0
Black students	15.2	24.0	8.8
Hispanic students	26.3	35.7	9.4
Other students	42.7	47.7	5.0
Not eligible for school lunch program	39.9	45.4	5.5
Eligible for school lunch program	20.2	28.7	8.5
Not in special education	35.9	44.2	8.3
In special education	6.9	13.3	6.4
Not an English learner student	34.5	43.1	8.6
English learner student	2.3	8.0	5.7
All students	32.8	42.6	9.8
2008/09			
White students	49.1	55.5	6.4
Black students	17.9	28.2	10.3
Hispanic students	30.4	42.0	11.6
Other students	47.3	54.1	6.8
Not eligible for school lunch program	46.0	52.3	6.3
Eligible for school lunch program	24.0	34.8	10.8
Not in special education	41.2	50.5	9.3
In special education	7.5	16.8	9.3
Not an English learner student	39.0	49.2	10.2
English learner student	2.6	6.5	3.9
All students	37.0	48.5	11.5
2009/10			
White students	50.2	55.3	5.1
Black students	18.9	29.2	10.3
Hispanic students	32.6	43.9	11.3
Other students	48.1	55.7	7.6
Not eligible for school lunch program	48.4	53.0	4.6
Eligible for school lunch program	26.1	35.8	9.7
Not in special education	42.3	50.7	8.4
In special education	8.4	17.1	8.7
Not an English learner student	40.3	49.4	9.1
English learner student	1.8	5.0	5.1
All students	38.2	48.7	10.5
2010/11			
White students	50.3	54.9	4.6
Black students	19.4	28.8	9.4
Hispanic students	34.7	45.5	10.8
Other students	49.4	57.5	8.1
Not eligible for school lunch program	49.4	52.9	3.5
Eligible for school lunch program	27.5	36.3	8.8

(continued)

Table B4. Percent of students scoring 3 or higher on the Florida Comprehensive Assessment Test who took online courses and those who did not, 2007/08–2010/11 *(continued)*

Student characteristics	Face-to-face courses only	One or more online courses	Difference (online minus face to face)
Not in special education	42.8	50.5	7.7
In special education	9.4	17.3	7.9
Not an English learner student	40.9	49.1	8.2
English learner student	1.9	4.6	2.7
All students	38.1	48.5	9.7

Note: Scores on the FCAT translate into achievement levels ranging from 1 to 5, with 3 and above considered on grade level or "passing" for the purposes of these analyses. All differences are statistically significant.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B5. Logistic regression coefficients for all courses, all students

Variable	Parameter estimate	Standard error
Intercept	0.5371***	0.0018
2008/09	–0.0047*	0.0019
2009/10	0.0359***	0.0019
2010/11	0.0587***	0.0019
Grade 10	0.1156***	0.0018
Grade 11	0.2438***	0.0019
Grade 12	0.7373***	0.0022
Online course	0.8439***	0.0183
Passed FCAT[a]	0.8137***	0.0017
Year*online course interaction 2008/09	0.0370*	0.0159
Year*online course interaction 2009/10	0.0083	0.0157
Year*online course interaction 2010/11	–0.0893***	0.0149
Grade 10*online course interaction	–0.1475***	0.0183
Grade 11*online course interaction	–0.2265***	0.0176
Grade 12*online course interaction	–0.5592***	0.0176
Passed FCAT[a]*online course interaction	–0.2039***	0.0118

* Significant at $p < .05$, *** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test.

Note: Number of cases (course records) = 11,783,461.

a. Scores of 3 and above are considered on grade level or "passing" for the purposes of these analyses.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B6. Contrast results for online and face-to-face courses for all courses, all students

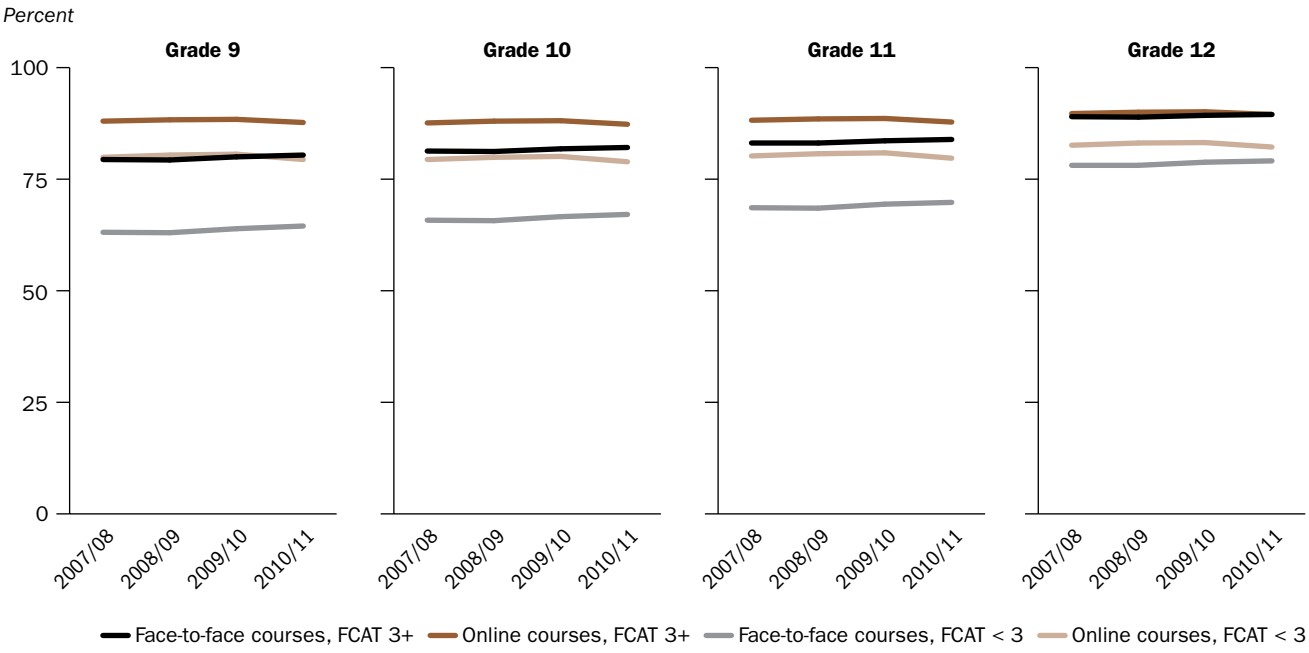
Variable	Parameter estimate	Standard error
FCAT 3+		
Grade 9	0.6400***	0.0197
Grade 10	0.4925***	0.0171
Grade 11	0.4135***	0.0167
Grade 12	0.0807***	0.0167
FCAT < 3		
Grade 9	0.8439***	0.0183
Grade 10	0.6964***	0.0152
Grade 11	0.6174***	0.0142
Grade 12	0.2846***	0.0141

*** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Figure B1. Percent chances of earning a C or better in all courses, all students



FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B7. Logistic regression coefficients for all courses, Black students

Variable	Parameter estimate	Standard error
Intercept	0.3462***	0.0032
2008/09	0.0265***	0.0035
2009/10	0.0958***	0.0035
2010/11	0.1177***	0.0036
Grade 10	0.1691***	0.0033
Grade 11	0.3871***	0.0035
Grade 12	0.9188***	0.0041
Online course	0.6866***	0.0450
Passed FCAT[a]	0.8156***	0.0043
Year*online course interaction 2008/09	0.0461	0.0365
Year*online course interaction 2009/10	0.1177**	0.0366
Year*online course interaction 2010/11	0.0032	0.0347
Grade 10*online course interaction	–0.1558**	0.0456
Grade 11*online course interaction	–0.2587***	0.0434
Grade 12*online course interaction	–0.6972***	0.0429
Passed FCAT[a]*online course interaction	–0.1110**	0.0343

