

A FAIR CHANCE

Simple steps to strengthen and diversify
the teacher workforce



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Executive Summary

Each year a significant number of aspiring elementary teachers, having successfully completed their formal preparation, are still unable to become licensed professionals. That's because an alarming number of candidates fail their licensing tests, far surpassing the failure rate for other professions' entry tests, bar exams, and boards. The fact that more candidates fail than pass on their first attempt, and a quarter are never able to earn a passing score, raises serious concerns—especially regarding the effect this failure has on diversity goals. While many factors going back to candidates' earliest years of education may explain this phenomenon, higher education institutions are in the best position to alter this untenable outcome.

The licensing tests that slam the brakes on so many elementary teacher candidates' careers assess subject knowledge in English, science, mathematics, and social studies—the spine of elementary curricula. Two companies, ETS and Pearson, supply these tests to states, with a current inventory of 22 different tests available. These tests vary in rigor and design, but generally share similar content and represent the widely held consensus by states and school districts for what elementary teachers need to know.

Historically, these tests have posed a greater challenge for candidates of color. Even allowing for costly and demoralizing retakes, a higher proportion of black and Hispanic candidates fail the most widely used content test (the focus of this report)

than white candidates. Among black candidates, 62 percent on average do not qualify for a standard license because they do not pass this test, and among Hispanic candidates, 43 percent do not pass.

These results are at the forefront of policy discussions because of the renewed imperative to increase diversity in the teaching profession. In fact, the need to build a teaching workforce that reflects the nation's diverse student body has fed a growing movement to eliminate licensing tests altogether, removing one potential barrier to bringing more teachers of color (and more teachers, period) to schools. This call is unprecedented, as the need for teachers to demonstrate by some valid means that they know their subject matter has rarely been a subject of debate.



Still, states and school districts may wish to reexamine the alignment of their licensing tests with their curricular expectations for elementary classrooms. Whatever outcomes the exercise yields, there will still be a need to verify that teacher candidates meet a minimum bar of content knowledge before becoming qualified to teach.

Any consideration of a “test-less” system must recognize why these tests were originally put into place. Until the 1990s, states largely relied on the courses teacher candidates took, not tests, to determine their qualifications to teach. That system was abandoned for reasons that are still relevant today, including pressure from teacher preparation programs demanding more flexibility than state-prescribed coursework allowed. As this study will show, while some programs took that newfound flexibility to heart, it often was to the detriment of candidates’ preparedness to teach subjects found in elementary grades.

This issue does not begin and end with licensing tests; even practicing teachers admit to struggling with the subject knowledge they are asked to teach. In surveys conducted by the U.S. Department of Education, two thirds of new teachers admit to not having a strong grasp of elementary subjects.¹ Tests aside, too many teachers are left to learn on the fly, often barely covering content or omitting it altogether in their classrooms. Given that students’ own ability to understand what they read depends on the breadth of the content knowledge to which they have been exposed, teachers’ grasp of content knowledge is more than a matter of secondary importance. It is a top priority.

This report probes sky-high failure rates on teacher licensing tests and asks what must change so that more new teachers can enter classrooms with the knowledge they need to do their jobs well. To identify the most effective levers for change, NCTQ conducted analyses on undergraduate preparation programs at more than 800 institutions as well as 250 graduate programs and a small sample of alternative route programs.

When exploring the data collected for NCTQ’s program ratings in the 2016-18 *Teacher Prep Review*, one likely cause of licensing exam failure leaped off the page: the profound lack of alignment between preparation program coursework and the content knowledge that states have determined an aspiring teacher needs to be an effective elementary teacher.



For a detailed listing of the content alignment for each program in this study, go to [Appendix A](#).

