

END-OF-COURSE EXAMS AND STUDENT OUTCOMES

By Adam Tyner and Matthew Larsen



Foreword and executive summary
by Chester E. Finn, Jr., and Amber M. Northern



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Foreword

By Chester E. Finn, Jr., and Amber M. Northern

Reforming high schools has been one of the biggest challenges in American education and the achievement evidence reveals its failures. National Assessment results in grade 12 are flat. ACT and SAT scores are flat. American PISA and TIMSS results are essentially flat. College remediation rates—and dropout rates—remain high. Advanced Placement (AP) participation is up, but success on AP exams is not—and for minority students, it's down. And though high school graduation rates are up, and though it's certainly a good thing for young people to acquire that credential, it's not so good when there's reason to believe it does not signify the level of learning that augurs success in post-high-school pursuits.

We at the Fordham Institute have a longstanding interest in strengthening student achievement and school performance, and it's no secret that we're accountability hawks: we believe strongly that results—and growth in results—are what matter in education, and we've been concerned for some time about ways in which the appearance or assertion of improvement may conceal something far more disappointing. In that connection, previous Fordham studies have unmasked what we termed the "[proficiency illusion](#)," the "[accountability illusion](#)," the rise of often-questionable "[credit recovery](#)," and the discrepancy between teacher-conferred grades and student performance on statewide assessments.

On the upside, we've also documented respectable—and authentic—achievement gains in the early grades, [particularly among disadvantaged](#) and low-achieving youngsters, and children of color. But high schools, as we've noted on [multiple occasions](#), remain a [huge challenge](#).

Federal efforts to strengthen academic performance via school accountability have never gotten much traction at the high school level.

Federal efforts to strengthen academic performance via school accountability have never gotten much traction at the high school level, where—under No Child Left Behind and now the Every Student Succeeds Act—there's been more emphasis on graduation rates than on student achievement. To their credit, most states, at one point or another, have supplemented those efforts by instituting exam-based requirements for students before awarding diplomas. These have taken the form of multisubject graduation tests—the best known probably being the Massachusetts MCAS exam—as well as subject-specific end-of-course exams (EOCs).

Both were extensively used until just a few years ago. At their high-water mark, graduation tests were required by 30 states and EOCs were employed by 30 jurisdictions (there's double counting there, as the two types of tests overlap somewhat). Both, however, are in decline now. For the class of 2020, students in just 12 states will have taken a graduation test, and in 26 states, students will have taken one or more EOCs.

Three factors seem to have driven that decline: the overriding push for higher graduation rates, which militates against anything that might get in the way; the nationwide backlash against testing in general; and a handful of studies indicating that requiring students to pass a graduation test may discourage them and lead to more dropouts, which is obviously bad for them and would also depress the graduation rate, without much evidence of a positive impact on student achievement.

It's possible that states, in turning away from EOCs, are throwing a healthy baby out with the testing bathwater.

Yet very little prior research has looked at EOCs in particular. We wondered: How, exactly, do states employ them? And what difference, if any, do they make for student achievement and for graduation rates? If they cause more harm than good, states might be right to downplay or discard them. If, on the other hand—and unlike graduation exams—they do good things for kids and/or schools, it's possible that states, in turning away from EOCs, are throwing a healthy baby out with the testing bathwater.

We entrusted this inquiry to Fordham's own Adam Tyner and Lafayette College economist Matthew Larsen, and they've done a first-rate job, the more so considering how challenging it is to corral EOCs separately from other forms of testing, how tricky it is to determine exactly what a test is being "used for," and how many different tests and states are involved and over such a long period of time. It's also a big problem that the nation lacks a reliable gauge of state-by-state achievement at the twelfth-grade level—a challenge that the National Assessment Governing Board recently promised to address, [but not until 2027!](#)

As you will see in the following pages, Tyner and Larsen learned a lot that's worth knowing and sharing because the implications for state (and district and school) policy and practice are potentially quite valuable. Probably most importantly, EOCs, properly deployed, have positive (albeit modest) academic benefits and do so without causing kids to drop out or graduation rates to falter. "In other words," write the authors, "the key argument against exit exams—that they depress graduation rates—does not hold for EOCs." Instead, these exams "are generally positively correlated with high school graduation rates." Better still, "The more EOCs a state administers, the better is student performance on college entrance exams, suggesting that the positive effects of EOCs may be cumulative."

Nor are those the only potential benefits associated with the thoughtful use of EOCs. External exams are a good way for states to maintain uniform content and rigor in core high school courses and keep a check on the local impulse (often driven as much by parents as teachers or administrators) to inflate student grades. At the same time, EOCs can motivate students to take those courses more seriously and tend to place teachers

and their pupils on the “same team”—for when the exam is external, the teacher becomes more coach than judge.

Such exams also lend themselves to an individualized, “mastery”-based education system in which students proceed through their coursework at their own speed, often with the help of technology as well as teachers (to optimize this benefit, “end-of-unit” exams would be even more beneficial than the kind that are given only at the end of a semester or a year).

We’re surely not suggesting that states go crazy with EOCs—there’s little danger of that happening in today’s climate anyway—but we do suggest that policymakers take seriously both the good that these exams can do and the potential harm from scrapping or softening them. And softening seems to be underway in more and more places, as states create detours around EOCs for kids who have trouble passing them, delay the year when they must actually be passed, or turn them into part of a student’s course grade rather than actually requiring that kids pass them.

As we said, we’re accountability hawks and are hence generally opposed to softening. Yet as Tyner and Larsen note, EOCs have the virtue of flexibility. States can deploy them in various ways: some firmer, some softer, and some simply as a source of valuable information for teachers, parents, school leaders, and policymakers. At a time when states are back in the driver’s seat on school and student accountability, that’s mostly a good thing. But at a time when high school performance is flat, flat, flat, it seems to us that wise educators and policymakers alike should use every tool in their toolbox to build the scaffolding for major improvement. EOCs are such a tool.

We do suggest that policymakers take seriously both the good that these exams can do and the potential harm from scrapping or softening them.

Executive Summary

One of the great disappointments—and puzzles—of modern education reform is the lack of student achievement progress at the high school level, where results-based accountability has never been effectively targeted. In fact, despite much furor over federal testing requirements for public education, Washington has never required more than a single assessment of math, English language arts (ELA), and science skills during the entire four years of high school. Instead, it has focused chiefly on graduation rates—which have indeed risen but without evidence that actual student learning has risen with them.

Beginning in the late 1990s, many states took it upon themselves to institute end-of-course exams (EOCs) at the high school level, tests specifically designed to assess students' mastery of the content that various subject-matter courses covered. Their use exploded into the early 2010s. All told, 32 states and the District of Columbia have used them for accountability at some point, whether for Algebra, Biology, English, U.S. History, or other classes. In the last five years, however, that number has declined as some states have jettisoned EOCs or reduced the stakes associated with them for students and schools.

Properly deployed, however, EOCs may help to uphold standards and rigor, incentivize high school students to work harder, encourage teachers to work with their pupils to succeed, and even support positive peer norms, as students are not graded relative to one other but against an external yardstick.

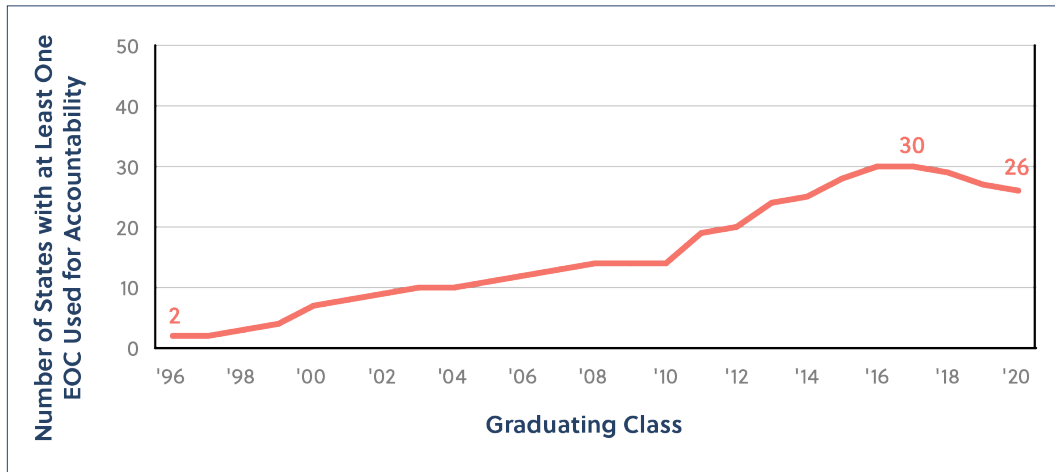
Up to now, it's been difficult to determine just how states are using EOCs and whether their use is associated with positive outcomes. Do EOCs encourage low-performing students to drop out, as some research indicates that graduation exams do? Do they have a positive impact on achievement, as some studies of Advanced Placement exams suggest they do? Or are they a neutral influence, a way for states to maintain standards without the downsides of graduation exams?

In the current study, Adam Tyner, Fordham's associate director for research, and Matthew Larsen, assistant professor of economics at Lafayette College, investigate these and other questions. They provide a rich longitudinal look at state policies related to EOCs over the past 20 years, including patterns of use, subjects tested, and what types of stakes or consequences are tied to EOCs. They then estimate the effects of administering any EOCs in each subject on graduation rates and college entrance exam scores, as well as the effect of the overall number of EOCs administered. Their analysis yielded five major findings:

FINDING 1: The use of EOCs has increased dramatically since the late 1990s but in the past few years has declined somewhat.

Taking EOCs was not a common practice for students 25 years ago (Figure ES-1). In 2008, students in 14 states took at least one EOC that was used for accountability purposes; by 2017, students in 30 states did so. Over the past three years, however, several states have moved to eliminate or reduce the number of mandatory EOCs.

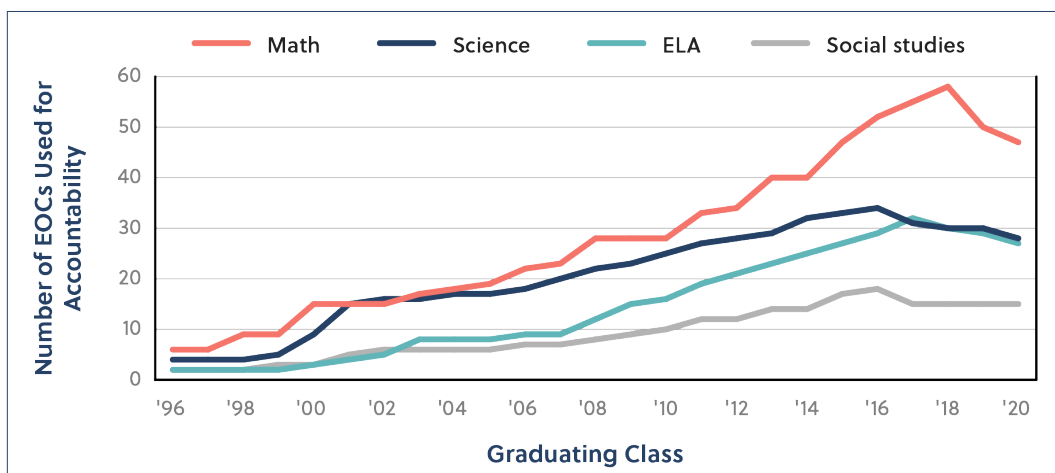
Figure ES-1. Many states adopted EOCs over the past 25 years, but this trend may be reversing.



FINDING 2: EOCs have been most widely used in math and science courses, but their use in ELA courses has risen fastest in the past decade.

Math EOCs have been the most widely deployed (Figure ES-2). Science and ELA are almost tied for second. Although social studies EOCs are less common, U.S. History is the third most widely used EOC overall, after Biology and Algebra I.

Figure ES-2. EOCs have most commonly been used for math, science, and English courses.



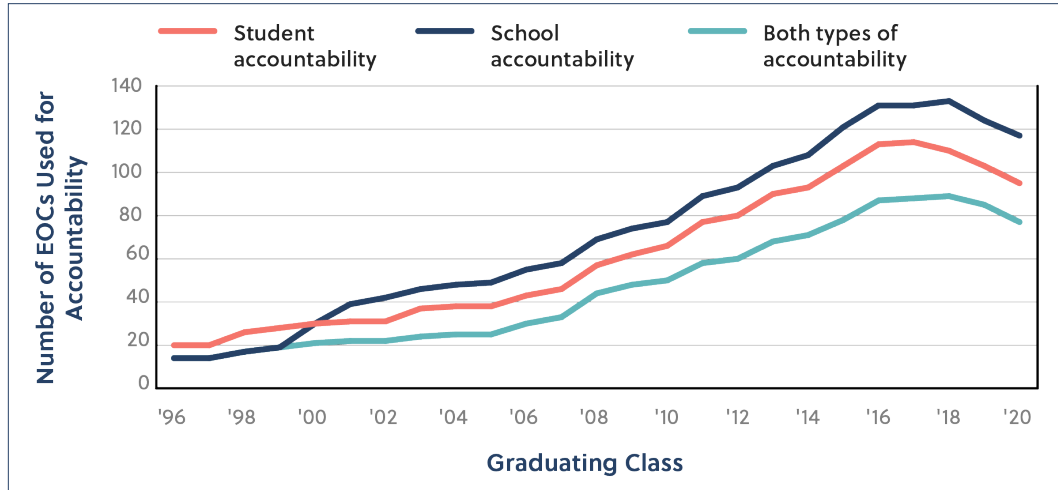
FINDING 3: Most state use of EOCs involves a mix of school and student accountability.