** Significant at $p < .01$, *** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test.

Note: Number of cases (course records) = 3,094,031.

a. Scores of 3 and above are considered on grade level or "passing" for the purposes of these analyses.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B8. Contrast results for online and face-to-face courses for all courses, Black students

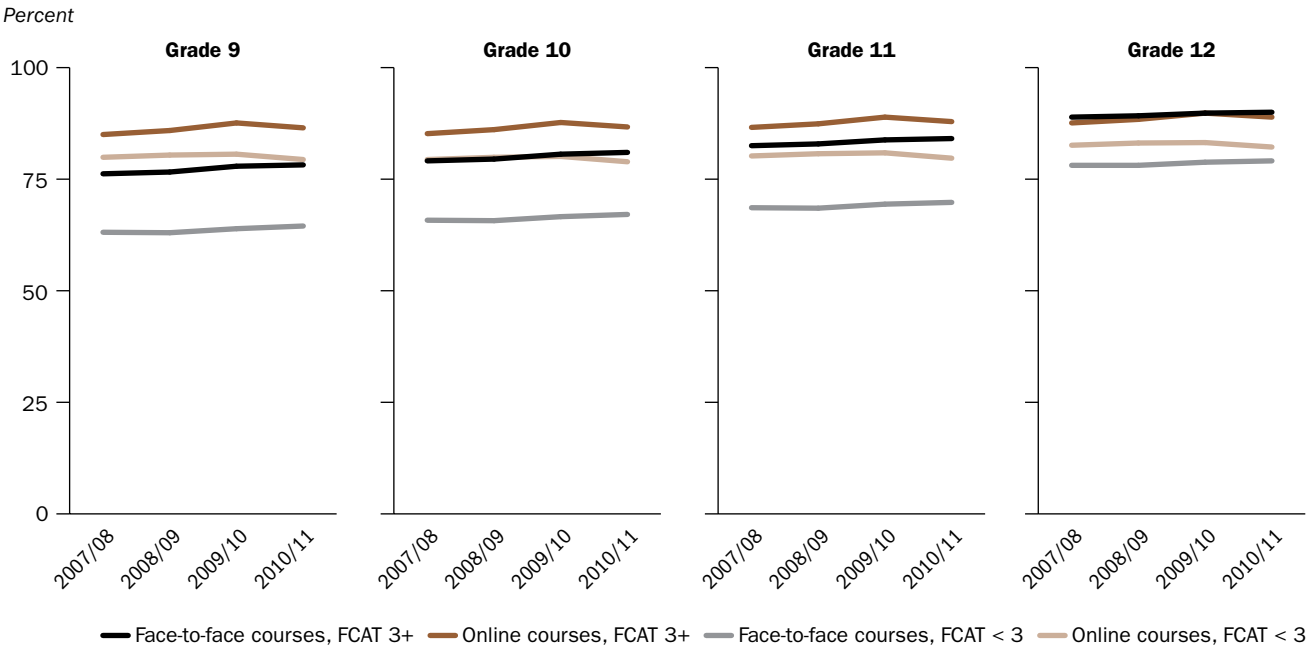
Variable	Parameter estimate	Standard error
FCAT 3+		
Grade 9	0.5788***	0.0493
Grade 10	0.4229***	0.0424
Grade 11	0.3200***	0.0410
Grade 12	–0.1185**	0.0406
FCAT < 3		
Grade 9	0.6898***	0.0426
Grade 10	0.5339***	0.0325
Grade 11	0.4310***	0.0287
Grade 12	–0.0075	0.0273

** Significant at $p < .01$, *** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Figure B2. Percent chances of earning a C or better in all courses, Black students



FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B9. Logistic regression coefficients for all courses, Hispanic students

Variable	Parameter estimate	Standard error
Intercept	0.5340***	0.0037
2008/09	0.0004	0.0040
2009/10	0.0358***	0.0040
2010/11	0.0368***	0.0041
Grade 10	0.1064***	0.0037
Grade 11	0.2911***	0.0039
Grade 12	0.8476***	0.0047
Online course	0.6544***	0.0451
Passed FCAT[a]	0.8138***	0.0039
Year*online course interaction 2008/09	0.0909*	0.0372
Year*online course interaction 2009/10	0.1892***	0.0374
Year*online course interaction 2010/11	0.1217***	0.0345
Grade 10*online course interaction	–0.1077*	0.0451
Grade 11*online course interaction	–0.2135***	0.0432
Grade 12*online course interaction	–0.5496***	0.0425
Passed FCAT[a]*online course interaction	–0.1413***	0.0286

* Significant at $p < .05$, *** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test.

Note: Number of cases (course records) = 2,628,835.

a. Scores of 3 and above are considered on grade level or "passing" for the purposes of these analyses.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B10. Contrast results for online and face-to-face courses for all courses, Hispanic students

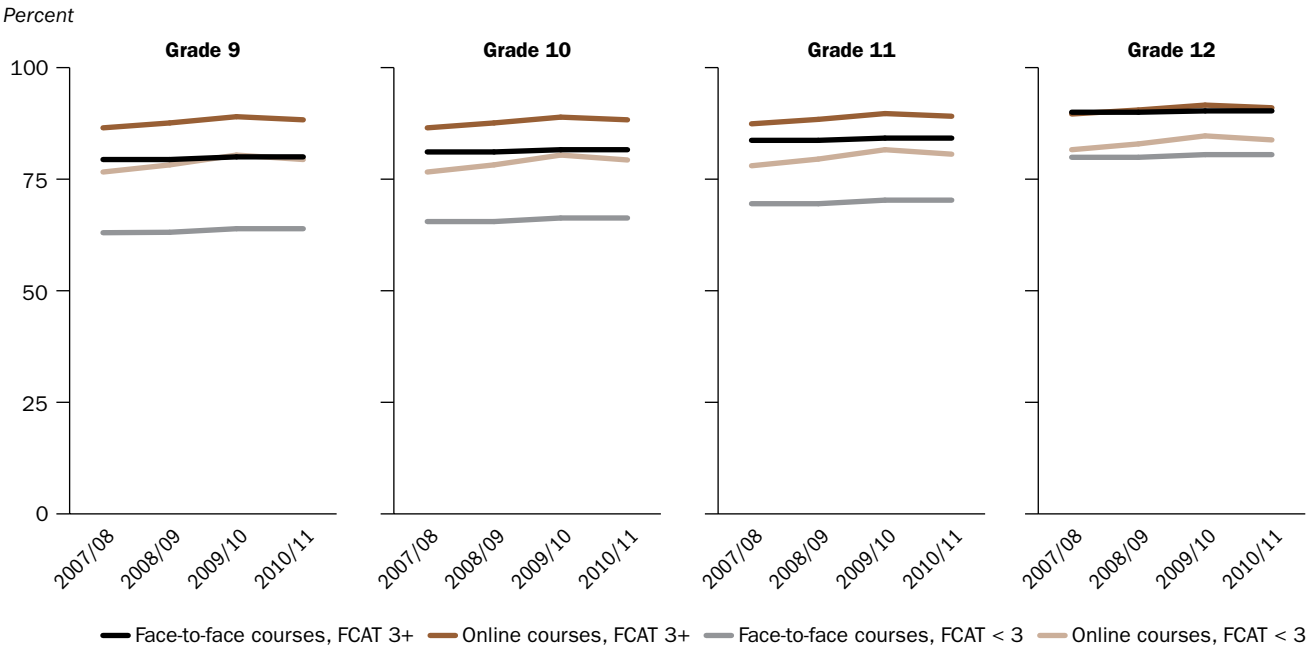
Variable	Parameter estimate	Standard error
FCAT 3+		
Grade 9	0.6348***	0.0446
Grade 10	0.5271***	0.0370
Grade 11	0.4213***	0.0350
Grade 12	0.0852*	0.0348
FCAT < 3		
Grade 9	0.7761***	0.0422
Grade 10	0.6683***	0.0324
Grade 11	0.5626***	0.0290
Grade 12	0.2265***	0.0275