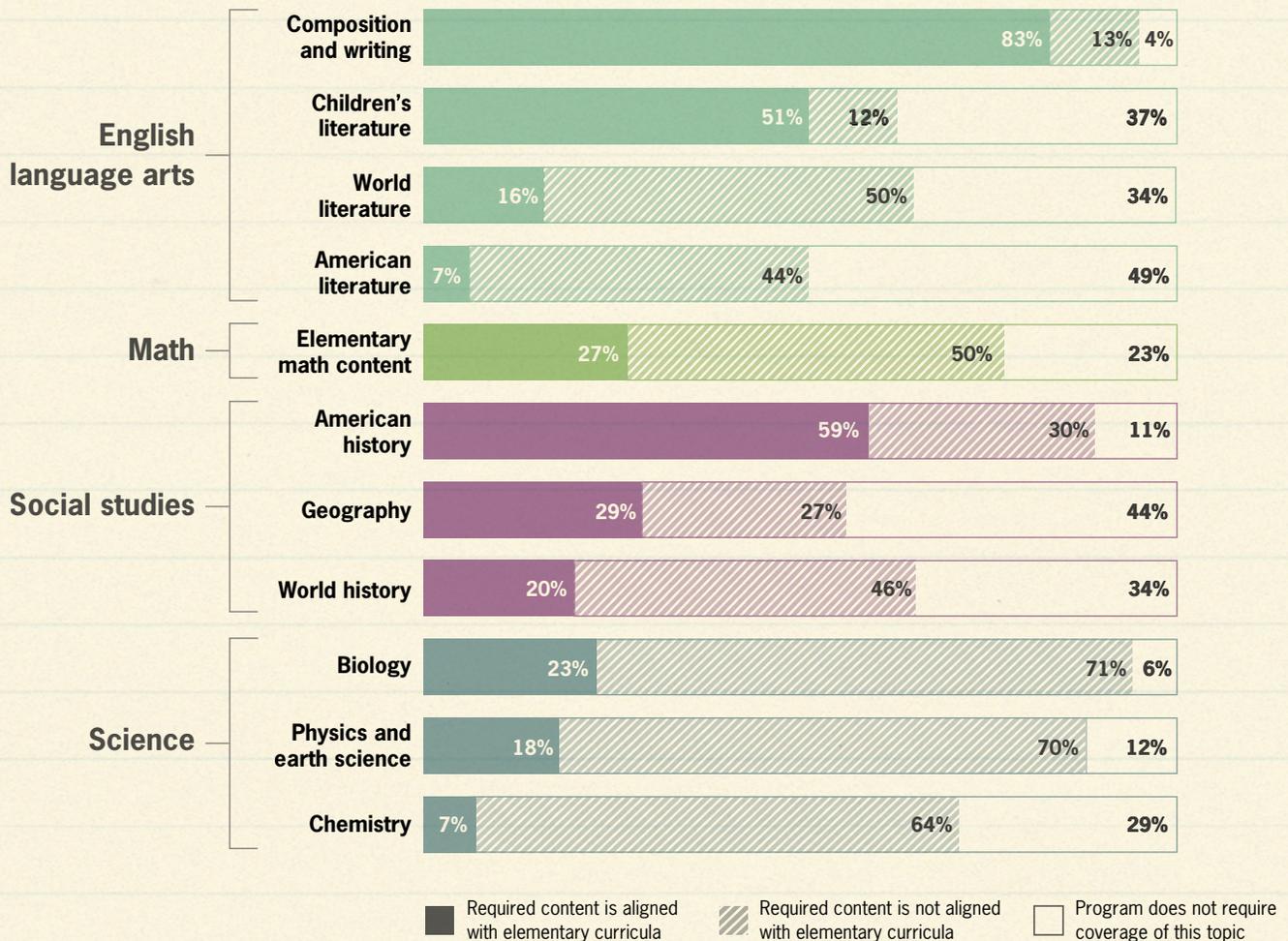


This analysis of most of the nation’s undergraduate preparation programs finds that:

- While most programs require teacher candidates to take a course in composition and writing, they seldom require a germane literature course. Notably, only half require an aligned children’s literature course.
- Only one in four programs covers the breadth of mathematics content necessary for elementary grades.
- One in three programs does not require a history or geography course aligned with the needs of elementary teachers.
- Two in three programs do not require a single science course that could be considered aligned.

The content areas included in this report were not chosen arbitrarily but rather reflect the content identified in standards for teacher preparation programs and for elementary students, drawn from elementary content licensing tests, accrediting bodies, national and international assessments, and associations.

Fig. 1 | 817 undergraduate programs’ approach to elementary content knowledge





Institutions require undergraduate students to take an average of 15 general education courses, providing ample opportunity to cover much of the content base demanded by elementary teaching. Programs often supplement general education courses with additional content coursework and could better target these courses to the topics candidates need. However, few programs make any attempt to identify gaps before it is too late for candidates to take the right coursework-- coursework that would not only make it possible for their candidates to pass the tests needed to qualify for a license but also would be most relevant to the job of teaching.

A significant obstacle to solving this problem is that undergraduates who plan to enroll in teacher preparation are often allowed to select general education courses from a long list of options, without advice from the preparation program as to which courses will build their core knowledge as aspiring elementary teachers. Some of these course options cover content that will not be found on an elementary licensing test or in an elementary classroom (e.g., *Sex and Western Society* or *Herbal Medicines and Functional Food*). Other choices are too narrow in scope (e.g., *America in the 1960s* or *Chemistry and Art*) and therefore are not capable of shoring up broad weaknesses in a candidate's content knowledge.

In graduate preparation programs, weaknesses in content requirements are even more striking. No programs require adequate coverage of all four subject areas: English language arts, social studies, science, and elementary mathematics.

Not all the news is bad. This report will highlight several examples of programs that have strong requirements and also report high pass rates on their licensing tests.

That teacher candidates arrive with so many gaps in their content knowledge is not a problem of higher education's own making. While it has always been considered the job of K-12 education to impart foundational content knowledge, NAEP results consistently show that many students, especially students of color, reach grade 12 with major gaps in their knowledge and skills. However, higher education and, specifically, teacher preparation programs and the liberal arts faculty who teach general education courses, have a unique opportunity, if not a responsibility, to alter current outcomes.