Most states using EOCs have used them for both school and student accountability, though the former has been more common for almost the entire period of study (Figure ES-3). Uses vary greatly, however, as do the types of stakes attached to EOCs, with some states integrating exam results into their school accountability metrics and/or using them to fulfill ESSA's requirement that states administer tests in math, ELA, and science in high school.

When employed for student accountability, EOCs have most often been used as graduation requirements. Yet incorporating EOC results into student grades has become more popular over time.

EOCs are rarely “high stakes.” In almost all cases, a single EOC is, at most, a “medium-stakes” test for students, accounting for perhaps a quarter of a student’s final course grade or serving as one of several assessments among which students can choose to fulfill their graduation requirements. Likewise, when EOC results are included in school accountability metrics, they represent one among multiple outcomes.

Figure ES-3. EOCs have often been used for a mix of school-level and student accountability, but school-level accountability has generally been more common.

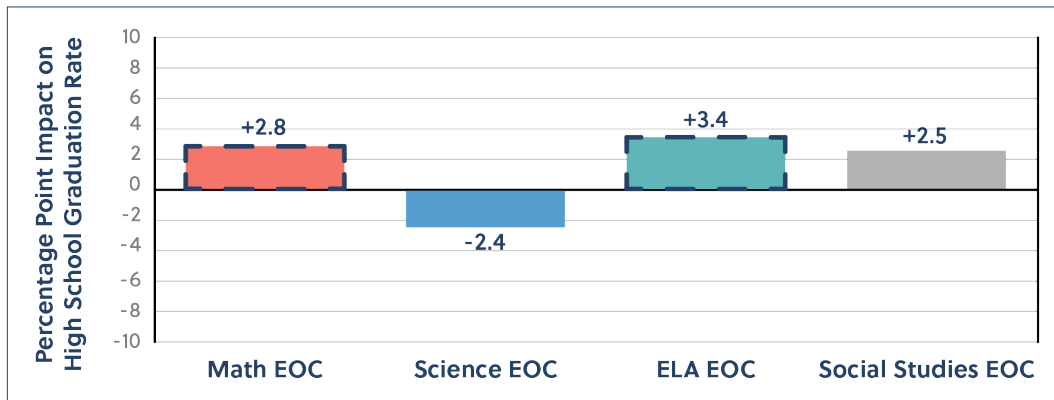


Note: Data are approximate, due to aggregating similar EOCs and EOCs for optional courses, and we do not code all optional and uncommon EOCs in states with many EOCs. Categories are not mutually exclusive.

FINDING 4: EOCs are generally positively correlated with high school graduation rates.

The effects of EOCs on graduation rates are generally positive, with the impacts of math and ELA EOCs being statistically significant. There is a negative correlation between science EOCs and graduation rates, but it is not statistically significant (Figure ES-4).

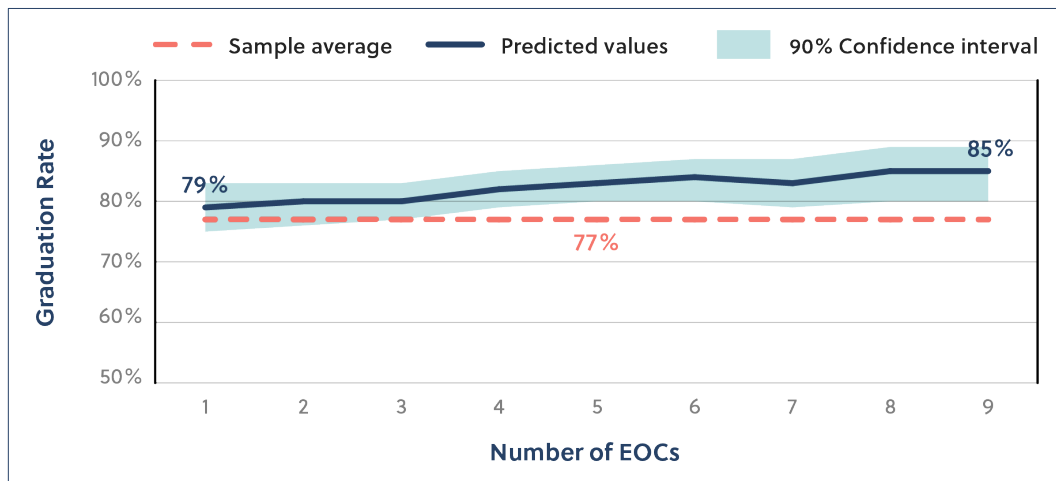
Figure ES-4. Most EOCs have a positive correlation with high school graduation rates. Science EOCs have a negative, though statistically insignificant, correlation.



Note: Broken outline indicates statistical significance greater than $p < 0.10$. $N=720$.

A greater number of EOCs administered correlates generally with higher graduation rates. For example, the mean graduation rate for states during our study is 77 percent, but the predicted graduation rate for a state with nine EOCs is 85 percent.

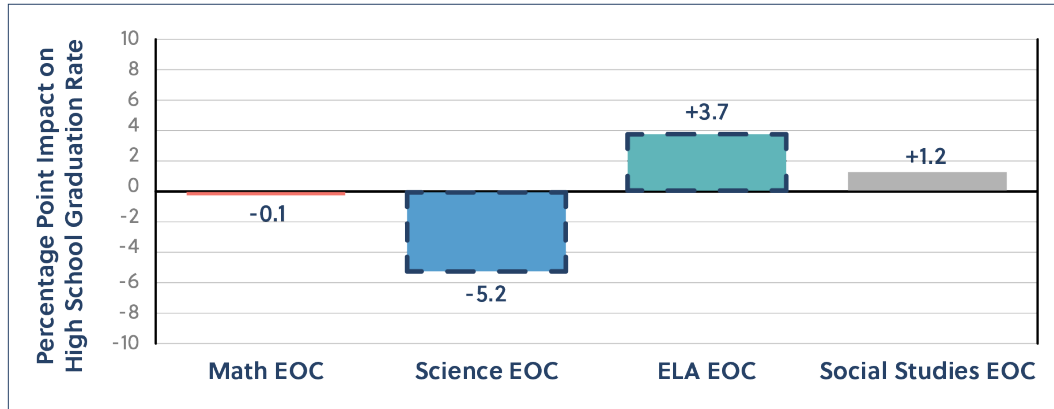
Figure ES-5. The number of EOCs a student takes correlates positively with the probability of graduation.



Note: The broken red line is the sample average, and the shaded areas are 90 percent confidence intervals. Both the (blue) coefficient line and the confidence intervals are three-unit moving averages. $N=720$.

When analyzing the relationship that EOCs have with the graduation rates of black and Hispanic students, the pattern is less clear (Figure ES-6). Having a science EOC is associated with a 5.2 percentage point decrease in the graduation rate. Still, this effect is largely counteracted by the positive impacts of ELA and social studies EOCs.

Figure ES-6. For black and Hispanic students, ELA EOCs have a positive correlation with high school graduation rates, while science EOCs have a negative correlation.

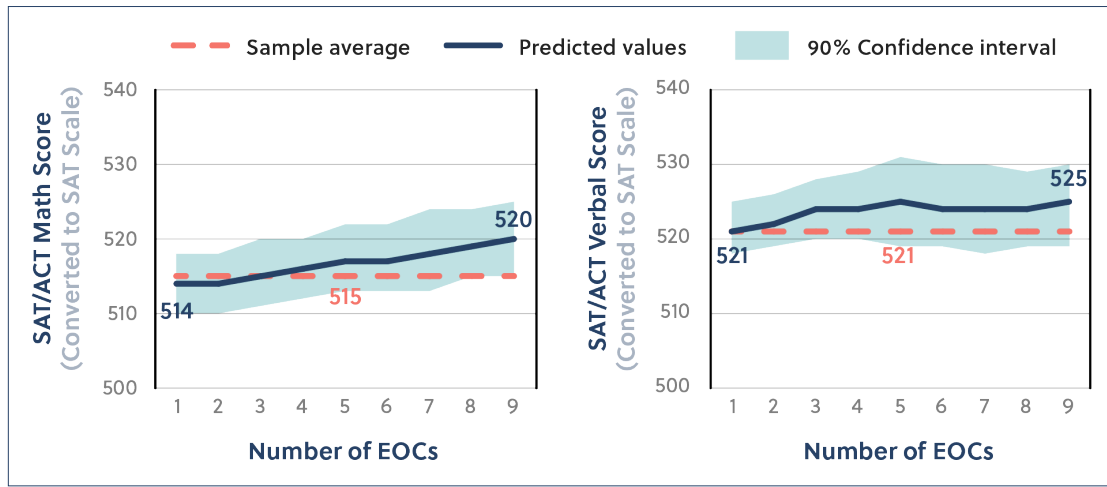


Note: Broken outline indicates statistical significance greater than $p < 0.10$. N=598.

FINDING 5: When analyzing EOCs by subject area, there is no statistically significant correlation with college entrance exam scores, but students in states with the most EOCs appear to outperform other students on these exams.

When we look at the relationship between having an EOC in a specific subject and college entrance exam scores in that subject, EOCs do not make a discernible difference. Yet the association strengthens when we examine the overall number of EOCs that states administer (Figure ES-7). In math, student performance on college entrance exams ticks up as the number of EOCs rises, although the differences only approach statistical significance for states with the greatest number of EOCs. Specifically, when states have eight or more of these exams—which six states did at some point during the study period—their students outperform the average college entrance exam score by four to five points on the SAT scale. For ELA, we find that states with three or more EOCs tend to slightly outperform states with no or fewer EOCs, although the differences are not statistically significant.

Figure ES-7. The more EOCs a state administers, the better students perform on college entrance exams, suggesting that any positive effects of EOCs may be cumulative.



Note: The broken red line is the sample average, and the shaded areas are 90 percent confidence intervals. Both the (blue) coefficient line and the confidence intervals are three-unit moving averages. N=720.

Turning to subgroup impacts, we see no evidence that EOCs harm the scores of black and Hispanic students, as their performance in states with EOCs is never lower than in those states *without* them.

Tyner and Larsen draw three implications from these findings.

States should leverage the potential benefits associated with external assessments without encountering the concerns raised about exit exams.

Although external assessments have been shown in many studies to increase student learning, they have faced extensive criticism in the U.S. due to other studies showing that pass-fail exit exams have slowed the rise of graduation rates. EOCs have no such negative effects—and, in some cases, have positive impacts on these rates. In other words, the key argument against exit exams—that they depress graduation rates—does not hold for EOCs.

States should consider building their high school accountability systems around EOCs given the suggestive evidence that such an approach will help them see better student outcomes.

When we look at the overall number of EOCs offered by states, we find strong clues that those that use EOCs as a central part of their high school accountability systems outperform other states in college entrance exam scores and graduation rates, even after controlling for a range of demographic factors, prior performance, and other relevant variables.

States should take advantage of the different ways that EOCs can promote accountability at the high school level.

The ability of states to customize the use and application of EOCs is a key strength of these tests. In jurisdictions that want to incentivize students to take their coursework seriously, EOCs can be used as graduation requirements, as part of course grades, or to augment the information on student transcripts. In states seeking greater quality control over high school coursework, EOCs can be deployed without “stakes” but with their results publicly reported so as to tamp down on grade inflation or abuse of credit-recovery programs. For states that want to set goals for schools and provide information to families about student progress, EOC results can be included in school accountability metrics. And for states that prefer a more hands-off approach, EOCs can be optional for districts.

The use of high-quality, content-linked external assessments could help push our education system toward mastery rather than seat time—a coveted goal, especially among advocates of competency-based and personalized models. That’s unlikely to happen, however, in the absence of external measures that schools and employers can trust. Adroitly deployed, EOCs can play this role.

Introduction

For almost four decades now—ever since the release of *A Nation at Risk* in 1983—American policy leaders have been committed to raising standards as an essential part of improving the outcomes of our public education system.¹ They have tried a variety of approaches, from boosting high school course requirements in the 1980s to introducing statewide assessment and accountability systems in the 1990s and the No Child Left Behind (NCLB) and Race to the Top (RTT) reforms in the 2000s and 2010s.

However, despite the achievement gains made by our lowest-performing students at the elementary and middle school levels (particularly in math), these improvements have not endured through high school, according to the National Assessment of Educational Progress (NAEP). This is one of the great disappointments—and puzzles—of modern education reform.

Yet federal accountability for student learning has never been effectively targeted at high schools. Although both NCLB and 2015's Every Student Succeeds Act (ESSA) require states to assess students in multiple subjects every year through most of elementary and middle school, there has never been a federal requirement for more than a single assessment of math, English, and science skills during the entire four years of high school. Under these federal laws, graduation rates are the only other reporting requirement that represents student academic achievement in high schools. Moreover, that heavy focus on graduation rates by both the federal and state governments has often allowed local schools and districts to determine how students meet diploma requirements, creating obvious moral hazard and likely prompting the development of new programs of questionable rigor, such as "credit recovery."