* Significant at $p < .05$, *** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Figure B3. Percent chances of earning a C or better in all courses, Hispanic students



FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B11. Logistic regression coefficients for all courses, students eligible for the school lunch program

Variable	Parameter estimate	Standard error
Intercept	0.3645***	0.0026
2008/09	0.0066*	0.0029
2009/10	0.0513***	0.0028
2010/11	0.0724***	0.0028
Grade 10	0.1585***	0.0025
Grade 11	0.3770***	0.0027
Grade 12	0.9243***	0.0033
Online course	0.3371***	0.0332
Passed FCAT[a]	0.6994***	0.0027
Year*online course interaction 2008/09	–0.0126	0.0304
Year*online course interaction 2009/10	0.0811**	0.0296
Year*online course interaction 2010/11	–0.0326	0.0280
Grade 10*online course interaction	–0.1327***	0.0311
Grade 11*online course interaction	–0.2043***	0.0300
Grade 12*online course interaction	–0.4871***	0.0306
Passed FCAT[a]*online course interaction	–0.1235***	0.0221

* Significant at $p < .05$, ** Significant at $p < .01$, *** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test.

Note: Number of cases (course records) = 5,159,164.

a. Scores of 3 and above are considered on grade level or "passing" for the purposes of these analyses.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B12. Contrast results for online and face-to-face courses for all courses, students eligible for the school lunch program

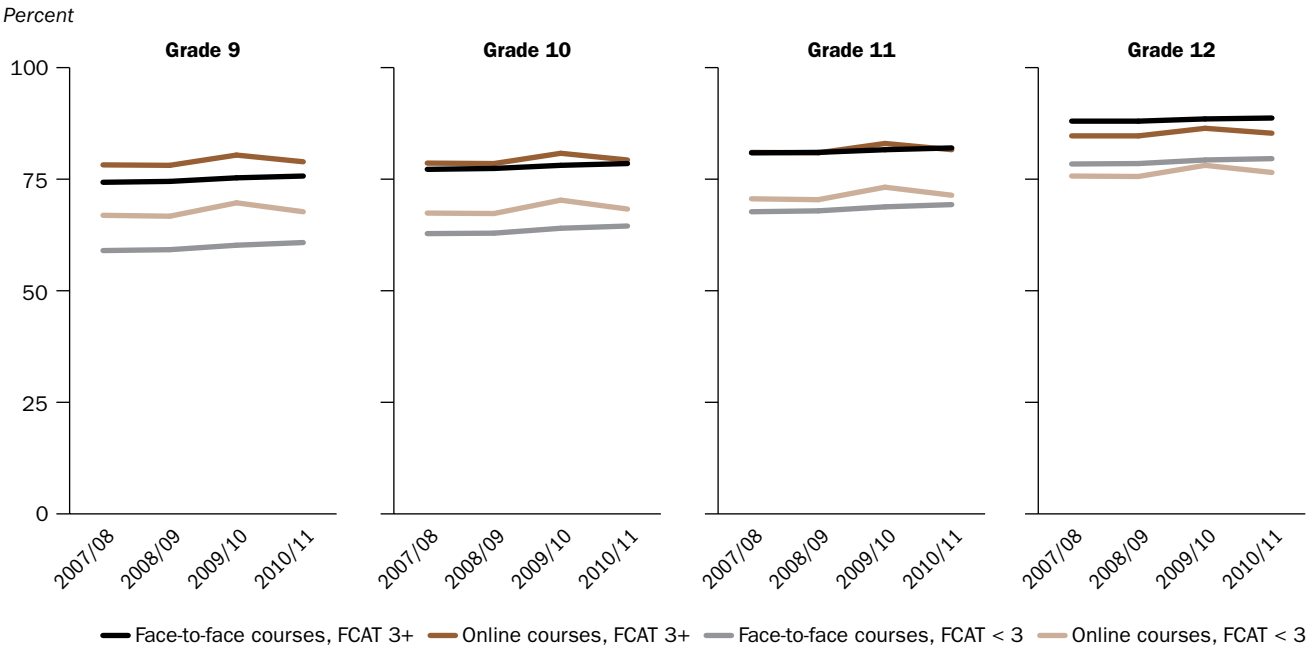
Variable	Parameter estimate	Standard error
FCAT 3+		
Grade 9	0.1810***	0.0314
Grade 10	0.0483	0.0276
Grade 11	–0.0233	0.0270
Grade 12	–0.3061***	0.0278
FCAT < 3		
Grade 9	0.3044***	0.0290
Grade 10	0.1718***	0.0235
Grade 11	0.1001***	0.0215
Grade 12	–0.1827***	0.0219

*** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

'Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Figure B4. Percent chance of earning a C or better in all courses, students eligible for the school lunch program



FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B13. Logistic regression coefficients for all courses, students in special education

Variable	Parameter estimate	Standard error
Intercept	0.1464***	0.0048
2008/09	0.0098	0.0054
2009/10	0.0806***	0.0053
2010/11	0.0904***	0.0054
Grade 10	0.1977***	0.0049
Grade 11	0.3972***	0.0052
Grade 12	0.9451***	0.0061
Online course	0.8504***	0.0624
Passed FCAT[a]	0.7207***	0.0071
Year*online course interaction 2008/09	0.0444	0.0578
Year*online course interaction 2009/10	–0.0403	0.0562
Year*online course interaction 2010/11	–0.0680	0.0540
Grade 10*online course interaction	–0.0797	0.0614
Grade 11*online course interaction	–0.0582	0.0602
Grade 12*online course interaction	–0.5102***	0.0601
Passed FCAT[a]*online course interaction	–0.2529***	0.0594

*** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test.

Note: Number of cases (course records) = 1,257,212.

a. Scores of 3 and above are considered on grade level or "passing" for the purposes of these analyses.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B14. Contrast results for online and face-to-face courses for all courses, students in special education