Systemic changes are never easily accomplished but, in this case, the mechanisms available for fortifying elementary teachers' content knowledge are available and straightforward.

Three steps higher education institutions and their teacher prep programs can take

- 1. Provide better parameters for selecting from course options that count toward general education requirements for undergraduate students who indicate an interest in teaching.**
- 2. Use the teacher preparation program admissions process for undergraduate, graduate, and alternative route programs as an opportunity to identify weaknesses in content knowledge and then tailor the course of study to fill in gaps.**
- 3. Set undergraduate and graduate program content course requirements to align with what elementary teachers need to know.**



Certainly some candidates would not be able to pass their licensing test even after taking a better aligned set of coursework. But everyone deserves a fair chance. Institutions in concert with their teacher prep programs must act to hold up their end of the commitments they have made with their states, school districts, and teacher candidates to prepare the next cohort of teachers. Doing so means that more teachers, and especially more teachers of color, could confidently enter classrooms and be better prepared to teach a range of content once they arrive.

In addition, policymakers play a key role in shining a light on the realities of program and candidate pass rates. Preparation programs and states currently have access to pass-rate data that give a more complete picture than what is reported to the federal government. States can make these data public, effectively pulling back the curtain on where some programs are cultivating well-prepared teacher candidates and others are missing the mark. Choosing transparency can elevate and spread effective practices for nurturing a profession-ready elementary teaching workforce.

Three steps state policymakers can take:

- 1. Revisit current licensing tests to ensure they capture the content knowledge teachers need to fully prepare students to meet college- and career-readiness standards.**
- 2. Understand that the response to low pass rates is not to abandon tests or make them easier to pass, but to hold teacher prep programs accountable for preparing candidates in the content aligned to elementary standards.**
- 3. Publish first-time and highest-score licensing test pass rates for all candidates enrolled in a teacher prep program to give prospective teacher candidates the information they deserve to choose a program where they are more likely to be successful.**

Big problems in education seldom have simple solutions. This is a rare instance where a few small shifts in programs' approach to preparation could yield large benefits that reverberate through the profession.

It's really frustrating and discouraging. I was Dean's List, Ed Honors Society. You think you are prepared, and it's the only thing holding you back from doing the thing you love.

– Undergraduate candidate from New York who did not pass exam

An unfair chance

When higher education institutions prepare public school teachers, they enter into what is effectively a contractual arrangement with the states that must approve their preparation programs as a valid path to licensure, with the school districts that depend on their graduates and, perhaps most importantly, with the aspiring teachers who have paid tuition to become teachers.

Publishing data that have never before been released, this paper documents the high number of elementary teacher candidates who struggle each year to pass their subject area licensing tests, with more than half of all candidates failing the test the first time they take it, and a quarter eventually giving up.²

This study provides an explanation for how so many candidates get so far down the path to becoming a teacher, only to stumble over the last hurdle. We demonstrate that elementary teacher preparation is too often unmoored from the content knowledge deemed necessary by the state to earn licensure.³ While the knowledge needed to pass licensing tests is spelled out clearly,⁴ many candidates simply move through their education without learning it.

When it came to general knowledge, I wasn't feeling like I had it all. I went to the school library and checked out the most recent Praxis prep books and read through the content sections. I was going back to my high school knowledge, because I didn't take those classes in college.

– Elementary teacher from Connecticut who took exam twice before passing

A reasonable case can be made that anyone entering college should already have ample knowledge of core content. Their K-12 education should have steeped them in much of the history, literature, sciences, and mathematics concepts elementary teachers need. When candidates enter teacher prep programs, their programs quite reasonably want to focus on how to teach, assuming that that incoming candidates already know what they will teach. Rather than put this assumption to the test, however, most prep programs overlook crucial opportunities to first

verify that their elementary teacher candidates know core content, and second address any weaknesses.

While many educational challenges require solutions that are messy, costly, and politically difficult, this particular challenge is largely surmountable. There are relatively straightforward solutions on which higher education institutions could act independently with few political or financial obstacles. The benefits for the teaching profession could be deep and lasting.