Federal accountability for student learning has never been effectively targeted at high schools.

Politicians and educators can talk about "higher standards," but raising standards is difficult when it means taking direct action of a punitive sort, whether that means closing a chronically failing school, retaining a third grader who cannot read, or—especially—denying a diploma to a high school student who dutifully sat through the required courses but did not learn much.

EXTERNAL ASSESSMENT & END-OF-COURSE EXAMS

One response to these challenges is to separate the doers from the determiners—that is, stop letting schools and districts “grade their own papers” and allowing those grades to serve as the sole determinants of diploma readiness. External assessment makes this possible.

This is not a new idea. Other countries have embraced the use of examinations with high stakes for students for years (and, in the case of China, for centuries). In the 1990s and 2000s, many American states embraced graduation exams—most famously Massachusetts and its well-regarded MCAS system, a fairly rigorous examination that almost every student had to pass in order to receive a diploma. Yet recent years have found many policymakers and scholars souring on such exit exams, not just because of the political issues they raise but also because of some rigorous studies showing that they tend to encourage low-performing students to drop out without finding strong evidence that they improve student learning.² Given that these exams are often quite generic—testing low-level reading and math skills disconnected from what students are learning in their classes—that shouldn’t be so surprising.

Beginning in the late 1990s, states increasingly turned to another form of external assessment at the high school level: end-of-course exams (EOCs). This kind of test is connected to what students are learning in their courses and is designed to assess precisely the content that those courses are supposed to cover. In this way, EOCs may help states overcome one of the main challenges that arose after *A Nation at Risk*, when the raising of course requirements resulted in many districts altering course names and descriptions to evade true compliance.

End-of-course exams are connected to what students are learning in their courses and designed to assess precisely the content that those courses are supposed to cover.

States’ use of EOCs exploded into the early 2010s. All told, 32 states and the District of Columbia have used them for accountability at some point, whether for Algebra, Biology, English, U.S. History, or other subjects. In the last five years, however, the number has shrunk, as some states have jettisoned EOCs or reduced the stakes associated with them for students and schools.

In some cases, states use these EOCs as a type of graduation exam, though here things grow complicated (see *EOCs versus Exit Exams*, page 17). Only rarely do students have to pass specific tests in order to graduate, because in most cases there are alternatives, and in many cases students have choice in which exams and courses are used to meet the requirements. States have experimented with other ways of making the tests “count,” both for schools (in their accountability systems) and for students. Requiring that the test results be included in students’ final grades is one popular approach; putting the test results on students’ transcripts is another approach.

Properly deployed, EOCs may help to uphold standards, both the integrity of course definitions and the value of a high school diploma. Studies from around the world suggest that they may have other benefits, as well.³ First, they could encourage high school students to work harder—not an insignificant thing, given how many students report that they are not challenged at school.⁴ They also tend to put students and teachers on the same team: Rather than placing teachers in the uncomfortable position of deciding whether their students have met standards, especially high-stakes ones that will determine whether they can graduate, that role is accomplished externally, allowing the teacher to focus on helping students climb the mountain that is the exam.⁵ External assessment may also support collaboration among students and positive peer norms, as students know that they are not being graded relative to each other but according to an external yardstick.⁶

In this respect, state-mandated EOCs share some similarities with Advanced Placement (AP) and International Baccalaureate (IB) tests, which are now taken by nearly one-third of all U.S. high school students.⁷ Nobody questions whether “AP Physics” is really AP Physics; the College Board ensures that the course is the same everywhere, and the rigorous, anonymously graded external exam serves as a check. AP teachers are freed to focus their energies on helping their students learn the material and then succeed on the test. Because of this virtuous cycle, there is good evidence that the AP experience is linked to better long-term outcomes for students in terms of college going and persistence.⁸

What has been difficult to determine, however, is just how states are using EOCs and whether their use is associated with positive outcomes for kids. Do EOCs encourage low-performing students to drop out, as some research indicates that graduation exams do? Do they have a positive impact on achievement, as some studies of AP exams suggest? Or are they a neutral influence—a way for states to maintain standards without the downsides of graduation exams? The following analysis seeks to answer these questions.

ORGANIZATION OF THE REPORT

In this report, we describe the patterns of EOC adoption over time, enabling readers to see which subjects are most commonly assessed and which types of accountability are most often implemented. Also, for the first time since the dramatic rise in the use of EOCs, we investigate the relationship between EOC policies and important student outcomes, including graduation rates and performance on the SAT or ACT—although this analysis is necessarily limited by the lack of uniform nationwide achievement measures for all high school students, which would enable comparisons across states.⁹

In the pages that follow, we first describe national trends in the adoption of state-mandated EOCs, how the exams are used in school accountability systems, and how they “count” for students—as graduation requirements, in student grades, and so forth. Then we describe our methodology for an impact analysis, looking at the relationship between state EOC policies in the 33 states that have used these assessments over the last 20 years and key student outcomes, including high school graduation and performance on the SAT or ACT. We conclude with key takeaways for policymakers.

EOCs Versus Exit Exams

Although the distinction is not absolute, it's important to distinguish EOCs from "exit exams," about which much more research has been conducted. The latter are statewide exams that often test low-level skills and are required for high school graduation; critics argue that they fail to improve student learning, while encouraging dropping out. The research on dropouts has shown some contradictory results,¹⁰ but recent studies of the effect of exit exams on academic achievement have shown no effect on NAEP outcomes,¹¹ small negative effects on SAT scores,¹² and—in California—no effect on academic achievement.¹³ And if exit exams make more students give up on school, it is possible that their negative effects could extend beyond the schoolhouse door.¹⁴ In the U.S., researchers have suggested both positive and negative effects of exit exams on adult outcomes such as wages, employment, and crime.¹⁵ Although some states, such as Massachusetts, have seen improvements that may be attributable to a strong exit exam system, enough evidence points to exit exams having negative effects without boosting achievement that concern about them is warranted.

Although states can make passing EOCs a graduation requirement (essentially making them a type of exit exam), they can also be used in other ways for accountability purposes, and a substantial volume of research from the late 1990s and early 2000s illustrates this potential.¹⁶ For example, when they have variable outcomes (as opposed to pass/fail) and are delinked from graduation requirements, EOCs may provide clearer signals of achievement than teacher-conferred grades, while avoiding the potential negative effects of exit exams. Improving such signals gives students a greater stake in their own performance and can counteract the effects of grade inflation: A recent study in North Carolina finds that EOC scores are better predictors of college readiness (as measured by ACT scores) than grades or class attendance.¹⁷

Concerns about negative effects of exit exams, as well as wider anxieties about testing and over-testing, have led some researchers to recommend that states drop them as graduation requirements—and some states have done so. As shown in Figure 1, just 12 states will require students in the class of 2020 to pass exit exams, falling from a peak of 30 states requiring them for the class of 2003. In the next section, we show how the use of EOCs has increased over most of that same period.

Figure 1. Many states have recently dropped their exit exam requirements.



Note: Data are derived from the *Digest of Education Statistics* for the classes of 2001 to 2017 and from the anti-testing group FairTest for the class of 2020.¹⁸

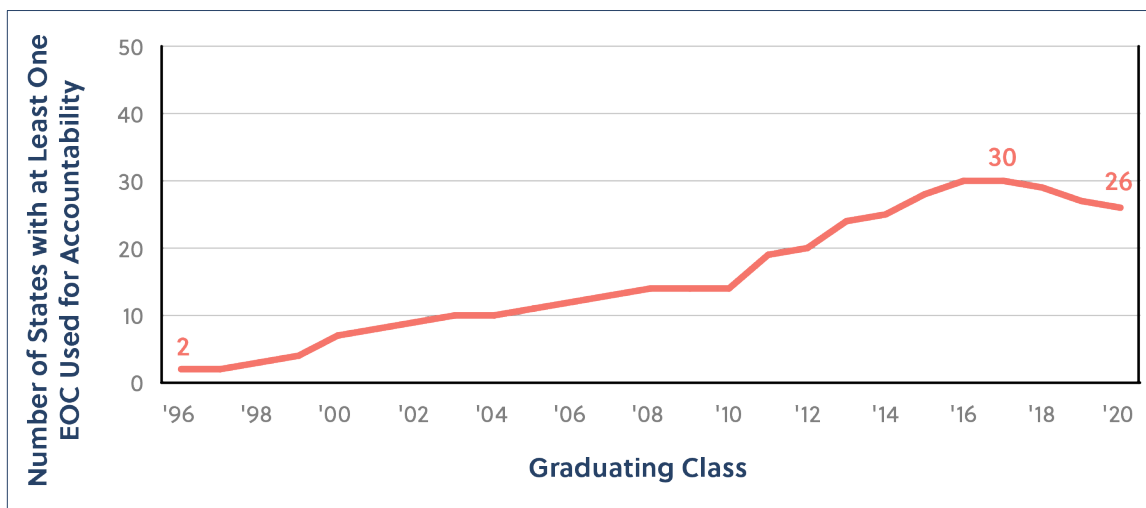
Trends in EOC Exam Adoption

Before examining relationships between the use of end-of-course exams and any impacts on student achievement, let's look at state policies related to EOCs over the past 20 years.¹⁹

FINDING 1: The use of EOCs increased dramatically since the late 1990s but in the past few years has declined somewhat.

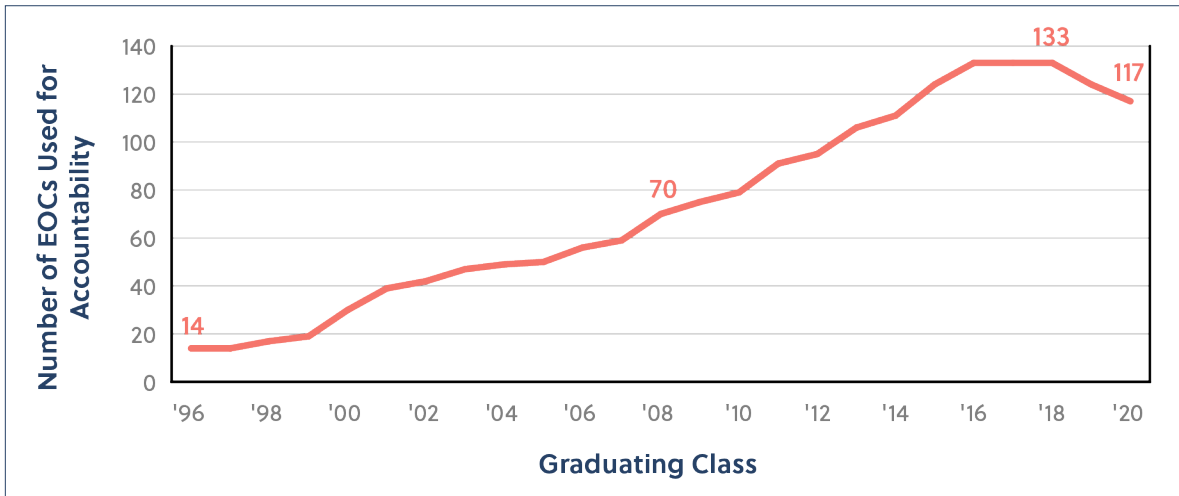
As shown in Figure 2, taking EOCs was not a common practice for students 25 years ago, when only New York and North Carolina administered them. In the class of 2008, students in 14 states took at least one EOC that was used for accountability purposes (either for schools or for students); by the class of 2017, students in 30 states did so. In the past three years, however, several states (including Alabama, Delaware, and Oklahoma) have moved to eliminate mandatory EOCs, meaning that future student cohorts will not take them. (Indiana also recently eliminated EOCs, although a biology EOC is still scheduled to go into effect for the class of 2022.) Some other states—including Hawaii, Maryland, Tennessee, Texas, and Washington—have preserved some EOCs but reduced their number. Figure 3 shows a similar trend, this time tabulating the overall number of EOCs administered across all states in a given year.

Figure 2. Many states adopted EOCs over the past 25 years, but this trend may be reversing.



Note: Multiple sources used, including state websites, media reports, and documentation from the Education Commission of the States and other organizations. See *Section II* for more information on the sample.

Figure 3. The number of EOCs in use has grown over time but recently fallen.



Note: Multiple sources used, including state websites, media reports, and documentation from the Education Commission of the States and other organizations. Data are approximate, due to aggregating similar EOCs and EOCs for optional courses, and we do not code all optional and uncommon EOCs in states with many EOCs. See Section II for more information on the sample.