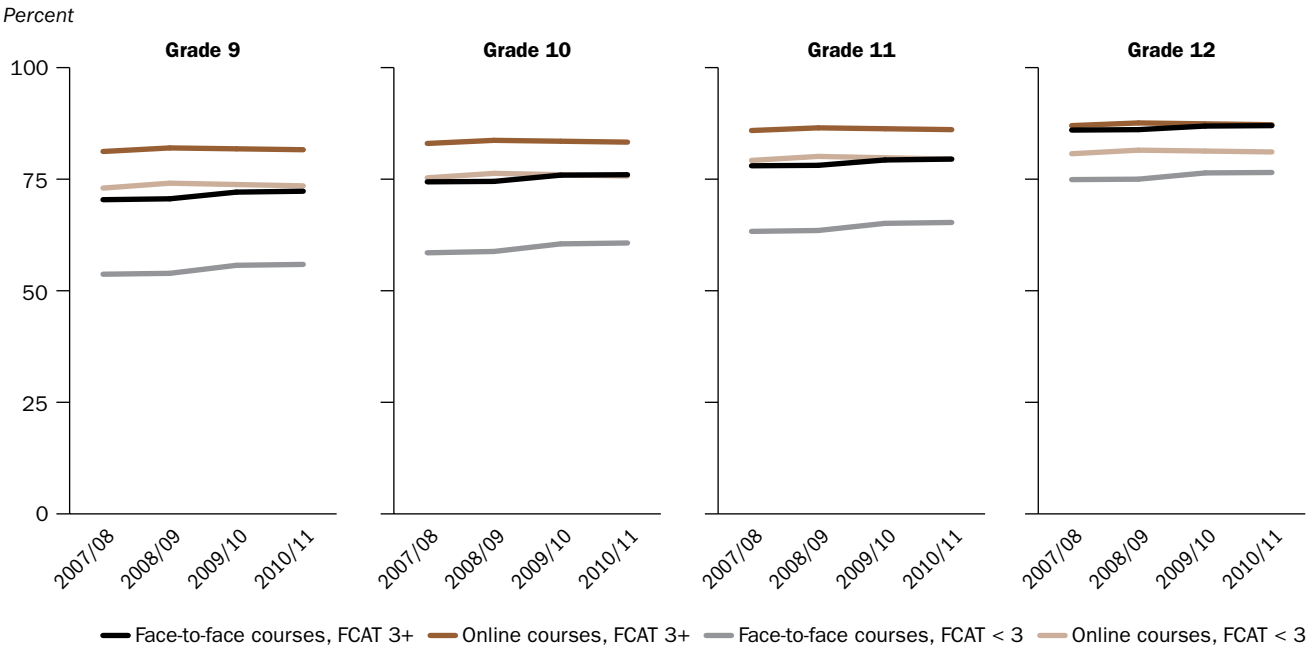
Variable	Parameter estimate	Standard error
FCAT 3+		
Grade 9	0.5294***	0.0761
Grade 10	0.4497***	0.0680
Grade 11	0.4713***	0.0690
Grade 12	0.0192	0.0691
FCAT < 3		
Grade 9	0.7824***	0.0575
Grade 10	0.7027***	0.0466
Grade 11	0.7242***	0.0449
Grade 12	0.2721***	0.0440

*** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Figure B5. Percent chances of earning a C or better in all courses, students in special education



FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B15. Logistic regression coefficients for all courses, English learner students

Variable	Parameter estimate	Standard error
Intercept	0.4536***	0.0076
2008/09	0.0671***	0.0082
2009/10	0.1372***	0.0082
2010/11	0.1425***	0.0085
Grade 10	0.1267***	0.0078
Grade 11	0.3558***	0.0082
Grade 12	0.8860***	0.0097
Online course	0.4986***	0.1272
Passed FCAT[a]	0.9127***	0.0254
Year*online course interaction 2008/09	–0.0851	0.1079
Year*online course interaction 2009/10	0.2260*	0.1136
Year*online course interaction 2010/11	–0.2980**	0.1058
Grade 10*online course interaction	–0.1666	0.1336
Grade 11*online course interaction	–0.1641	0.1296
Grade 12*online course interaction	–0.5627***	0.1265
Passed FCAT[a]*online course interaction	0.0675	0.2111

* Significant at $p < .05$, ** Significant at $p < .01$, *** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test.

Note: Number of cases (course records) = 564,613.

a. Scores of 3 and above are considered on grade level or "passing" for the purposes of these analyses.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B16. Contrast results for online and face-to-face courses for all courses, English learner students

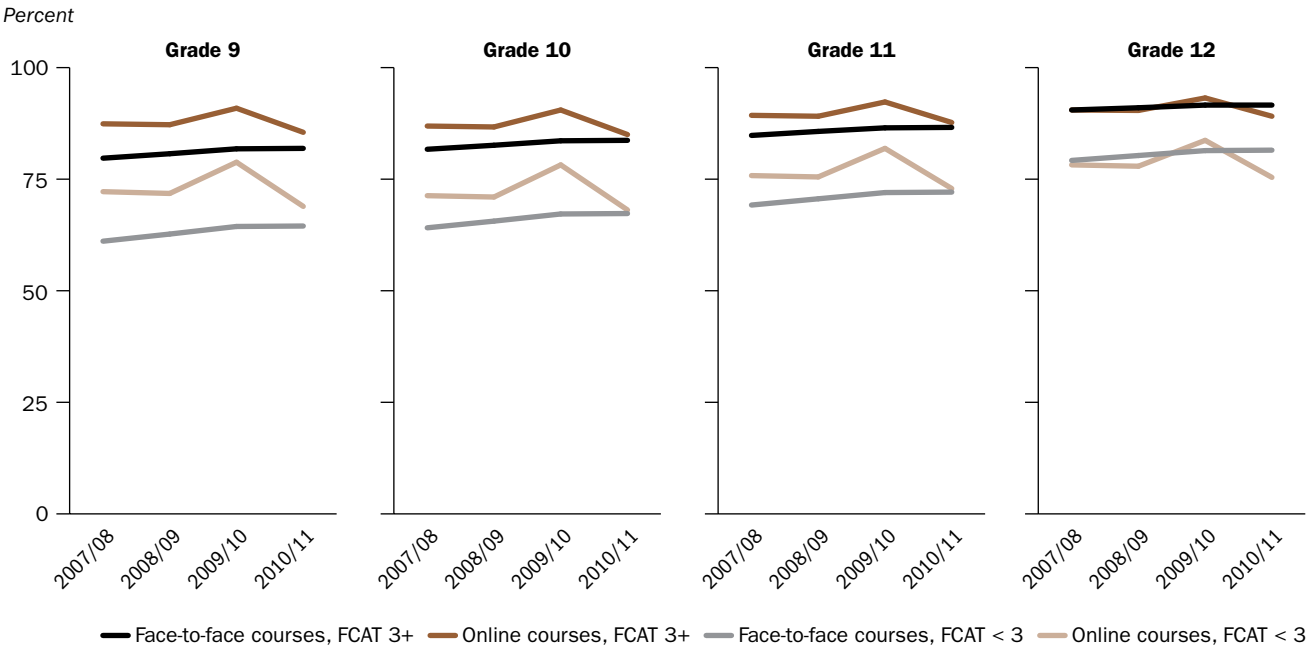
Variable	Parameter estimate	Standard error
FCAT 3+		
Grade 9	0.2682	0.2387
Grade 10	0.1015	0.2223
Grade 11	0.1041	0.2240
Grade 12	–0.2946	0.2256
FCAT < 3		
Grade 9	0.2006	0.1253
Grade 10	0.0340	0.0991
Grade 11	0.0365	0.0904
Grade 12	–0.3621***	0.0846

*** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Figure B6. Percent chance of earning a C or better in all courses, English learner students



FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B17. Differences in predicted probabilities of earning a C or better for online and face-to-face courses, 2010/11 (percentage points)

Student group	FCAT score	Grade 9	Grade 10	Grade 11	Grade 12
All students	3+	7.3***	5.2***	3.9***	–0.1***
	< 3	15.0***	11.8***	9.9***	3.0***
Black students	3+	8.3***	5.7***	3.8***	–1.1**
	< 3	15.0***	11.8***	9.9***	3.0
Hispanic students	3+	8.3***	6.6***	4.8***	0.7*
	< 3	15.5***	13.0***	10.3***	3.3***
Students eligible for school lunch program	3+	3.2***	0.8	–0.3	–3.4***
	< 3	7.0***	3.8***	2.1***	–3.1***
Students in special education	3+	9.3***	7.2***	6.6***	0.2
	< 3	17.6***	15.0***	14.2***	4.5***
English learner students	3+	3.6	1.3	1.2	–2.6
	< 3	4.5	0.7	0.7	–6.1***

* Significant at $p < .05$, ** Significant at $p < .01$, *** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B18. Logistic regression coefficients for credit recovery courses, all students

Variable	Parameter estimate	Standard error
Intercept	0.5188***	0.0223
2009/10	0.0323	0.0193
2010/11	–0.0676**	0.0199
Grade 10	0.3906***	0.0232
Grade 11	0.9202***	0.0233
Grade 12	1.7650***	0.0276
Recovery course online	2.4627***	0.2096
Failed prior course online	0.8811***	0.0866
Passed FCAT[a]	–0.0913***	0.0198
Year*online course interaction 2009/10	–0.2654	0.1508
Year*online course interaction 2010/11	–0.1584	0.1461
Grade 10*online course interaction	–0.1084	0.2151
Grade 11*online course interaction	–0.4349*	0.2087
Grade 12*online course interaction	–1.6795***	0.2022
Passed FCAT[a]*online course interaction	0.3976**	0.1233

* Significant at $p < .05$, ** Significant at $p < .01$, *** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test.