The heart of the problem

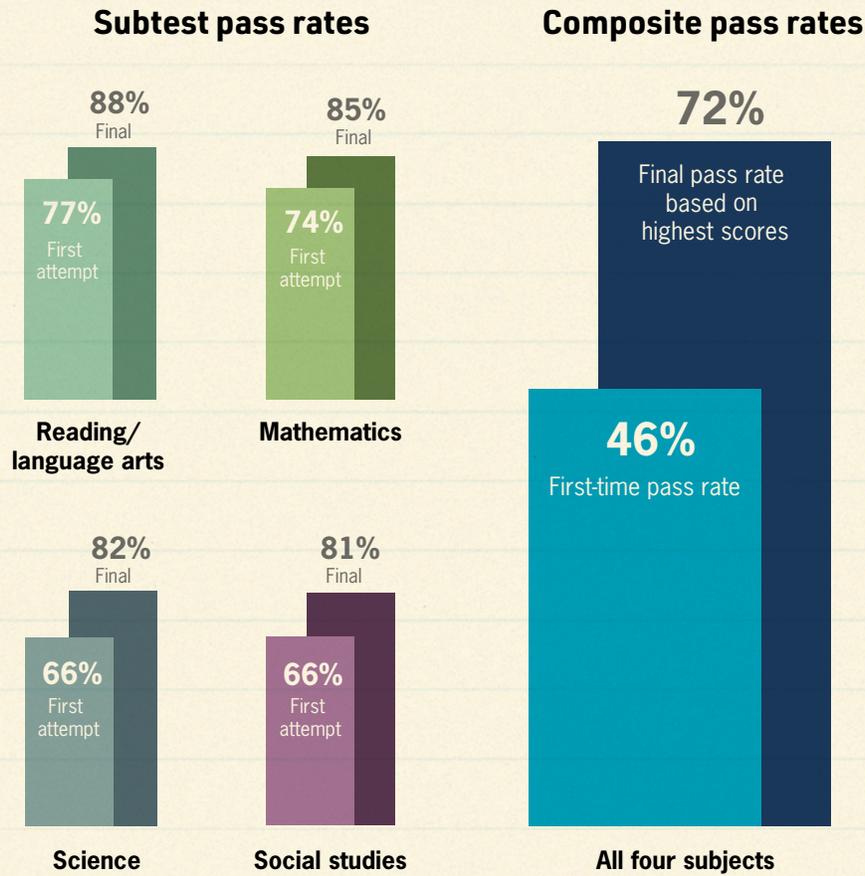
Many teacher candidates lack the knowledge they need to enter the classroom. Every state determines for itself a minimum amount of content knowledge that elementary teachers need to enter the classroom. Nearly every state measures candidates' grasp of this content knowledge through licensure exams.⁵ For many (an estimated 27,000 elementary teacher candidates each year), an exam that was meant to be only a basic check for essential knowledge slams the brakes on their journey toward teaching.⁶

Never before published data belonging to the Educational Testing Service (ETS), one of nation's two providers to states of teacher licensure tests,

is presented here to illustrate the aggregated pass rates for its elementary content test, *Praxis Elementary Education: Multiple Subjects*.⁷ This test is required by 18 states and is optional in five others,⁸ making it the most widely used of the 23 elementary content tests currently on the market.⁹ It is one of eight elementary content tests ETS offers, but it is one of the more useful for our purposes here, not for its popularity, but because candidates must separately pass each of the four content area subtests to pass the licensing test. Some of the other available tests (created by ETS and Pearson) allow candidates to fail some subjects, as long as their overall scores meet a certain threshold.¹⁰



Fig. 2 | Pass rates by subject area on elementary licensing tests



While this Praxis test is not used in all states, its outcomes appear roughly comparable with those of other tests. For example, on the Florida Teacher Certification Examinations, which also has four separate subtests, first-time pass rates range from 54 percent on the Language Arts and Reading subtest to 65 percent on the Science subtest.¹¹ The Texas

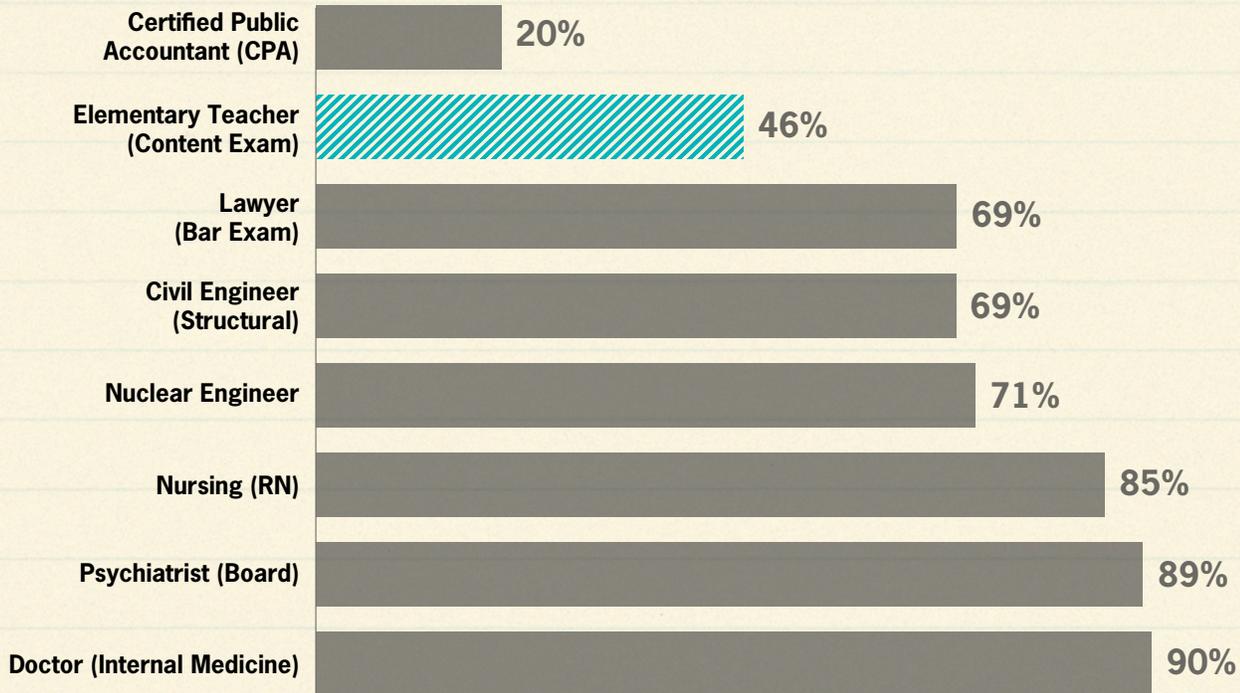
Examinations of Educator Standards (TExES) Core Subjects EC-6 (291) examination has first-time pass rates ranging from 71 percent (on the Social Studies subtest) to 85 percent (on the English Language Arts, Reading, and Science of Teaching Reading subtest).¹² For more state-level first-time pass rates, see [Appendix E: First-time pass rates by state](#).