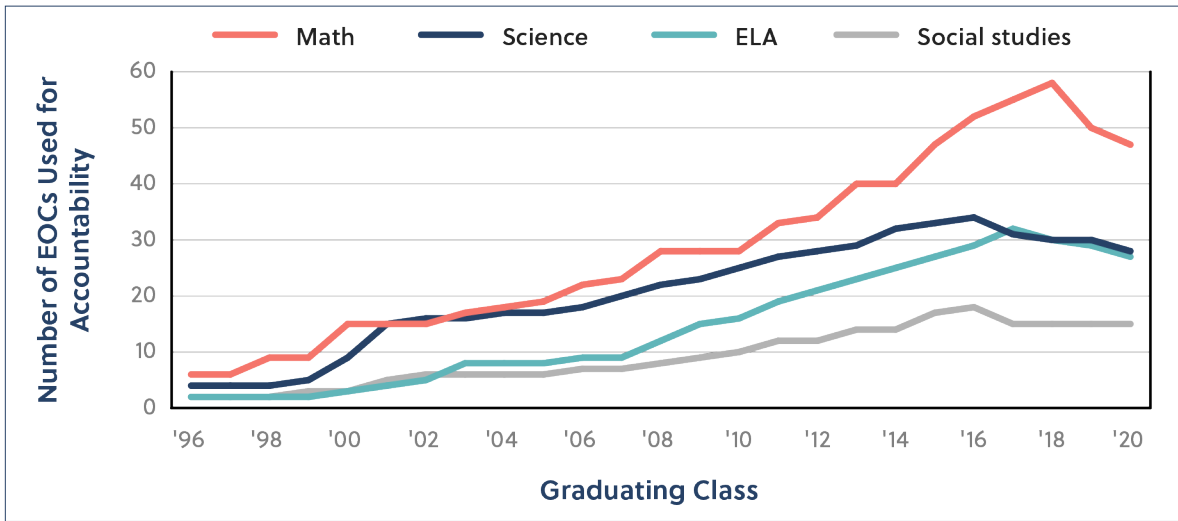
FINDING 2: EOCs have been most widely used in math and science courses, but their use in English courses has risen fastest in the past decade.

As shown in Figure 4, math EOCs have been the most widely deployed. Science and English are almost tied for second most widely used. Although social studies EOCs are less common, U.S. History is the third most widely used EOC overall (Table 1), after Biology and Algebra I. (For a list of all the courses we categorized by subject area, see Table A-1 in Appendix A.) Of course, the use of EOCs may to some extent reflect the number of courses in each subject that students typically take during high school.

Table 1. EOCs are most common in Biology and Algebra I.²⁰

EOC	STATES USING IN 2016
Biology	22
Algebra I	16
U.S. History	14
English II	12
Geometry	10
Algebra II	9
English I	8
Integrated Math I	6
Integrated Math II	6
Chemistry	5
English III	5

Figure 4. EOCs have most commonly been used for math, science, and English courses.



Note: Multiple sources used, including state websites, media reports, and documentation from the Education Commission of the States and other organizations. Data are approximate, due to aggregating similar EOCs and EOCs for optional courses, and we do not code all optional and uncommon EOCs in states with many EOCs. See *Section II* for more information on the sample.

FINDING 3: Most state use of EOCs involves a mix of school and student accountability.

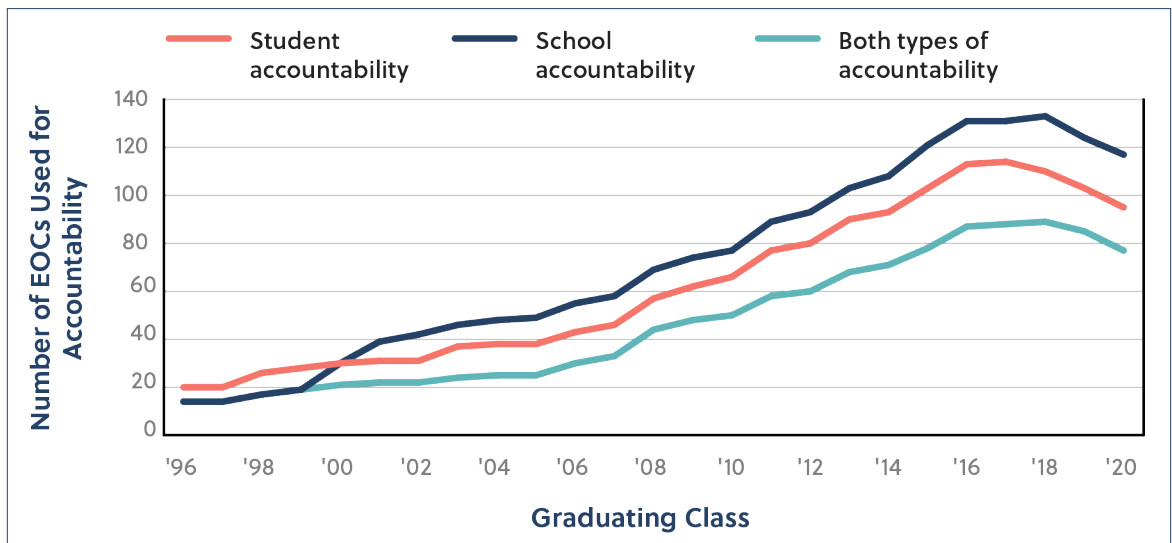
Most states using EOCs have used them for both school and student accountability, though the former has been more common for almost the entire period of study (Figure 5). States vary greatly, however, in the kinds of stakes attached to EOCs, with a few attaching no stakes at all.²¹ Others use EOCs to hold schools accountable, where their results are included in state accountability metrics, creating potential incentives and consequences for teachers and administrators.²² Since 2016, when ESSA began to require tests of math, English, and science in high school, some states use EOCs to fulfill this requirement, in part or in full.

States also use EOCs to hold students accountable. In New York, for example, passing five of the Regents Exams is required for graduation with a “Regents Diploma.”²³ Other states, like Nevada and North Carolina, now include EOC scores in students’ course grades, rather than requiring a passing score on the test itself for graduation, as they once did. Indiana has experimented with printing EOC scores directly on student transcripts, as Arkansas also did in the 2000s. Still other states require students to pass the EOC in order to pass the course, which can turn it into a de facto graduation requirement if passing is required for a student to receive her diploma.²⁴

States also differ in the weights attached to EOC results when they are included in course grades. For instance, the proportion of students’ final grades that are derived from their EOC scores ranges from 10 to 25 percent in states that use them this way. In Georgia, Nevada, and Tennessee, among others, there has been a gradual phase in, with the EOC score comprising 10 to 15 percent of a student’s final course grade in the first year, rising to 20 or 25 percent a few years later.

In reality, EOCs are rarely “high stakes,” no matter how they are used. In almost all cases, a single EOC is, at most, a “medium-stakes” test for students, accounting for perhaps one-quarter of a student’s final course grade or serving as one of several assessments from which students can choose to fulfill their graduation requirements.²⁵ Likewise, when EOC results are included in state accountability metrics, they represent one among multiple outcomes for which schools are held accountable.

Figure 5. EOCs have often been used for a mix of school-level and student accountability, but school-level accountability has generally been more common.

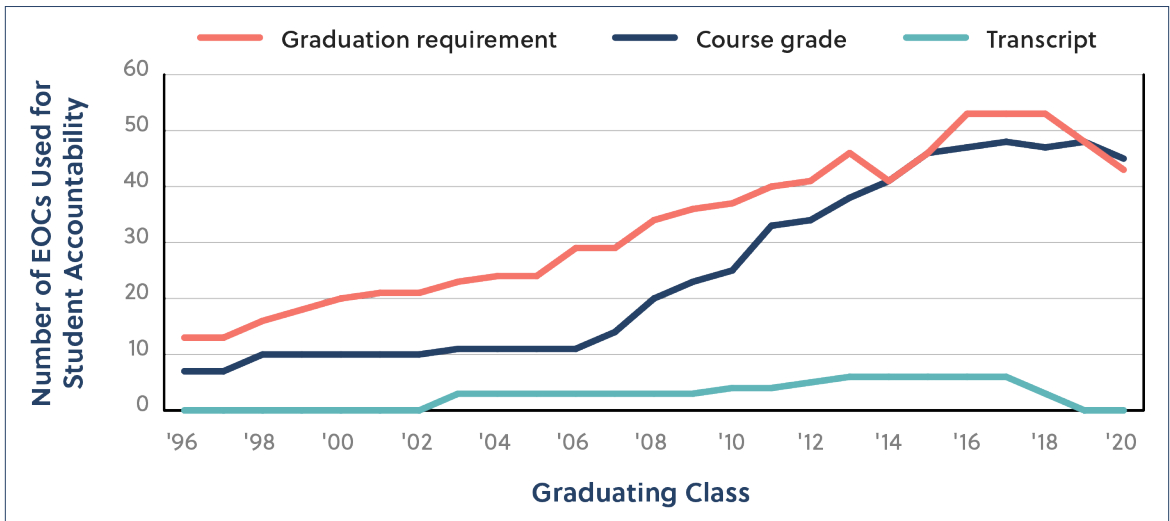


Note: Multiple sources used, including state websites, media reports, and documentation from the Education Commission of the States and other organizations. Data are approximate, due to aggregating similar EOCs and EOCs for optional courses, and we do not code all optional and uncommon EOCs in states with many EOCs. Categories are not mutually exclusive. See *Section II* for more information on the sample.

When employed for student accountability, EOCs have most often been used as graduation requirements. Yet over time, the inclusion of EOC results in student grades has caught up with their use as graduation requirements (Figure 6). When states have adopted EOCs in recent years, they have more commonly incorporated EOC results into student grades, and Nevada and North Carolina have recently shifted from requiring passing EOCs for graduation to incorporating EOC scores in students’ course grades. This change in the types of stakes for students could be viewed as lowering the stakes associated with EOCs—although because many students are not on the “bubble” of passing or failing the EOCs, it may also have the effect of increasing the share of students to whom some stakes apply.

A less popular form of student accountability is including EOC scores on students’ transcripts, as Arkansas did when the state provided paper stickers to schools to mark EOC proficiency levels on students’ transcripts until the state abolished its EOCs in 2015.

Figure 6. When used for student accountability purposes, EOCs have most often functioned as requirements for graduation (i.e., exit exams), although incorporating EOC scores into course grades has become increasingly popular.



Note: Multiple sources used, including state websites, media reports, and documentation from the Education Commission of the States and other organizations. Data are approximate, due to aggregating similar EOCs and EOCs for optional courses, and we do not code all optional and uncommon EOCs in states with many EOCs. Categories are not mutually exclusive. See Section II for more information on the sample.

Impact Analysis: Data & Methods

We use three types of data, including data on each state's high school assessment policies, on our outcomes of interest (graduation rates and scores on college entrance exams), and various control-variable data. The unit of analysis is the "state-class"—for example, Ohio students who graduated in 2005 and had entered high school four years earlier.

STATE POLICIES

State EOC policy data were collected from published reports, official state websites, and communication with state departments of education (including Washington, DC).²⁶ We collected information on which students took the exams in which years, the subjects tested on the exams, and what type of stakes or consequences were tied to them.

Because of the decentralized nature of high school assessment policy, there are many idiosyncrasies and variations across states regarding how EOCs are used; in some cases, we had to make judgment calls about which exams to include. Generally, we include math EOCs (Algebra I, Geometry, Algebra II, and Integrated Math I–III), the other six most common EOCs (Biology, Chemistry, English I–III, and U.S. History), as well as one additional "wild card" EOC for each state, when applicable.²⁷ To verify whether we had accurately coded EOCs, we contacted individual state assessment officials and received responses from 24 of the 36 states with any EOCs during the study period.²⁸

The *Digest of Education Statistics* codes states with EOCs that are used as graduation requirements as having exit exams, which we combined with EOC data. We created a new variable indicating whether a state has exit exams but not EOCs, and we use this variable as a control in our models (for more on the differences between the two, see *EOCs Versus Exit Exams*, page 17).

Because it is not possible to identify specific types of accountability for each individual year, we generally code states for all years based on the typical form(s) of accountability for which the EOC has been used in that state during the study period.²⁹ As all types of accountability (whether for students, schools, or both) may impact outcomes, either by incentivizing students directly or encouraging schools to get students to learn more, we combine these forms of accountability when analyzing the potential impacts of EOCs on student outcomes.³⁰

OUTCOMES

We examine two academic outcomes that are potentially impacted by EOC policy: high school graduation rates and college entrance exam scores.³¹

We compute high school graduation rates from 1990 to 2009 based on data from the U.S. Department of Education's (ED) Common Core of Data using the adjusted-cohort graduation rate method,³² and we include 2011 to 2016 data from the ED's EdFacts website, which was computed using a similar method.³³

The ACT organization provided ACT data for the graduating classes of 1998 to 2017, and SAT data are publicly available from 1998 to 2016. We analyze which of the two college entrance exams had a higher participation rate for each graduating class in each state. To put these data on a common scale, we use an ACT-SAT score concordance endorsed by the College Board and the ACT organization.³⁴ Although the data on college entrance exams are not ideal, particularly given that not all students take these exams, they are the only national assessments that are taken by a high proportion of high schoolers on a yearly basis.³⁵

CONTROL VARIABLES

We employed various demographic controls, including the share of Asian, black, Hispanic, and white high-school-age population; median income; and education levels from the American Community Survey (ACS) in the years 2000 to 2016. For assessment outcomes, we include controls for the share of students in a given cohort who took the assessment and the demographics of exam takers (excluding racial/ethnic demographics from the ACS in these analyses). Although it is impossible to fully control for policy changes that may have occurred in conjunction with changes to EOC policies, we control for teacher-student ratio, per-pupil spending, and non-EOC exit exams to help control for other education policies.³⁶ Additionally, we include both state and year (class) fixed effects in each regression.