Note: Number of cases (course records) = 122,862.

a. Scores of 3 and above are considered on grade level or "passing" for the purposes of these analyses.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B19. Contrast results for online and face-to-face credit recovery courses, all students

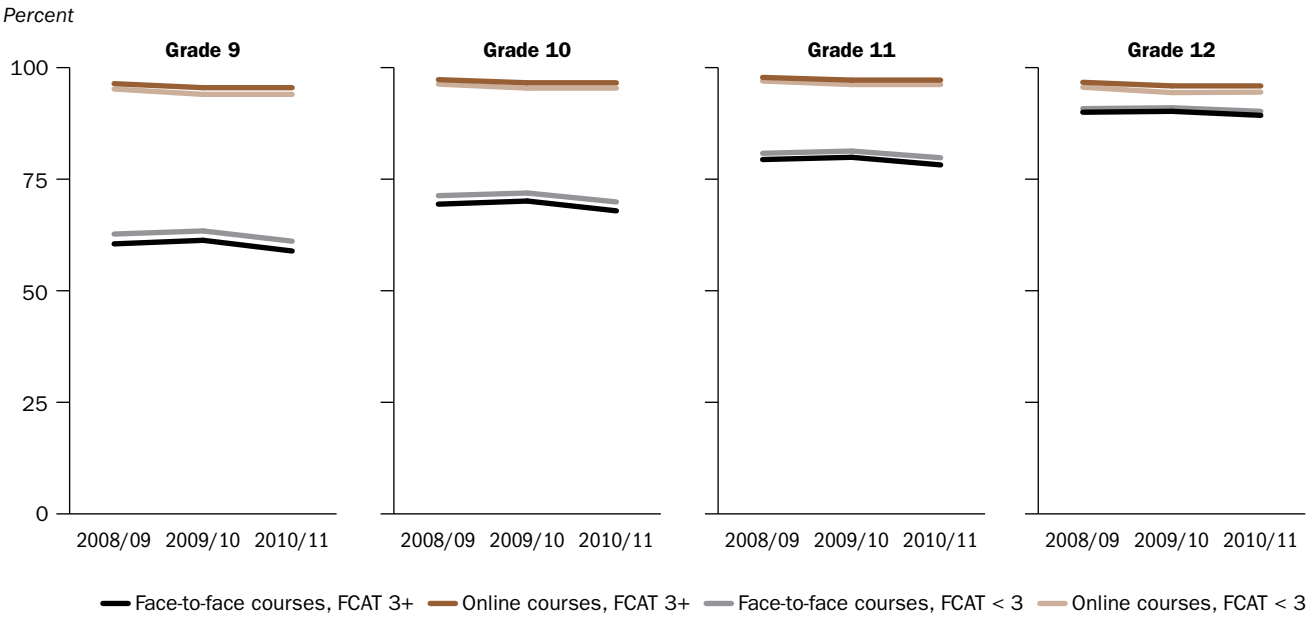
Variable	Parameter estimate	Standard error
FCAT 3+		
Grade 9	2.8603***	0.2237
Grade 10	2.7519***	0.1788
Grade 11	2.4254***	0.1796
Grade 12	1.1808***	0.1730
FCAT < 3		
Grade 9	2.4627***	0.2096
Grade 10	2.3544***	0.1572
Grade 11	2.0279***	0.1515
Grade 12	0.7833***	0.1446

*** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Figure B7. Percent chance of earning a C or better in credit recovery courses, all students



FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B20. Logistic regression coefficients for credit recovery courses, Black students

Variable	Parameter estimate	Standard error
Intercept	0.6455***	0.0429
2009/10	0.0817*	0.0366
2010/11	0.1648***	0.0396
Grade 10	0.4248***	0.0459
Grade 11	0.9785***	0.0465
Grade 12	1.7585***	0.0532
Recovery course online	2.0503***	0.4296
Failed prior course online	0.9697***	0.2278
Passed FCAT[a]	–0.0300	0.0542
Year*online course interaction 2009/10	–0.6221	0.3514
Year*online course interaction 2010/11	–0.6046	0.3490
Grade 10*online course interaction	0.5319	0.4585
Grade 11*online course interaction	0.0647	0.4224
Grade 12*online course interaction	–1.1531**	0.3983
Passed FCAT[a]*online course interaction	0.6593	0.4093

* Significant at $p < .05$, ** Significant at $p < .01$, *** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test.

Note: Number of cases (course records) = 36,886.

a. Scores of 3 and above are considered on grade level or "passing" for the purposes of these analyses.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B21. Contrast results for online and face-to-face credit recovery courses, Black students

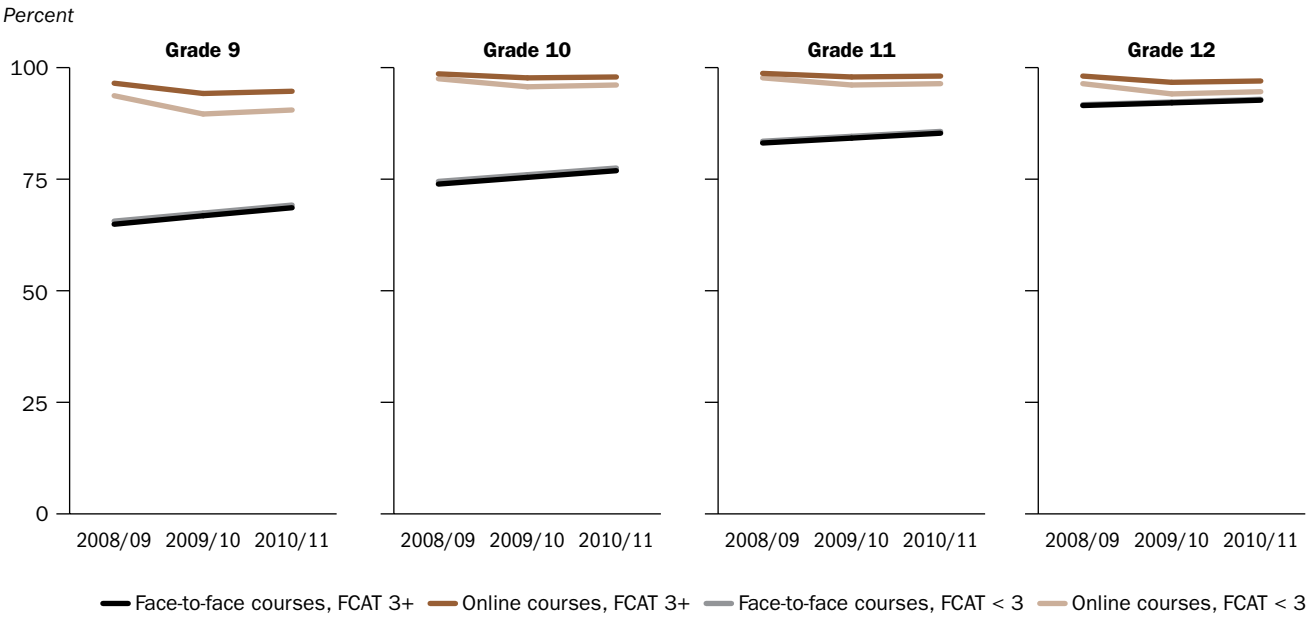
Variable	Parameter estimate	Standard error
FCAT 3+		
Grade 9	2.1050***	0.5224
Grade 10	2.6369***	0.4877
Grade 11	2.1697**	0.4659
Grade 12	0.9519*	0.4377
FCAT < 3		
Grade 9	1.4457**	0.3946
Grade 10	1.9776***	0.3373
Grade 11	1.5104***	0.2668
Grade 12	0.2926	0.2203