Fig. 2 Note (1): Praxis Elementary Education: Multiple Subjects tests, used in 23 states (those that require this test or give it as an option). Pass rates were calculated by examining the scores of all test takers over a three-year window from 2014-2015 to 2016-2017 and calculating who passed the first time, and who passed after one or more attempts, the 'Final pass rate.' The pass rates are based on ETS's recommended cut score; all but two states that use this exam adhere to this cut score.

Fig. 2 Note (2): This three-year window means that an aspiring teacher could have first taken the test in 2014 and not passed until 2016, and still count in the pass rate here. Alternatively, someone who first took the test in 2016 and did not pass until after the three-year window would count as taking, but not passing, the test. The final pass rate of 72 percent could improve if enough candidates were to attempt to pass the test beyond the three-year window. However, nine in ten test takers attempt each content area only once or twice, suggesting that examining these data over a longer window would not meaningfully improve the passing rate.



Fig. 3 | **First-time pass rates in other professions**



Even in professions with a reputation for requiring challenging qualifying exams, first-time pass rates on most entry exams far exceed those achieved by elementary teacher candidates

Fewer than half of teacher candidates (46 percent) are able to pass the test on their first attempt.

Relatively speaking, this is very low. In an examination of pass rates for licensing exams for other professions, the only lower initial pass rate is the famously difficult multi-part CPA exam -- made more rigorous by the requirement that

candidates must pass all sections of the exam within eighteen months.¹³ Because of liberal rules about retaking education licensing tests, the number of teacher candidates who end up finally passing (at least as captured in a three-year window)¹⁴ increases to 72 percent.

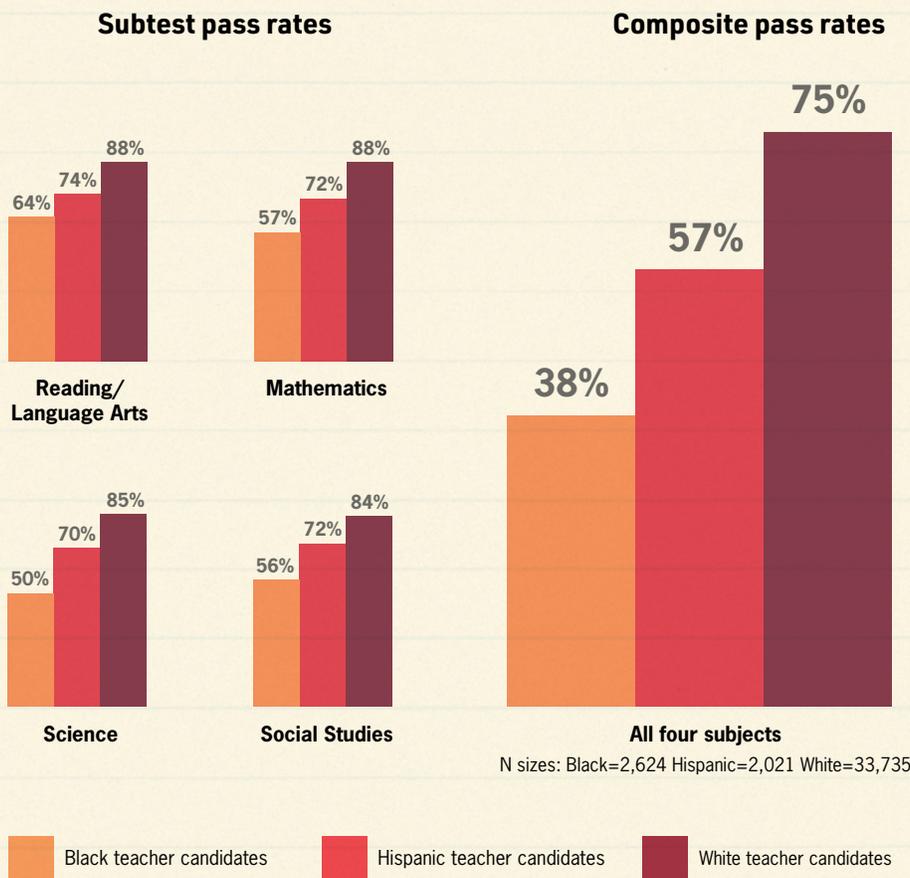


Candidates of color are hit hardest

The figure below speaks for itself. If we assume similarly disparate pass rates for the tests used by all states, considering the number and percentages of black and Hispanic teacher candidates in each state, we estimate that approximately 8,600 candidates of color each year are likely not to qualify to teach