RESEARCH METHODS

We use the data described above to estimate impacts of EOC policies on student outcomes, controlling for state and year (class) fixed effects as well as the demographic compositions of each class of students in each state. Our preferred model includes the effects of administering any EOCs in each subject—math, English language arts (ELA), science, and social studies—for a class, and we also include results from some models where we estimate the effect of the overall number of EOCs administered. For more on the difference-in-differences models used to estimate effects, see *Appendix B*.

Do EOC Exams Influence Student Outcomes?

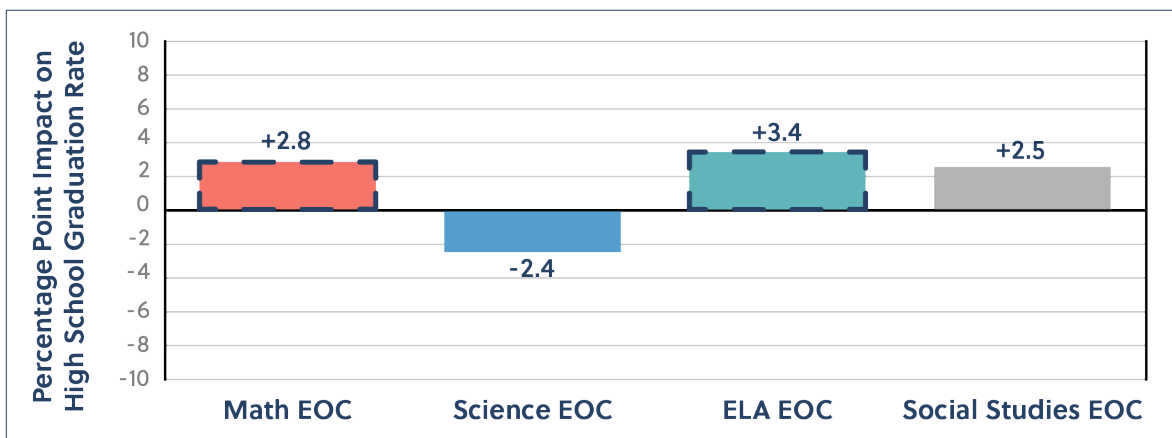
This section examines the potential impacts of EOC policies on student academic outcomes, namely high school graduation rates and college entrance exam scores.³⁷

GRADUATION RATES

FINDING 4: EOCs are generally positively correlated with high school graduation rates.

The effects of EOCs on graduation rates are generally positive, with the impacts of math and ELA EOCs statistically significant. There is a negative correlation between science EOCs and graduation rates, but it is not statistically significant (Figure 7).

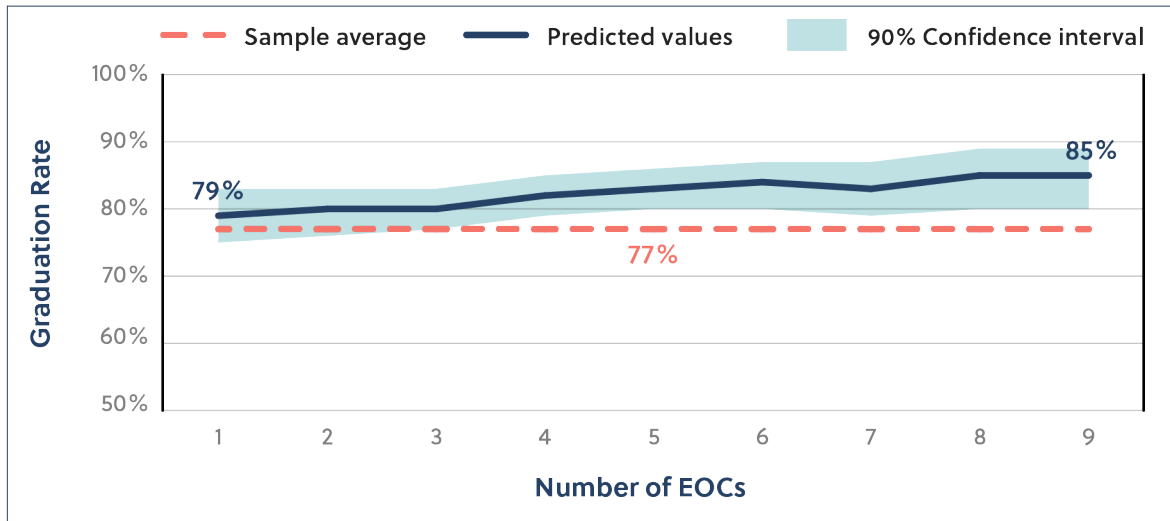
Figure 7. Most EOCs have a positive correlation with high school graduation rates. Science EOCs have a negative, though statistically insignificant, correlation.



Note: Broken outline indicates statistical significance greater than $p < 0.10$. N=720.

This finding is robust to our alternative approach, which examines the effect of the number of EOCs on high school graduation (Figure 8). In general, a greater number of EOCs correlates with higher graduation rates. For example, the mean graduation rate for states during our study is 77 percent, but the predicted graduation rate for a state with nine EOCs is 85 percent.

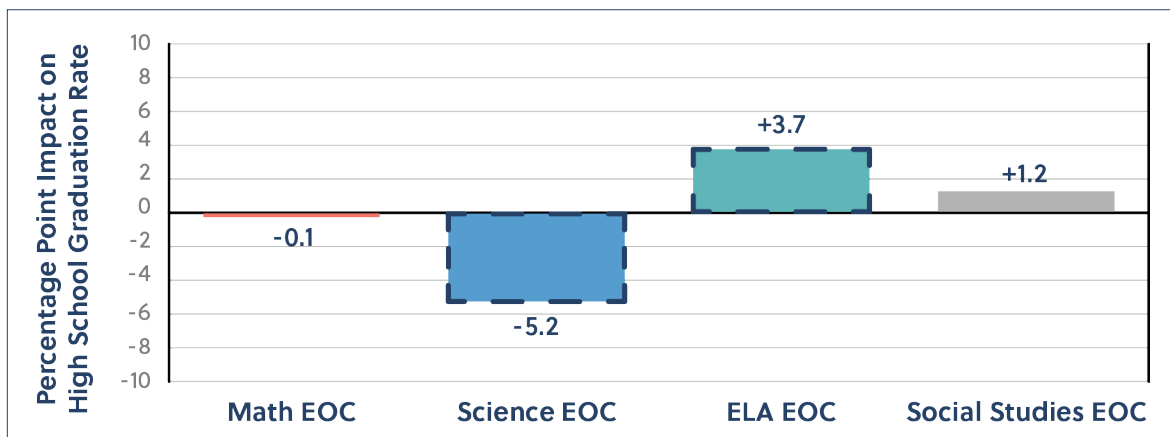
Figure 8. The number of EOCs a student takes correlates positively with the probability of graduation.



Note: The broken red line is the sample average, and the shaded areas are 90 percent confidence intervals. Both the (blue) coefficient line and the confidence intervals are three-unit moving averages. N=720.

When analyzing the relationship of EOCs to the graduation rates of black and Hispanic students, the pattern is less clear (Figure 9). Having a science EOC is associated with a 5.2 percentage point decrease in the graduation rate. Still, this effect is largely counteracted by the positive impacts of ELA and social studies EOCs. Having an ELA EOC is associated with a 3.7 percentage-point increase in the graduation rate, while having a social studies EOC is associated with a 1.2 percentage point increase, although the latter is not statistically significant.

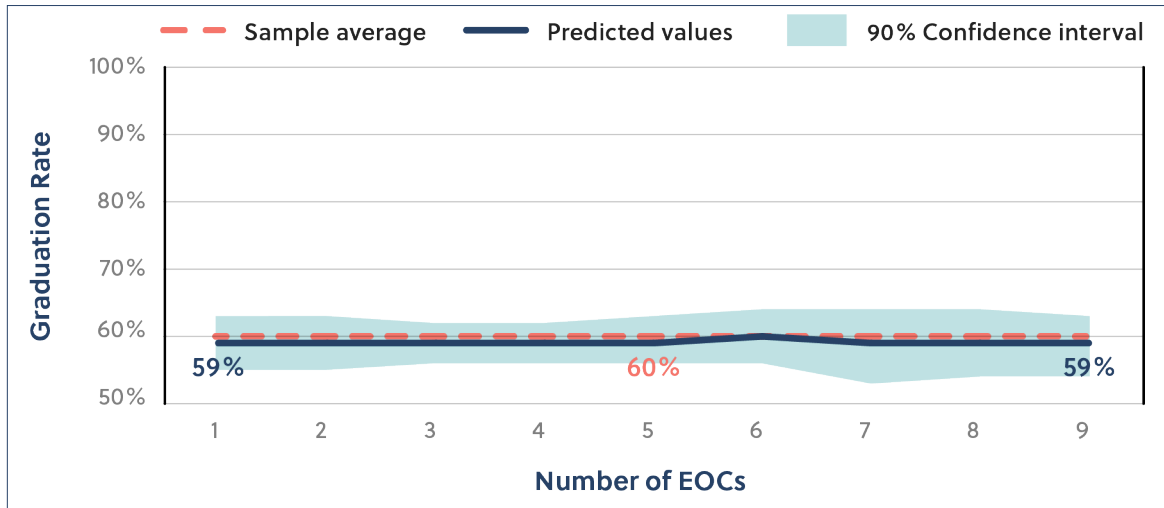
Figure 9. For black and Hispanic students, ELA EOCs have a positive correlation with high school graduation rates, while science EOCs have a negative correlation.



Note: Broken outline indicates statistical significance greater than $p < 0.10$. N=598.

Analysis of the number of EOCs supports the notion that the effects of different-subject EOCs on black and Hispanic graduation rates negate one another; we find no correlation between the number of EOCs and the probability of graduating high school for black and Hispanic students (Figure 10). The mean graduation rate for these students is 60 percent during this period, and the estimated graduation rate is nearly the same no matter how many EOCs a state administers.

Figure 10. The number of EOCs administered by a state does not appear to affect the probability of black and Hispanic students graduating from the state’s high schools.



Note: The broken red line is the sample average, and the shaded areas are 90 percent confidence intervals. Both the (blue) coefficient line and the confidence intervals are three-unit moving averages. N=598.

In sum, EOCs are generally positively correlated with high school graduation rates, and taking more of them appears to boost those rates. This finding contrasts with the literature on high school exit exams, where some studies have found negative effects on graduation.³⁸

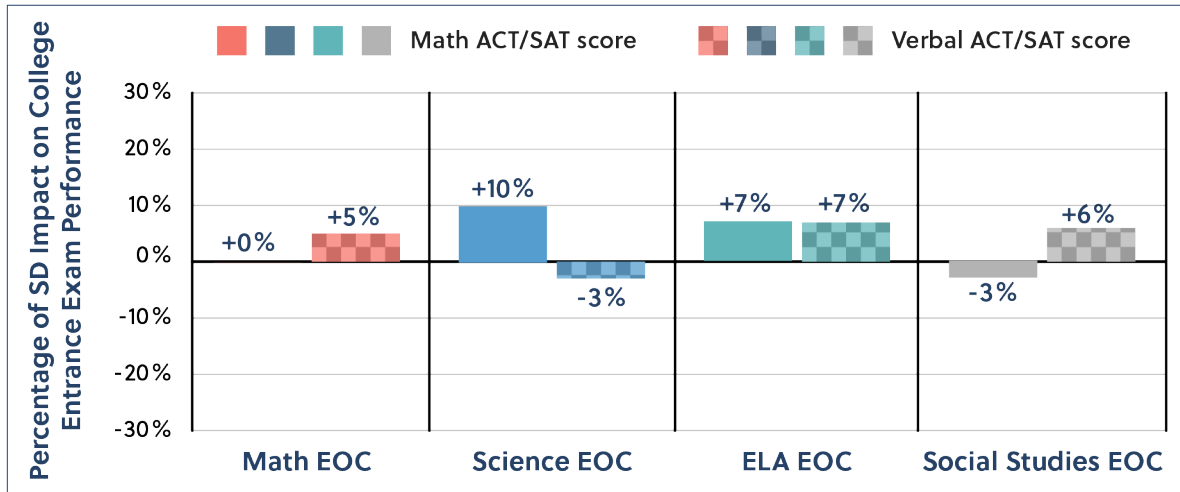
COLLEGE ENTRANCE EXAMS

FINDING 5: When analyzing EOCs by subject area, there is no statistically significant correlation with college entrance exam scores, but students in states with the most EOCs appear to outperform other students on these exams.

Our preferred model examines the impact of taking at least one EOC in each of the four primary subject areas (i.e., math, science, ELA, and social studies). The effects of EOCs on college entrance exam taking are generally positive but statistically insignificant (Figures A-1 and A-2 in *Appendix A*). Likewise, correlations between EOCs and college entrance exam scores (both verbal and math) are generally positive but statistically insignificant

(Figure 11). Further, there is no clear “subject alignment”: Math EOCs have less of a positive correlation with math scores than with verbal scores, and ELA EOCs have no greater impact on verbal scores than on math scores.³⁹ In sum, when looking at the relationship between having an EOC in a specific subject and college entrance exam scores in that subject, EOCs are not making a discernible difference.