* Significant at $p < .05$, ** Significant at $p < .01$, *** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Figure B8. Percent chance of earning a C or better in credit recovery courses, Black students



FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B22. Logistic regression coefficients for credit recovery courses, Hispanic students

Variable	Parameter estimate	Standard error
Intercept	0.5465***	0.0511
2009/10	–0.0196	0.0446
2010/11	0.0119	0.0470
Grade 10	0.3742***	0.0533
Grade 11	1.0713***	0.0545
Grade 12	1.8793***	0.0643
Recovery course online	3.5709**	1.0381
Failed prior course online	1.5329***	0.2864
Passed FCAT[a]	0.0364	0.0517
Year*online course interaction 2009/10	0.5351	0.4397
Year*online course interaction 2010/11	0.1727	0.3970
Grade 10*online course interaction	–1.4621	1.0608
Grade 11*online course interaction	–2.3850*	1.0362
Grade 12*online course interaction	–2.3469*	1.0583
Passed FCAT[a]*online course interaction	0.0513	0.3719

* Significant at $p < .05$, ** Significant at $p < .01$, *** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test.

Note: Number of cases (course records) = 23,916.

a. Scores of 3 and above are considered on grade level or "passing" for the purposes of these analyses.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B23. Contrast results for online and face-to-face credit recovery courses, Hispanic students

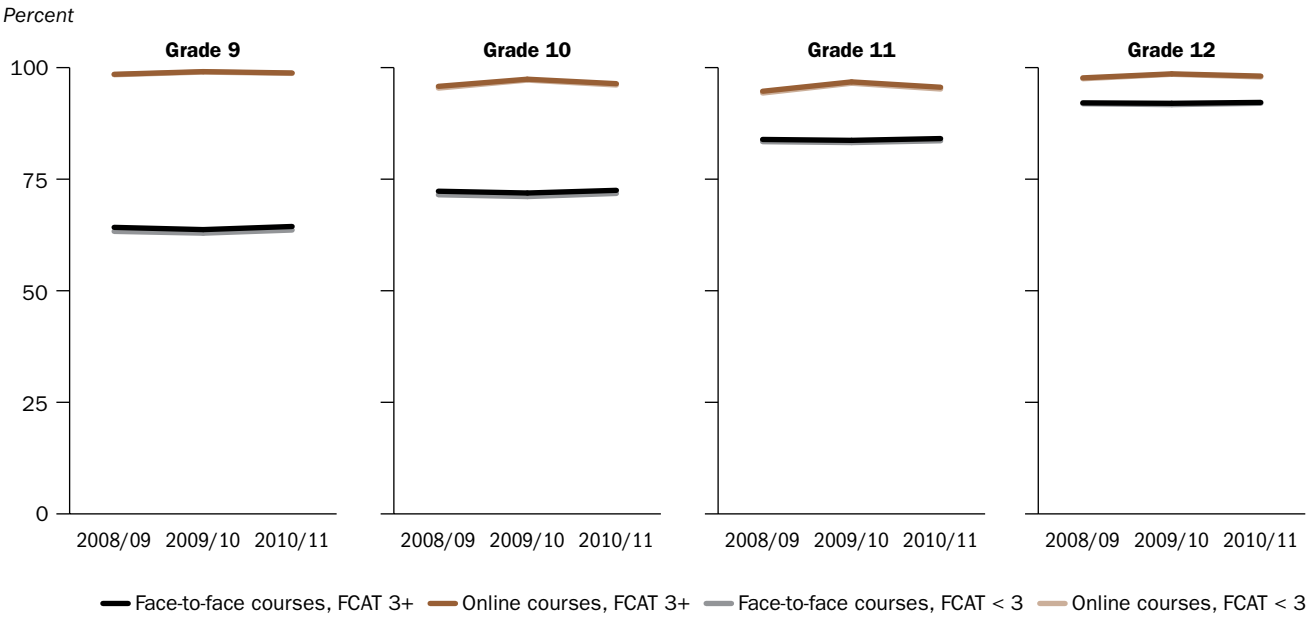
Variable	Parameter estimate	Standard error
FCAT 3+		
Grade 9	3.7949**	1.0552
Grade 10	2.3328***	0.4620
Grade 11	1.4099**	0.3990
Grade 12	1.4481**	0.4491
FCAT < 3		
Grade 9	3.7437**	1.0379
Grade 10	2.2815***	0.3823
Grade 11	1.3587***	0.2917
Grade 12	1.3968***	0.3471

** Significant at $p < .01$, *** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Figure B9. Percent chance of earning a C or better in credit recovery courses, Hispanic students



FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B24. Logistic regression coefficients for credit recovery courses, students eligible for the school lunch program

Variable	Parameter estimate	Standard error
Intercept	0.4249***	0.0299
2009/10	0.0545*	0.0272
2010/11	–0.0284	0.0277
Grade 10	0.4367***	0.0307
Grade 11	1.0210***	0.0315
Grade 12	1.8607***	0.0380
Recovery course online	2.1218***	0.3556
Failed prior course online	0.9436***	0.1387
Passed FCAT[a]	–0.1044**	0.0299
Year*online course interaction 2009/10	–0.3179	0.2975
Year*online course interaction 2010/11	–0.4910	0.2800
Grade 10*online course interaction	0.1172	0.3457
Grade 11*online course interaction	–0.4679	0.3263
Grade 12*online course interaction	–1.4352***	0.3230
Passed FCAT[a]*online course interaction	0.4876*	0.2358

* Significant at $p < .05$, ** Significant at $p < .01$, *** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test.

Note: Number of cases (course records) = 60,250.

a. Scores of 3 and above are considered on grade level or "passing" for the purposes of these analyses.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B25. Contrast results for online and face-to-face credit recovery courses, students eligible for the school lunch program