because of low test performance.¹⁵ We estimate that the number of teacher candidates of color who do not pass the test outpaces the number who do pass – an estimated 8,300 black and Hispanic teachers.

Fig. 4 | Final pass rates by race/ethnicity on elementary licensing test

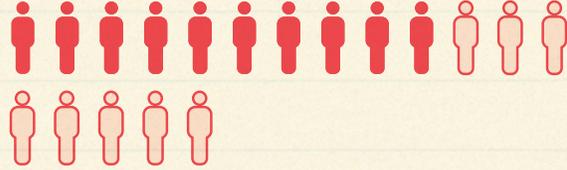


High numbers of black and Hispanic candidates do not pass, wasting time and tuition dollars and effectively disqualifying them from teaching.

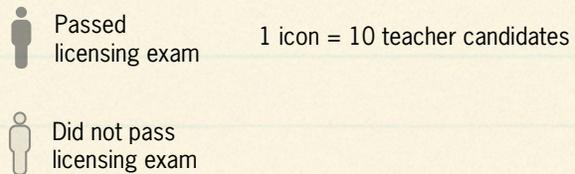
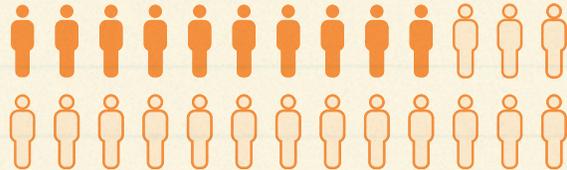
Fig. 3 Note: Data are from the Praxis Elementary Education: Multiple Subjects tests, used in 23 states (those that require this test or give it as an option). Pass rates were calculated by examining the scores of all test takers over a three-year window from 2014-2015 to 2016-2017 and calculating who passed the first time, and who passed after one or more attempts, the 'Final pass rate.' The pass rates are based on ETS's recommended cut-score; all but two states that use this exam adhere to this cut-score.

Fig. 5 | Candidates of color who enroll in teacher prep but do not pass licensing exams

To produce 100 Hispanic teachers, a program currently needs to enroll 175 Hispanic candidates.



To produce 100 black teachers, a program currently needs to enroll 263 black candidates.



Implications for producing a diverse teacher workforce

Increasing the talent pool of well-prepared teachers of color requires addressing a range of deep-rooted issues.¹⁶ Lower pass rates on elementary teacher licensing exams are one manifestation of those issues, and attention to the exams alone will not solve the challenge, but is a meaningful step in the right direction.

Currently, programs need to have an average of 139 candidates take the test for 100 candidates to pass it successfully and earn a license, as only 72 percent are likely to pass. Given current disparities in pass rates, far more candidates of color would need to be recruited to produce 100 teachers of color (see Figure 5 above). Unless programs provide necessary coursework to teacher candidates of color, this disparity will persist.¹⁷

High failure rates come at a cost

By the time most teacher candidates in traditional preparation programs take their licensing test, they will have spent significant years and tuition dollars traveling the path to a teaching career.

Failing a licensing test—a final step in the journey to formally enter their chosen profession—can be devastating. The fees to retake the licensing tests are also not inconsequential. For the commonly required Praxis exam, taking the full exam (four sections)

costs \$170; retaking any individual section costs \$60.¹⁸ Test preparation, too, can add extra expenses for candidates, costing as much as several hundred dollars for books and courses. Even if the prep programs themselves offer test preparation, these costs are passed on to teacher candidates through tuition and fees.



Common questions about licensing tests

Do any of these tests measure the content elementary teachers actually need to know?

States and perhaps their school districts are in the best position to answer that question. States decide on the content they want to see on a licensing test in order to align teacher preparation with curricular standards, choosing from existing tests or contracting with a testing company to build a new one. If they suspect the test is out of alignment with elementary curricula, they should conduct an

additional analysis, trading out some items or even choosing another test.

It is important to point out that elementary certifications generally span grades K-6 (although some states' certifications extend as far as grade 8). States will always test teachers' knowledge of content that they may not need to teach in one grade, but would if they were assigned to another.

Is the test too hard?

Some licensing tests are harder than others, but determining whether they are *too hard* is difficult to answer. There are some licensing tests in use that few teachers fail. Are those tests too easy? Those are the questions that states wrestle with almost continuously.