Figure 11. When analyzing EOCs by subject area, there are no statistically significant differences in college entrance exam performance between students in states with and without EOCs.



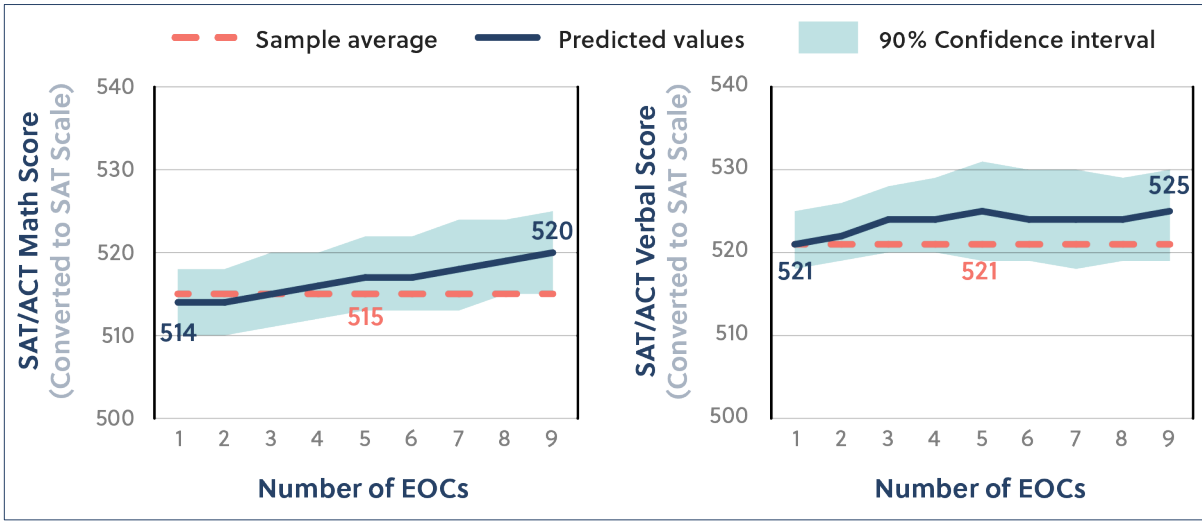
Note: Broken outline indicates statistical significance greater than $p < 0.10$ (no effects are statistically significant). The outcomes are math and verbal scores on the ACT or SAT, depending on which assessment is more common in the given state for a given state-cohort observation. N=720.

The association between EOCs and college entrance exams strengthens when we examine the overall number of EOCs that states administer (Figure 12).⁴⁰ In math, student performance on college entrance exams ticks up as the number of EOCs rises, although the differences only approach statistical significance for states with the greatest number of EOCs. Specifically, when states have eight or more EOCs, students outperform the average college entrance exam score by four to five points on the SAT scale.⁴¹

For ELA, we find that states with three or more EOCs tend to slightly outperform states with no or fewer EOCs, although the differences are not statistically significant.⁴² Altogether, these results suggest that the effect of EOCs may be cumulative and states that orient their high school accountability systems more around EOCs may see some gains in student learning, insofar as that is gauged by college entrance exams.

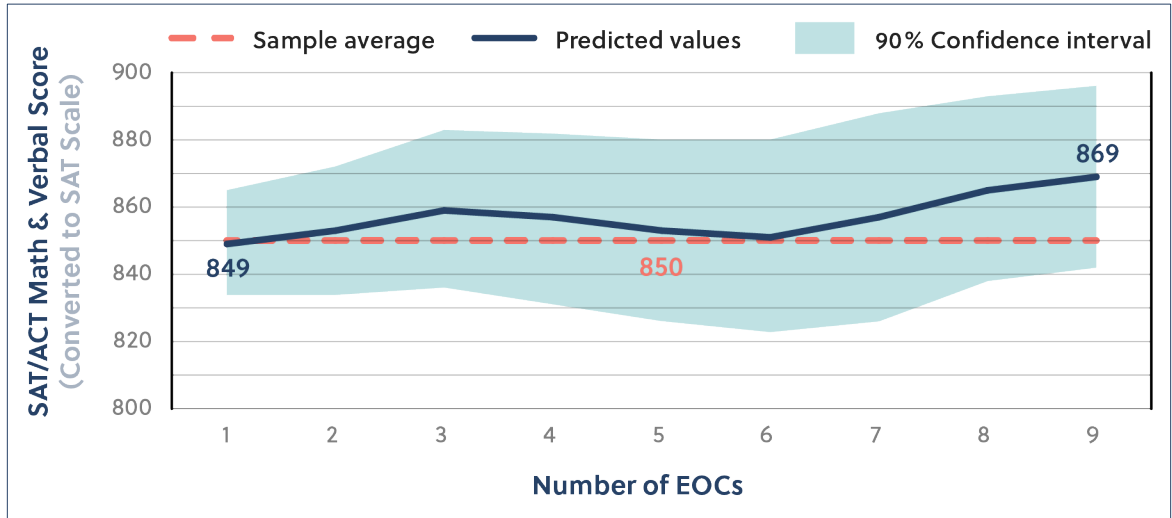
The picture looks somewhat different for black and Hispanic students (Figure 13). Although their performance is slightly higher in states administering the most EOCs, the differences are small and not statistically significant. Overall, we see no evidence that EOCs harm the scores of black and Hispanic students, as their performance in states with EOCs is never lower than in those states without them (neither do we see statistically significant effects when looking at EOCs by subject area).

Figure 12. The more EOCs a state administers, the better students perform on college entrance exams, suggesting that any positive effects of EOCs may be cumulative.



Note: The broken red line is the sample average, and the shaded areas are 90 percent confidence intervals. Both the (blue) coefficient line and the confidence intervals are three-unit moving averages. N=720.

Figure 13. Performance of black and Hispanic students on college entrance exams is highest in states with the most EOCs, but differences are statistically insignificant.



Note: The broken red line is the sample average, and the shaded areas are 90 percent confidence intervals. Both the (blue) coefficient line and the confidence intervals are three-unit moving averages. N=720.

Policy Implications

As states reevaluate their high school accountability and testing policies, we draw three lessons from this study.

Leverage the potential benefits associated with external assessments without the concerns raised about exit exams.

This report's findings of some positive effects of EOCs on student outcomes, while limited, dovetail with numerous studies from the U.S. and around the world on the effects of external exam systems on student achievement. Yet while external assessments have been shown in many studies to increase student learning, they have faced extensive criticism in the U.S. due to other studies showing that pass-fail exit exams have slowed the rise of graduation rates (see *EOCs Versus Exit Exams*, page 17). As a 2011 blue-ribbon panel on the use of exit exams put it, "High school exit exam programs, as currently implemented in the United States, decrease the rate of high school graduation without increasing achievement."⁴³ The negative impact on high school completion is concerning, but it's also worth keeping in mind that as graduation rates have soared in recent years, other measures of achievement have not kept pace.⁴⁴

Still, raising graduation rates remains a key goal for high schools in most states, and when we examine the effects of EOCs on these rates, we find no negative effects—and in some cases, positive ones. In other words, the key argument against exit exams—that they depress graduation rates—does not hold for EOCs.

The key argument against exit exams—that they depress graduation rates—does not hold for EOCs.

In 2014, New America's Anne Hyslop argued against states requiring high school exit exams but speculated that "students can be motivated to work hard in high schools by using assessments toward final course grades, rather than as graduation requirements."⁴⁵ In recent years, states such as Nevada and North Carolina have done exactly that, foregoing the use of the exams as graduation requirements but mandating that EOC scores be incorporated into students' course grades. Policymakers should strongly consider these and other uses of EOCs that may result in tangible benefits to students without the concerns that have been raised about exit exams.

There's suggestive evidence that states that build their high school accountability systems around EOCs see better student outcomes.

Our results suggest that taking one or two EOCs in a specific subject does not have a measurable impact (positive or negative) on college entrance exam scores. That shouldn't be terribly surprising, as few interventions that do not directly address these outcomes have been shown to alter them.⁴⁶ Further, many states only require a single EOC in a given subject, limiting the potential for large impacts.⁴⁷

When we look at the overall number of EOCs offered in each state, however, we find strong clues that states that use EOCs as a central part of their high school accountability systems outperform other states in college entrance exam scores and graduation rates, even after controlling for a range of demographic factors, prior performance, and other relevant variables in our difference-in-differences models. Although differences in outcomes are nonexistent between states with just one or two EOCs and those with none at all, states with the most EOCs generally outperformed other states in college entrance exam and graduation outcomes, though the differences are modest and not always statistically significant.⁴⁸

We find strong clues that states that use EOCs as a central part of their high school accountability systems outperform other states in college entrance exam scores and graduation rates

Take advantage of the different ways that EOCs can promote accountability at the high school level.

Unlike mandatory standardized-testing policies in elementary and middle schools, there is no federal policy on EOC administration. Given this freedom from federal mandates, states have devised a variety of ways to use them. The ability of states to customize the use and application of EOCs is a key strength of these tests.

Here are some ideas for uses of EOCs that may serve specific state policy goals:

- For states that want to incentivize students to take their coursework seriously, EOCs can be used as graduation requirements, as part of course grades, or to supplement A-to-F grades on student transcripts. States might also choose to award students special diplomas (or other certificates) for passing sets of state tests, which could serve as an important signal to employers or college admission officers that students have done far more than simply show up for class. Though AP and IB tests already offer such signals to high-performing students, EOCs can extend such benefits more broadly.

- In states seeking greater quality control over high school course work, EOCs can be administered without stakes. Just having access to information on EOC performance can promote uniform rigor and raise flags in places where many students fail the EOC. Regardless of what stakes are attached, publicly reporting the results of EOCs can make it easier to spot grade inflation and may prevent misuse of credit-recovery programs meant to help students reach graduation.⁴⁹
- For states that want to set goals for schools and provide information to families about student academic achievement, EOC results can be included in school accountability metrics.
- For states that prefer a more hands-off approach, they can transfer the locus of control to districts, making EOCs optional, and/or specify that localities can decide whether and how to use the tests to meet district- or school-level goals. In these cases, state departments of education might help vet external assessments and recommend high-quality options or best practices in administering them.

Looking ahead, the use of high-quality, content-linked external assessments could help push our education system toward mastery rather than seat time—a coveted goal, especially among advocates of competency-based and personalized models. That’s unlikely to happen, however, in the absence of external measures that schools and employers can trust, whether developed by government or by the private sector. Adroitly deployed, EOCs could play this role. Indeed, states such as South Dakota are experimenting with them as a way for students to earn course credit, whether or not they have formally taken the related course.⁵⁰

High-quality, content-linked external assessments could help push our education system toward mastery rather than seat time.

In the past five years, many states have weakened their use of EOCs. Arkansas, Delaware, and Oklahoma have abandoned them entirely. Tennessee and Washington have decreased their number. Ohio has deferred the timetable for making them count, while Pennsylvania has diminished the stakes they have for students. And Utah and Texas have gone so far as to pass laws forbidding students from being held accountable for their performance on the tests, although administrators and teachers may still be held accountable.

Without access to more nuanced data about test quality and the way the EOCs are used, we can’t say whether these changes are for better or for worse. And it remains to be seen whether the recent downward blip in the use of EOCs is the beginning of the end for them or a temporary shift as states cope with budget squeezes, testing backlash, and the recalibration of accountability systems in the post-NCLB era. Although we found only modest impacts of EOCs, other research and experience suggest that such tests can boost learning and hold students and schools accountable to higher standards.

So the question is: Will states that abandon EOCs eventually live to regret it?

Appendix A: Additional Tables & Figures

EOC SUBJECT AREAS

We estimated the grade level (i.e., freshman, sophomore, etc.) students would take each course/EOC by examining relevant official and unofficial websites for each state. Because some states have many EOCs, we coded math EOCs, the six other most common EOCs (Biology, Chemistry, U.S. History, English I, English II, and English III), and one additional EOC, if applicable (Table A-1).

AP TEST TAKING AND PERFORMANCE

We also examined potential impacts of EOCs on AP test taking and performance, finding that the exams are generally uncorrelated with these outcomes when looking at all students (Table A-2) or specifically at black and Hispanic students (Table A-3).

Table A-1. Correspondence of Subjects and Courses

Subject	Course
ELA	English I
	English II
	English III
Math	Algebra I
	Geometry
	Algebra II
	Integrated Math I
	Integrated Math II
	Integrated Math III
Science	Biology
	Chemistry
	Physics
	Physical Science
Social Studies	U.S. History
	Civics and Economics
	American Government

Table A-2. There are no clear patterns of effects of EOCs on AP test taking and passing.