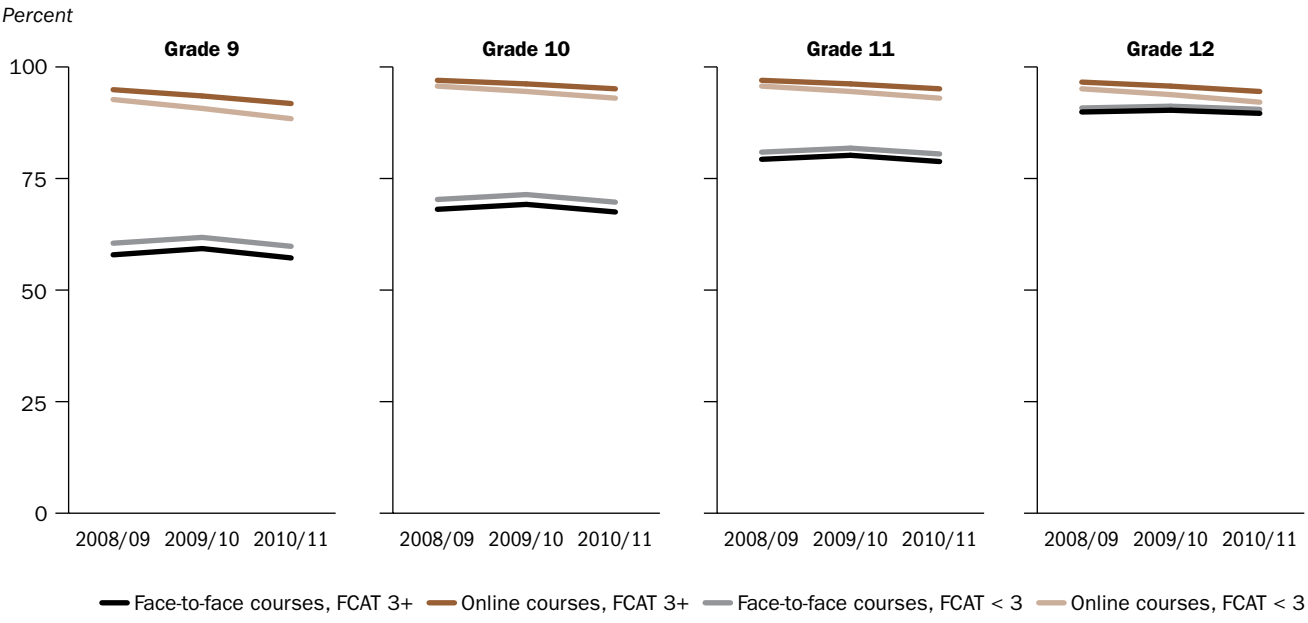
Variable	Parameter estimate	Standard error
FCAT 3+		
Grade 9	2.1184***	0.3388
Grade 10	2.2356***	0.2846
Grade 11	1.6505***	0.2684
Grade 12	0.6831**	0.2568
FCAT < 3		
Grade 9	1.6308***	0.3088
Grade 10	1.7480***	0.2260
Grade 11	1.1629***	0.1831
Grade 12	0.1955	0.1688

** Significant at $p < .01$, *** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Figure B10. Percent chance of earning a C or better in credit recovery courses, students eligible for the school lunch program



FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B26. Logistic regression coefficients for credit recovery courses, students in special education

Variable	Parameter estimate	Standard error
Intercept	0.2991***	0.0559
2009/10	0.0846	0.0520
2010/11	0.0481	0.0535
Grade 10	0.4235***	0.0592
Grade 11	0.8404**	0.0595
Grade 12	1.7851***	0.0733
Recovery course online	2.9663***	0.7123
Failed prior course online	1.1324**	0.3203
Passed FCAT[a]	0.2285**	0.0823
Year*online course interaction 2009/10	–0.7096	0.7100
Year*online course interaction 2010/11	–1.4070*	0.6478
Grade 10*online course interaction	0.1543	0.6472
Grade 11*online course interaction	0.4987	0.6822
Grade 12*online course interaction	–1.0682	0.6358
Passed FCAT[a]*online course interaction	0.4677	0.7598

* Significant at $p < .05$, ** Significant at $p < .01$, *** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test.

Note: Number of cases (course records) = 15,134.

a. Scores of 3 and above are considered on grade level or "passing" for the purposes of these analyses.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B27. Contrast results for online and face-to-face credit recovery courses, students in special education

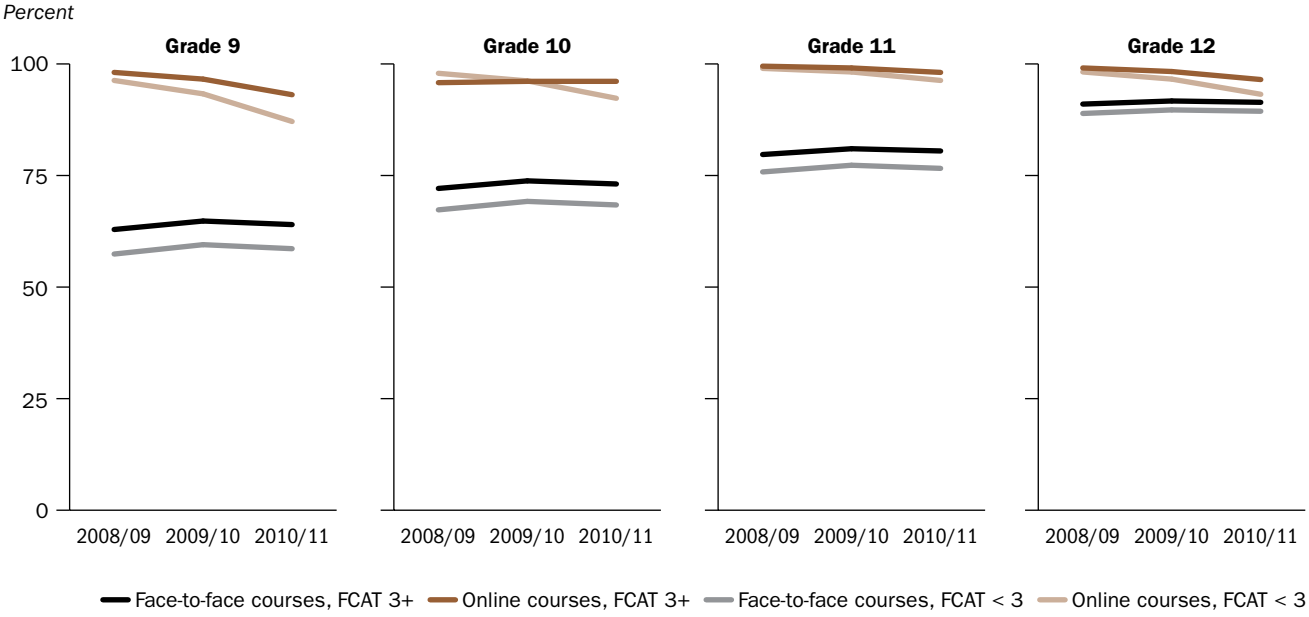
Variable	Parameter estimate	Standard error
FCAT 3+		
Grade 9	2.0269*	0.8622
Grade 10	2.1812**	0.7989
Grade 11	2.5256**	0.8590
Grade 12	0.9587	0.8006
FCAT < 3		
Grade 9	1.5592**	0.5774
Grade 10	1.7136***	0.4096
Grade 11	2.0579***	0.4448
Grade 12	0.4911	0.3530

* Significant at $p < .05$, ** Significant at $p < .01$, *** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Figure B11. Percent chance of earning a C or better in credit recovery courses, students in special education



FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B28. Logistic regression coefficients for credit recovery courses, English learner students

Variable	Parameter estimate	Standard error
Intercept	0.5522***	0.1176
2009/10	0.1189	0.0967
2010/11	–0.0273	0.1045
Grade 10	0.2792*	0.1269
Grade 11	0.9555***	0.1291
Grade 12	1.9473***	0.1486
Recovery course online	12.7332	542.5
Failed prior course online	12.0034	176.2
Passed FCAT[a]	0.5964	0.4165
Year*online course interaction 2009/10	1.0709	1.0904
Year*online course interaction 2010/11	0.2497	0.9194
Grade 10*online course interaction	–0.4122	639.1
Grade 11*online course interaction	–13.1144	542.5
Grade 12*online course interaction	–13.1028	542.5
Passed FCAT[a]*online course interaction	10.4065	481.0

* Significant at $p < .05$, *** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test.