A test's rigor depends on its design and content, as well as where states set the minimum score needed to pass the test. The passing scores that states set intend to reflect what experts identify as "the level

of knowledge for a test taker to be considered minimally qualified for independent, beginning practice."¹⁹ On the Praxis Elementary Education: Multiple Subjects exam subtests, nearly every state follows the cut score recommended based on a data-driven process; two states (Alabama and South Dakota) use a lower score, and no state uses a higher one.²⁰ In other words, the tests and their required passing scores, regardless of difficulty, reflect what states believe beginning teachers need to know.²¹

Can programs achieve higher passing rates without raising admissions standards?

Certainly, low admissions standards mean that many programs admit individuals who are unlikely to pass the test, given some candidates' measurably weak academic backgrounds.²² Few programs – even those in less selective institutions – require all applicants to have solid B averages in their college coursework prior to admission into the prep program.²³

However, low admissions standards do not preclude the possibility that a program's graduates can do well. For comparison, few nursing preparation programs require a 3.0 GPA for admission, but after their preparation, 85 percent of nursing candidates pass their licensure tests on the first try.²⁴ The preparation programs take ownership for readying the candidates with the skills and knowledge they need.



Are the tests unfairly biased?

The differences in pass rates by race could lead one to question whether the tests themselves are biased, perhaps by including content that is more familiar to one group than another or by framing questions in a way that advantages some groups over others. While it may not be possible to fully remove bias from any exam, test designers take steps to measure whether bias may be present in the exam and to eradicate any questions that may lead to differences in outcomes based on anything other than one's understanding of the content.²⁵

However, concerns about bias are the subject of ongoing debate, and have led to many cases being

brought before a court of law. These challenges have met with mixed results, as it is not enough to provide proof of disproportionately low pass rates for a court to decide a test is unfairly biased. It must also be demonstrated that the content knowledge on the tests is not germane to the job of teaching. New York State has had numerous versions of its licensing tests challenged in court, some successfully, but the most recent was not.²⁶ Similar, and largely unsuccessful, claims were brought in Alabama, California, Massachusetts, and Texas.²⁷

Given the research on the benefits of same-race teachers, is it more important to have teachers who look like their students than ones with strong content knowledge?

Students of color gain genuine benefits from teachers who share their race or ethnicity,²⁸ perhaps even when those teachers struggled to pass licensing tests.²⁹ In fact, all students may benefit from working with skilled teachers of color.³⁰ However, these licensing tests measure real differences in content knowledge and, to an extent, basic academic aptitude.³¹

Ultimately, the teachers will need to teach this content to their students, regardless of whether they took a licensing test. Moreover, the assertion that current testing standards must be abandoned or lowered in order to increase the diversity of the teacher corps must surely corrode the confidence of teacher candidates of color.

Is there evidence that teachers who pass this test are more effective?

A test score alone cannot determine who will be effective in the classroom and who will not; many of us can name a teacher who had trouble passing licensing tests but impressed people once in the classroom. Nor are content tests designed to make this prediction, as they omit pedagogy and other essential skills. Instead, they intend to verify that teachers have the minimum knowledge they need to teach their subject.³² However, research suggests that teachers who meet a higher passing score on

content licensing tests tend to be more effective in the classroom (as measured by their students' achievement gains), especially for mathematics.³³ While every test will have some false positives (people who pass the test despite weaker content knowledge) and false negatives (people who fail despite strong knowledge), these exams offer more insight than some other measures, such as whether a teacher has an advanced degree.³⁴



Does requiring licensing tests exacerbate teacher shortages?

While some districts do struggle to fill their elementary teaching positions, there is generally a surplus of people trained to be elementary teachers.³⁵ Few schools or states identify elementary instruction as a shortage area.³⁶

Still, as worries over teacher shortages have accelerated in the past few years, so, too, have the number of states deliberating whether to drop licensing tests. Only a few short years ago, states were taking laudable steps to raise standards for entry into the profession. Between 2011 and 2013,

16 states adopted a new elementary test that for the first time required teachers to pass each of the four content areas of the test, instead of allowing a single composite score that could mask a candidate's weak grasp of one or more subject areas.³⁷

Now, states appear to be retreating from these actions. For example, North Carolina allows teacher candidates to delay taking licensing tests until after they have begun teaching, while some other states are exempting some teachers from these tests entirely.³⁸