AP Subject	Outcome	Estimated Effects of EOCs				N
		Math EOC	Science EOC	ELA EOC	Social Studies EOC	
Biology	Participation rate	0.0	0.0	0.5*	-0.2	720
	Pass rate	-0.9	1.0	1.3	-0.4	720
	High pass rate	-0.9	1.5	0.9	-1.1	720
Calculus	Participation rate	0.1	0.1	0.3	-0.4	720
	Pass rate	0.6	0.6	0.6	-0.9	720
	High pass rate	0.0	1.0	0.6	-1.1	720
Chemistry	Participation rate	0.0	0.1	0.2*	-0.2*	720
	Pass rate	-0.6	-0.2	-0.1	0.5	716
	High pass rate	0.0	-0.3	-0.3	-0.2	716
Language	Participation rate	1.0	1.3	0.5	-0.2	720
	Pass rate	-0.6	0.9	-0.1	-0.8	720
	High pass rate	-0.2	0.7	-0.1	-0.9	720
Literature	Participation rate	0.3	1.0	0.4	-0.6	720
	Pass rate	-1.6	1.7**	0.4	-0.4	720
	High pass rate	-0.8	1.1**	0.4	-0.2	720

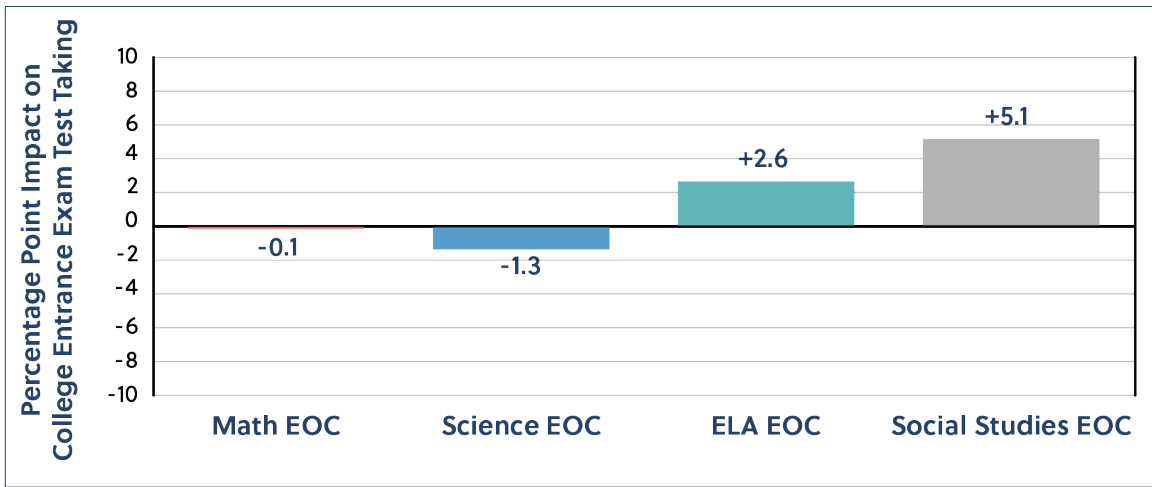
Note: * = $p < 0.10$; ** = $p < 0.05$; and *** = $p < 0.01$. "Pass rate" refers to the percentage of students earning a score of three or higher on the AP exam, and "high pass rate" refers to the percentage of students earning a score of four or higher on the AP exam.

Table A-3. There are no clear patterns of effects of EOCs on AP test taking and passing for black and Hispanic students.

AP Subject	Outcome	Estimated Effects of EOCs				N
		Math EOC	Science EOC	ELA EOC	Social Studies EOC	
Biology	Participation rate	-0.1	0.1	0.3	0.0	720
	Pass rate	-0.1	3.0**	-1.4	0.5	476
	High pass rate	0.0	1.3	-0.6	0.4	476
Calculus	Participation rate	-0.2	0.4	0.0	-0.1	720
	Pass rate	0.1	-0.2	-0.4	1.2	519
	High pass rate	0.3	-0.3	-0.1	0.6	519
Chemistry	Participation rate	0.0	0.1	0.0	0.0	720
	Pass rate	-1.8*	0.8	-0.1	1.8	423
	High pass rate	-0.5	-0.3	0.0	0.9	423
Language	Participation rate	0.6	1.3	0.3	-0.4	720
	Pass rate	0.9	0.7	-3.5**	-0.4	550
	High pass rate	0.0	-0.2	-1.2	-0.4	550
Literature	Participation rate	-0.2	1.3*	-0.1	-0.2	720
	Pass rate	-0.9	3.1***	-1.1	-0.9	571
	High pass rate	0.0	1.3**	-0.6	-0.2	571

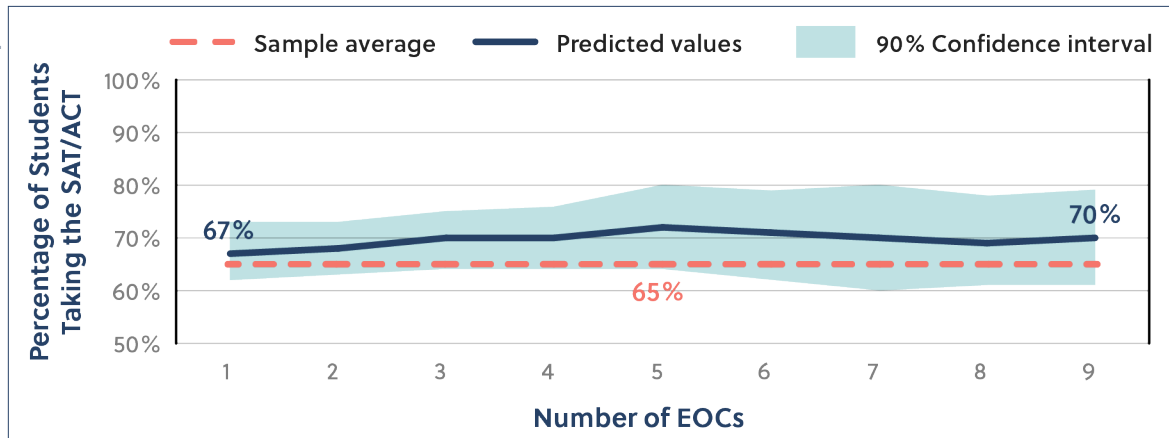
Note: * = $p < 0.10$; ** = $p < 0.05$; and *** = $p < 0.01$. "Pass rate" refers to the percentage of students earning a score of three or higher on the AP exam, and "high pass rate" refers to the percentage of students earning a score of four or higher on the AP exam.

Figure A-1. When analyzing EOCs by subject area, there are no statistically significant differences in college entrance exam taking between students in states with and without EOCs.



Note: Analysis examines binary indicators of EOCs by subject area. Broken outline indicates statistical significance greater than $p < 0.10$ (no effects are statistically significant). The outcome is ACT or SAT exam taking, depending on which assessment is more common in a given state for a given cohort. N=720.

Figure A-2. States with EOCs have slightly higher student participation on college entrance exams, although the differences between states with few and many EOCs are small and statistically insignificant.



Note: The broken red line is the sample average, and the shaded areas are 90 percent confidence intervals. Both the (blue) coefficient line and the confidence intervals are three-unit moving averages. N=720.

Appendix B:

Technical Appendix

We present estimates of the effects of EOCs from two types of models. The first type includes a binary indicator for each EOC subject (math, science, ELA, and social studies) indicating whether a state had any EOCs used for accountability purposes in that subject area. Second, we present estimates from models showing the impact of the number of EOCs (up to nine) that the state administers. Note that states may have more EOCs than students are required to take. For example, Virginia offers EOCs in 12 courses, and students may select from these to fulfill the state's graduation requirements. Thus, this variable is best viewed as a proxy for the importance of EOCs to the state's high school accountability system, rather than the exact number of EOC requirements for students.

To estimate the effects of students taking EOCs, we leverage the timing of state EOC requirements. To provide a plausibly causal effect, the strategy requires that the timing of EOC implementation is exogenous to the examined outcomes. In addition, it relies on the "parallel-trends" assumption, which holds that the treatment and comparison states must have similar trends in the outcomes prior to EOC implementation. In this way, the comparison states represent a satisfactory counterfactual to the EOC states absent EOC implementation.

The following equation represents our preferred model for attaining estimates of the effect of EOCs:

$$1. \quad Y_{st} = \beta_0 + \beta_1 ELA_EOC_{st} + \beta_2 Math_EOC_{st} + \beta_3 Science_EOC_{st} + \beta_4 SocialStudies_EOC_{st} + \beta_5 ExitExam_{st} + \beta_6 Educ_{st} + \beta_7 Econ_{st} + \beta_8 Demo_{st} + \gamma_s + \delta_t + \varepsilon_{st}$$

where Y_{st} is an outcome of interest (e.g., graduation rate) for state s and cohort t . $(Subject)_EOC_{st}$ is a binary indicator equal to one if state s required any EOC in the corresponding subject for cohort (class) t . $ExitExam_{st}$ is a dummy for whether the state has a non-EOC exit examination. $Educ_{st}$, $Econ_{st}$, and $Demo_{st}$ are controls at the state and cohort level representing education (i.e., per-pupil spending and teacher-student ratio), socio-economic factors (i.e., median income), and demographics (i.e., share of student population that is Asian, black, Hispanic, or white and father's education level). (For assessment outcomes, such as ACT, SAT, and AP scores, we use demographic information from the test-taking population instead of data from the ACS used elsewhere.) Standard errors are clustered at the state level. Finally, γ_s is a set of state fixed effects while δ_t is a set of cohort fixed effects. β_1 , β_2 , β_3 , and β_4 provide the average effects of utilizing any EOC exams in each respective subject.

We include additional analyses of the potential impact of the number of EOCs coded in a state (up to nine), represented by the following equation:

$$2. \quad Y_{st} = \beta_0 + \sum_{(i=1)}^9 \beta_i \text{Number_EOC}_{st} + \beta_{10} \text{ExitExam}_{st} + \beta_{11} \text{Educ}_{st} + \beta_{12} \text{Econ}_{st} + \beta_{13} \text{Demo}_{st} + \gamma_s + \delta_t + \varepsilon_{st}$$

where Y_{st} is an outcome of interest (e.g. graduation rate) for state s and cohort t . Number_EOC_{st} is a set of binary indicators equal to one if state s required a number of EOCs (from one to nine) for cohort t . This estimation strategy does not assume a linear effect of additional EOCs, but allows us to compute a separate coefficient for each number of EOCs a state requires, from one to nine (with observations of states with zero EOCs serving as the excluded category). ExitExam_{st} , Educ_{st} , Econ_{st} , and Demo_{st} are the same exit examination, education, economic, and demographic controls described above, with standard errors clustered at the state level. Finally, γ_s is a set of state fixed effects while δ_t is a set of cohort fixed effects, as described above. β_1 through β_9 provide the average effect of utilizing the specific number of EOC exams.

For graduation-rate and assessment-taking outcome variables, we use demographic data from the ACS in the years 2000 to 2016, lagged as necessary to most accurately reflect the demographics of the cohort. For assessment outcomes (SAT, ACT, and AP), we use the demographics of the test takers as controls and also include the percentage of students in the cohort who took the assessment as an additional control variable.

Endnotes

1. David P. Gardner et al., *A Nation At Risk: The Imperative For Educational Reform*, Washington, DC: National Commission on Excellence in Education, United States Department of Education (April 1983), https://www.edreform.com/wp-content/uploads/2013/02/A_Nation_At_Risk_1983.pdf.
2. For a discussion of graduation “exit” exams and the evidence that they may negatively influence students, see *EOCs Versus Exit Exams*, page 17.
3. John H. Bishop, “Do Curriculum-Based External Exit Exam Systems Enhance Student Achievement?” (CAHRS Working Paper Series, Cornell University, Ithaca, NY, November 1, 1997), <http://digitalcommons.ilr.cornell.edu/cgi/viewcontent.cgi?article=1168&context=cahrswp>; John H. Bishop et al., “The Role of End-of-Course Exams and Minimum Competency Exams in Standards-Based Reforms,” *Brookings Papers on Education Policy* (2001): 267–345, doi: 10.1353/pep.2001.0002; John H. Bishop and Ludger Woessmann, “Institutional Effects in a Simple Model of Educational Production,” *Education Economics* 12, no. 1 (2004): 17–38; Hendrik Jürges, Kerstin Schneider, and Felix Büchel, “The Effect of Central Exit Examinations on Student Achievement: Quasi-Experimental Evidence from TIMSS Germany,” *Journal of the European Economic Association* 3, no. 5 (2005): 1134–55; and Ludger Woessmann, “Central Exit Exams Improve Student Outcomes,” *IZA World of Labor* 419 (2018).
4. Adam Tyner and Michael J. Petrilli, “The Case for Holding Students Accountable: How Extrinsic Motivation Gets Kids to Work Harder and Learn More,” *Education Next* 18, no. 3 (2018): 26–33.
5. When teaching and assessment are both vested in the teacher, “avoidance treaties” are especially prone to emerge. These implicit agreements arise from bargaining between students and teachers, where teachers require little from students and students do not cause too many problems for their teachers. Arthur G. Powell, Eleanor Farrar, and David K. Cohen, *The Shopping Mall High School: Winners and Losers in the Educational Marketplace. A Study of High Schools* (Boston, MA: Houghton Mifflin, 1985).
6. These peer effects manifest themselves as the “curve raiser” problem, “nerd harassment,” derision of an academically engaged student as the “teacher’s pet,” and the problem of academically motivated students of color being accused by their peers of “acting white.” James S. Coleman, “Academic achievement and the structure of competition,” *Harvard Educational Review* 29, no. 4 (January 1959): 330–351; John H. Bishop and Michael M. Bishop, “An economic theory

of academic engagement norms: The struggle for popularity and normative hegemony in secondary schools" (CAHRS Working Paper, Cornell University ILR School, Ithaca, NY, 2007); and Roland G. Fryer, "'Acting white': the social price paid by the best and brightest minority students," *Education Next* 6, no. 1 (2006): 52–60.