Note: Number of cases (course records) = 4,824.

a. Scores of 3 and above are considered on grade level or "passing" for the purposes of these analyses.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

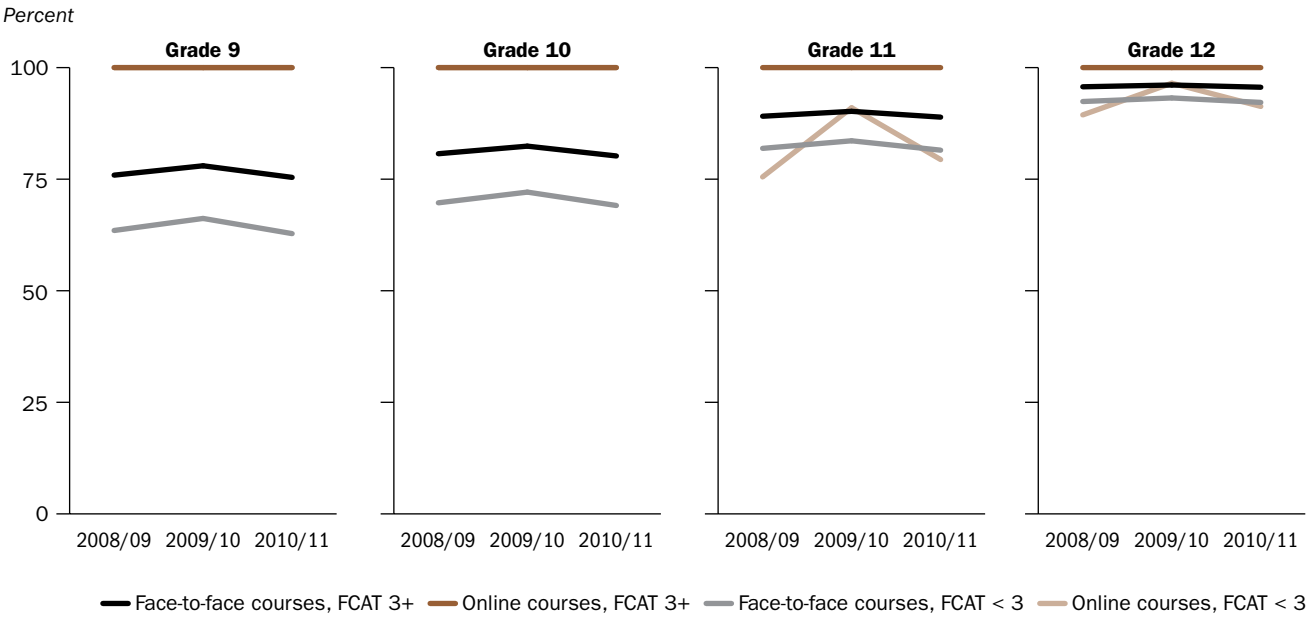
Table B29. Contrast results for online and face-to-face credit recovery courses, English learner students

Variable	Parameter estimate	Standard error
FCAT 3+		
Grade 9	23.3895	725.0000
Grade 10	22.9773	587.8000
Grade 11	10.2750	481.0000
Grade 12	10.2867	481.0000
FCAT < 3		
Grade 9	12.9830	542.5000
Grade 10	12.5708	337.9000
Grade 11	–0.1315	0.5368
Grade 12	–0.1198	0.6518

FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Figure B12. Percent chance of earning a C or better in credit recovery courses, English learner students



FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

Table B30. Differences in predicted probabilities of earning a C or better for online and face-to-face credit recovery courses, 2010/11 (percentage points)

Student group	FCAT score	Grade 9	Grade 10	Grade 11	Grade 12
All students	3+	36.6***	28.7***	19.0***	6.5***
	< 3	32.9***	25.5***	16.5***	4.3***
Black students	3+	26.1***	21.0***	10.8***	1.7*
	< 3	21.3***	18.7***	10.8***	1.7
Hispanic students	3+	34.3**	24.0***	11.5**	5.8**
	< 3	35.1**	24.4***	11.6***	5.9***
Students eligible for school lunch program	3+	34.5***	27.6***	16.3***	4.9**
	< 3	28.6***	23.3***	12.5***	1.5
Students in special education	3+	29.1*	23.0**	17.6**	5.1
	< 3	28.5*	23.9***	19.6***	3.8
English learner students	3+	24.6	19.8	11.1	4.4
	< 3	37.2	30.9	–2.1	–0.9

* Significant at $p < .05$, ** Significant at $p < .01$, *** Significant at $p < .001$.

FCAT is the Florida Comprehensive Assessment Test. FCAT 3+ indicates that a student scored 3 or higher on the prior-year Florida Comprehensive Assessment Test, which is considered on grade level or "passing" for the purposes of these analyses. FCAT < 3 indicates that a student scored less than 3 on the prior-year FCAT.

Source: Authors' analysis of transcript data provided by the Florida Department of Education's Education Data Warehouse.

References

Allensworth, E., & Easton, J. Q. (2007). *What matters for staying on-track and graduating in Chicago Public High Schools: A close look at course grades, failures and attendance in the freshman year.* Chicago, IL: Consortium on Chicago School Research. http://eric.ed.gov/?&id=ED498350

Andrie, R. (2012). Credit recovery explained. *American School Board Journal, 199*(4), 32–33.

Corry, M., & Stella, J. (2012). Developing a framework for research in online K–12 distance education. *The Quarterly Review of Distance Education, 13*(3), 131–151. http://eric.ed.gov/?&id=EJ1005844

Davis, M. (2011). Credit- recovery lessons. *Education Week, 30*(25), 30–32.

Dessoff, D. (2009). Reaching graduation with credit recovery. *District Administration, 45*(9), 43–48. http://eric.ed.gov/?&id=EJ860581

Enders, C. K. (2010). *Applied missing data analysis*. New York, NY: The Guilford Press.

Florida Department of Education. (2015). *2014–15 Student Information System*. Retrieved April 27, 2015, from http://www.fldoe.org/accountability/data-sys/database-manuals-updates/2014–15-student-info-system/index.stml

Franco, S. M., & Patel, N. (2011). An interim report on a pilot credit recovery program in a large suburban midwestern high school. *Education, 132*(1), 15–27.

Heppen, J., Allensworth, E., Walters, K., Pareja, A. S., Kurki, A., Nomi, T., et al. (2012). *Efficacy of online algebra for credit recovery for at-risk ninth grade students: Evidence from year 1.* Paper presented at the Spring Conference of the Society for Research on Educational Effectiveness, Washington, DC. http://eric.ed.gov/?id=ED530562

Plummer, L. (2012). Assuring a virtual second chance. *THE Journal, 39*(2), 20–22.

Queen, B., & Lewis, L. (2011). *Distance education courses for public elementary and secondary school students: 2009–10* (NCES No. 2012–008). Washington, DC: U.S. Department of Education, National Center for Education Statistics. http://eric.ed.gov/?id=ED526879

Roblyer, M. D., & Marshall, J. (2002). Predicting success of virtual high school distance learners: Preliminary results from an educational success prediction instrument (ESPRI). *Journal of Research on Technology in Education, 35*(2), 241–255.

U.S. Department of Education. (2011). *Digest of Education Statistics: Table 110* Washington, DC: U.S. Department of Education, National Center for Educational Statistics. Retrieved April 27, 2015, from http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2012001

Watson, J., Murin, A., Vashaw, L., Gemin, B., & Rapp, C. (2011). *Keeping pace with K–12 online learning: An annual review of policy and practice, 2011.* Durango, CO: Evergreen Education Group. http://eric.ed.gov/?id=ED535912

Watson, J., Pape, L., Murin, A., Gemin, B., & Vashaw, L. (2014). *Keeping pace with K–12 online learning: An annual review of policy and practice, 2014.* Durango, CO: Evergreen Education Group.

The Regional Educational Laboratory Program produces 7 types of reports

Making Connections
Studies of correlational relationships

Making an Impact
Studies of cause and effect

What's Happening
Descriptions of policies, programs, implementation status, or data trends

What's Known
Summaries of previous research

Stated Briefly
Summaries of research findings for specific audiences

Applied Research Methods
Research methods for educational settings

Tools
Help for planning, gathering, analyzing, or reporting data or research