7. Ben Dalton, Steven J. Ingels, and Laura Fritch, "High School Longitudinal Study of 2009 (HSLs:09). 2013 Update and High School Transcript Study: A First Look at Fall 2009 Ninth-Graders in 2013," National Center for Education Statistics, United States Department of Education, NCES 2015-037rev (April 2018), <https://nces.ed.gov/pubs2015/2015037rev2.pdf>.
8. Phillip L. Ackerman, Ruth Kanfer, and Charles Calderwood, "High School Advanced Placement and Student Performance in College: STEM Majors, Non-STEM Majors, and Gender Differences," *Teachers College Record* 115, no. 10 (2013): 43, https://www.researchgate.net/publication/289101698_High_School_Advanced_Placement_and_Student_Performance_in_College_STEM_Majors_Non-STEM_Majors_and_Gender_Differences; Mary E. M. Mckillip and Anita Rawls, "A Closer Examination of the Academic Benefits of AP," *The Journal of Educational Research* 106, no. 4 (2013): 305–18, <https://www.tandfonline.com/doi/abs/10.1080/00220671.2012.692732>; Russell T. Warne et al., "The Impact of Participation in the Advanced Placement Program on Students College Admissions Test Scores," *The Journal of Educational Research* 108, no. 5 (2015): 400–16, <https://www.tandfonline.com/doi/ref/10.1080/00220671.2014.917253?scroll=top>; and Mark C. Long, Dylan Conger, and Patrice Iatarola, "Effects of High School Course-Taking on Secondary and Postsecondary Success," *American Educational Research Journal* 49, no. 2 (2012): 285–322, <https://journals.sagepub.com/doi/abs/10.3102/0002831211431952>.
9. The National Assessment Governing Board promises to start providing those in reading, writing, and math, but not until 2027: National Assessment Governing Board, "Governing Board Updates NAEP Assessment Schedule: Reading and Mathematics prioritized, with additional state and district data in Science, Technology and Engineering, U.S. History and Civics," (July 24, 2019), <https://www.nagb.gov/news-and-events/news-releases/2019/release-20190724-assessment-schedule.html>.
10. For example, see Jay P. Green and Marcus A. Winters, "Pushed Out or Pulled Up? Exit Exams and Dropout Rates in Public High Schools" (education working paper, Manhattan Institute, New York, NY, May 2004), and Anne Hyslop, "The Case against Exit Exams," (policy brief, New America, Washington, DC, 2014), <https://www.newamerica.org/education-policy/policy-papers/the-case-against-exit-exams>.
11. Eric Grodsky, John Robert Warren, and Demetra Kalogrides, "State High School Exit Examinations and NAEP Long-Term Trends in Reading and Mathematics, 1971–2004," *Educational Policy* 23, no. 4 (2009): 589–614.
12. Gregory J. Marchant and Sharon E. Paulson, "The Relationship of High School Graduation Exams to Graduation Rates and SAT Scores," *Education Policy Analysis Archives* 13, no. 6 (2005), <http://epaa.asu.edu/epaa/v13n6>.

13. Sean F. Reardon and Michal Kurlaender, "Effects of the California High School Exit Exam on Student Persistence, Achievement, and Graduation" (policy brief, Policy Analysis for California Education, Berkeley, CA, August 2009), <http://www.edpolicyinca.org/sites/default/files/PB.09-3.pdf>.
14. Steven W. Hemelt and Dave E. Marcotte, "High school exit exams and dropout in an era of increased accountability," *Journal of Policy Analysis and Management* 32, no. 2 (2013): 323–349.
15. Olesya Baker and Kevin Lang, "The Effect of High School Exit Exams on Graduation, Employment, Wages and Incarceration" (working paper, National Bureau of Economic Research, Cambridge, MA, June 2013); and Matthew F. Larsen, "High Bars or Behind Bars? The Effect of Graduation Requirements on Arrest Rates" (working paper, Department of Economics, University of California–Davis, 2019).
16. Bishop, "Do Curriculum-Based External Exit Exam Systems Enhance Student Achievement?"; Bishop et al., "The Role of End-of-Course Exams"; Bishop and Woessmann, "Institutional Effects"; Jürges, Schneider, and Büchel, "The Effect of Central Exit Examinations"; and Woessmann, "Central Exit Exams."
17. Seth Gershenson, *Grade Inflation in High Schools (2005–2016)* (Washington, DC: Thomas B. Fordham Institute, 2018).
18. We use the following source except in the case of Indiana, where officials indicated to us in February 2019 that their English 10 ECA and Algebra I ECA assessments would continue to be graduation requirements for Indiana students. FairTest, "Graduation Test Update: States That Recently Eliminated or Scaled Back High School Exit Exams (Updated MAY 2019)," <https://www.fairtest.org/graduation-test-update-states-recently-eliminated>.
19. Throughout the report, we include Washington, DC, as a state-level observation.
20. Jennifer Dounay Zinth, "End-of-Course Assessments Response" (Education Commission of the States, February 2016). Data are approximate, due to aggregating similar EOCs and EOCs for optional courses, as well as changes since 2016.
21. This report focuses on EOCs used for accountability, but these assessments have been used for a variety of other purposes, some of which are unrelated to accountability. For example, Idaho requires students who take biology and chemistry to sit for the associated EOC, but state policy does not attach any stakes to student performance, either for students or schools. Other states, such as Alabama, have completely devolved EOC policy to the districts.
22. Christopher Domaleski, "State End-of-Course Testing Programs" (policy brief, Council of Chief State School Officers, Washington, DC, February 2011), http://www.ccsso.org/Documents/2011/State_End-of-Course_Testing_Programs_2011.pdf. Analysts such as Domaleski have broken what we are calling "school accountability" into additional categories, such as "teacher accountability."

23. An additional twist with the Regents model is that many EOCs are offered and students choose a subset that fulfills their graduation requirements, meaning that some EOCs are higher stakes than others for each student. Moreover, students may take more than the required number of EOCs on the way to graduation.
24. For example, the Arkansas Code (Ann. § 6-15-2009) stipulated that students “shall not receive credit on his or her transcript for Algebra, Geometry, Biology, or any other course that requires an end-of-course assessment for which the student has not received the requisite scale score on a general end-of-course assessment, until the student is identified as having participated in remediation through an individual academic improvement plan.”
25. Until and unless employers and admission officers begin to focus on the EOC scores of their prospective workers and students, it is hard to imagine printing the results on student transcripts becoming a high-stakes proposition.
26. Zinth, “End-of-Course Assessments Response,” and Domaleski, “State End-of-Course Testing Programs.”
27. Some states allow students to select which EOCs will be used for graduation requirements. For example, Virginia offers EOCs in 12 courses, and students may select from these to pass the state’s graduation requirements. Our coding system means that we capture Virginia’s Algebra I, Algebra II, Geometry, Biology, Chemistry, English, and U.S. History exams, and we arbitrarily selected one more EOC (Earth Science) to include in our analysis as a “wild card.” For a list of all courses we coded and how they align to subjects, see Table A-1 in *Appendix A*.
28. Three states used EOCs but did not use them for any type of accountability.
29. For example, in North Carolina’s EOCs were used as exit exams for many years, but this approach was abandoned in 2010–11, with scores only incorporated into students’ grades from that point forward. Nevada also recently shifted their student accountability system in this way. Although we track which EOCs were used for which cohorts of students and categorize the type of accountability that is relevant, we are generally not able to identify uses of EOCs in individual years and thus ignore changing uses of accountability for each EOC in most states, categorizing only whether it has ever been used for each type of accountability. Still, we updated the data for North Carolina to reflect this change of policy, as it was clear from media reports.
30. For example, an official from Missouri communicated to us that although the state does not mandate any stakes for students’ performance on EOCs, “local districts have full control of their awarding of credit and grading policies, [and] the department does not track local course grades or grading policies.” In other words, districts, schools, or even individual teachers may have their own policies that result in accountability “trickling down,” creating stakes for the students. Still, in some other states, giving students skin in the EOC game is forbidden by law: in Texas and Utah, state law forbids including EOC results in students’ final grades.

31. When examining AP performance, we dropped observations representing fewer than 50 black and Hispanic students (combined) from the class that took the given AP exam in that state. When examining high school graduation, we excluded observations with fewer than 1,000 black and Hispanic students (combined) estimated to be in the cohort.
32. Jay P. Greene and Marcus A. Winters, "Public High School Graduation and College-Readiness Rates: 1991–2002," (education working paper no. 8, Center for Civic Innovation, 2005).
33. "EDFacts Data Files," About ED, U.S. Department of Education, accessed February 5, 2019, <https://www2.ed.gov/about/inits/ed/edfacts/data-files/index.html>.
34. Concordance available at <https://www.act.org/content/act/en/products-and-services/the-act/scores/act-sat-concordance.html>. Because it does not include data for all values, we impute intermediate values using regression techniques.
35. The potential negative effects of using an assessment often not taken by all students in a cohort are mitigated by analyzing scores from the more common of the two national college entrance exams for each state-cohort observation, including state-level fixed effects in each analysis, and controlling for the share of students who participate in the exam in each state-cohort observation.
36. We create a binary indicator for exit exams that are not EOCs by pulling data from the *Digest of Education Statistics* and removing cases where state-class observations took EOCs that were graduation requirements.
37. We also run tests assessing potential correlations of the administration of EOCs with AP test taking and success, finding no clear patterns. These results are presented in *Appendix A*.
38. That said, prior analyses of exit exams include some EOCs, and the present analysis includes EOCs used as graduation requirements (see *EOCs Versus Exit Exams*, page 17).
39. Ideally, the study could have looked individually at the number of EOCs in each subject, but there is not sufficient variation in the number of EOCs by subject to conduct such an analysis. Instead, we attempted to strike a balance between a focus on subjects and a focus on the number of EOCs by estimating models that focused on the former separately from models that focused on the latter.
40. As described in *Section II*, these models do not take the relationship between the number of EOCs and student outcomes to be linear but, rather, compute a separate coefficient for each quantity of EOCs the students in the analyzed state-class took. We smooth the curves with a three-unit moving average.
41. Six states were coded as having eight or nine EOCs at some point during the study period.
42. To see the small but statistically insignificant positive effects of EOCs on college entrance exam taking, see Figure A-1 in *Appendix A*.

43. National Research Council, *Incentives and test-based accountability in education* (National Academies Press, 2011).
44. The high school graduation rate increased from 67.9 percent to 84.3 percent in our data covering the graduating classes of 2000 to 2016. Since this study period, graduation rates have continued to tick upwards. See Atwell et al., *Building A Grad Nation: Progress and Challenge in Raising High School Graduation Rates* (Baltimore, MD: Everyone Graduates Center, School of Education, Johns Hopkins University, June 2019).
45. Hyslop, "The Case against Exit Exams."
46. For example, programs that change AP course-taking requirements or incentivize students to participate have changed participation in the AP program and boosted long-term outcomes. See Rachewl Roegman and Thomas Hatch, "The AP lever for boosting access, success, and equity," *Phi Delta Kappan* 97, no. 5 (February 2016): 20–25; and C. Kirabo Jackson, "A Little Now for a Lot Later: A Look at a Texas Advanced Placement Incentive Program," *Journal of Human Resources* 45, no. 3 (2010): 591–639.
47. For example, 8 of 30 states with math EOCs have mandated just one exam in that subject.
48. Early studies from the U.S. examined New York and North Carolina, where students have been generally required to take much more than just a few EOCs. In New York, students have been required to pass five Regents examinations to receive a Regents diploma since the abolition of the lower diploma track under Chancellor Ramon Cortines in the 1990s. North Carolina adopted a similar system later in the decade. See, John H. Bishop, Joan Y. Moriarty, and Ferran Mane, "Diplomas for learning, not seat time: The impacts of New York Regents examinations," *Economics of Education Review* 19, no. 4 (2000): 333–49, doi: 10.1016/S0272-7757(00)00006-6.
49. Without measures of student learning, such as exit exams or EOCs, high schools have many strategies for graduating students that fail to ensure that they are equipped with the requisite knowledge and skills. One has to look no further than the increasing use of often low-quality high school "credit-recovery" programs to see what happens in the absence of accountability for authentic learning. For more on the prevalence of credit-recovery programs in high schools, see Adam Tyner and Nicholas Munyan-Penney, *Gotta Give 'Em Credit: State and District Variation in Credit Recovery Participation Rates* (Washington, DC: Thomas B. Fordham Institute, 2018).
50. South Dakota does not require EOCs but offers the assessments for districts to opt into. Students may earn course credit by earning an 85 percent score on the EOC on their first attempt. South Dakota is not classified as using EOCs for accountability in this study because districts are not required to administer the assessments. For more on South Dakota's credit-by-exam law, see <http://sdlegislature.gov/rules/DisplayRule.aspx?Rule=24:43:11:09>.