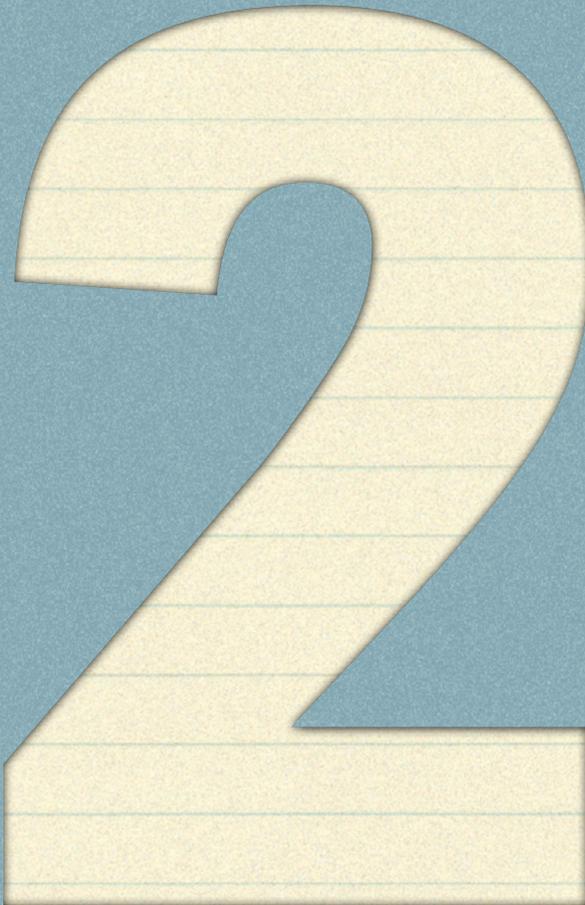
Is it more practical for teachers to learn as they go and rely on their curriculum materials to fill in the gaps?

Teachers should continue to learn more about the subjects they teach and to pursue their students' interests so that they can keep them engaged. However, lifelong learning does not take the place of the solid foundation that teachers must have. They need to know the content they will teach from their first year in the classroom, and expecting teachers to research a topic about which they know little places an added burden on them and may lead to more errors in instruction. Teachers report spending

the equivalent of an entire school day searching Pinterest and other online sites for resources.³⁹ They may not be able to rely on their school's curricular materials to fill in the gaps, either. A recent survey found that fewer than half of English language arts teachers in grades 4 through 10 (46 percent) believe their curricular materials do a good job of building content knowledge.⁴⁰

If I were to give advice to someone starting this program...
When I took my gen-ed requirements, I looked around for the easiest classes--the easy A. Instead, take the content you need: history, science, math.

– Undergraduate candidate from New York who did not pass exam



A missed opportunity

Why do more than half of all teacher candidates struggle to pass their licensing tests?

Why do more than half of new elementary teachers believe they do not have a sufficient grasp of the content they need to teach?⁴¹

The evidence presented here establishes the disconnect between how candidates are typically prepared to become licensed teachers and what they actually need to know to achieve this goal and navigate the elementary curriculum.

To explore factors that might contribute to these outcomes, beginning when candidates enter college through the point at which they take their content licensing test, we examine college course requirements and their relevance to the content knowledge needed by elementary teachers. We find current preparation to be insufficient.



The content knowledge elementary teachers need

Elementary teachers need to be versed in at least 11 core topics within the four traditional content areas (English language arts, elementary mathematics, social studies, and science) of the elementary curriculum. For elementary students, these core topics lay a foundation of essential knowledge which will be built upon in their secondary and postsecondary education.

English language arts ⁴²	Elementary mathematics ⁴³	Social studies	Science
Composition and writing Children’s literature American literature World literature	Counted as one topic in this analysis comprising numbers and operations, algebra, geometry, and data analysis and probability	U.S. history (both early and modern) World history (both ancient and modern) World geography	Biology Chemistry Physics and earth sciences

These subjects are drawn from reviews of available research, consultation with experts, states’ content knowledge expectations for elementary teachers, consideration of professional standards for teachers, and learning standards for elementary students. For a list of the support for these subject areas, see [Appendix D: Support for essential elementary content subjects](#).

Though neither **art** nor **music** is included on most licensing tests, there is no shortage of support behind the idea that elementary teachers should have some understanding and appreciation of both. However, the analysis in this report is limited to the 11 topics within the four core subjects listed above

Many leaders in the field are pressing for strong content instruction in elementary school – and for training teachers who are up to the task. CAEP, or the Council for the Accreditation of Educator Preparation, recently released new standards for elementary teacher preparation programs, which

include a standard titled, “Understanding and Applying Content and Curricular Knowledge for Teaching.” Requiring that preparation programs assess and provide evidence of candidates’ content knowledge, CAEP’s standard addresses much of the same content as NCTQ’s own review of preparation programs.⁴⁴

The core content areas examined here do not encompass everything elementary teachers must learn, omitting scientifically based reading methods, pedagogy, classroom management, assessment, collaborating with parents and families, and many other topics. We focus specifically on the core subject matter that teachers will be expected to teach, setting aside everything they need to know about *how* to teach it.

The following sections examine undergraduate, graduate, and alternative route program requirements in these 11 topic areas.



Undergraduate programs overlook straightforward solutions

The data here were obtained from undergraduate elementary teacher prep programs at 817 institutions,⁴⁵ constituting 71 percent of the undergraduate elementary teacher prep programs in the nation. We look at programs in all 50 states and DC, regardless of whether they use the Praxis exam described previously. The data were initially collected between 2014 and 2016 as part of NCTQ's 2016 -2018 *Teacher Prep Review*.

Undergraduate programs address few core topics

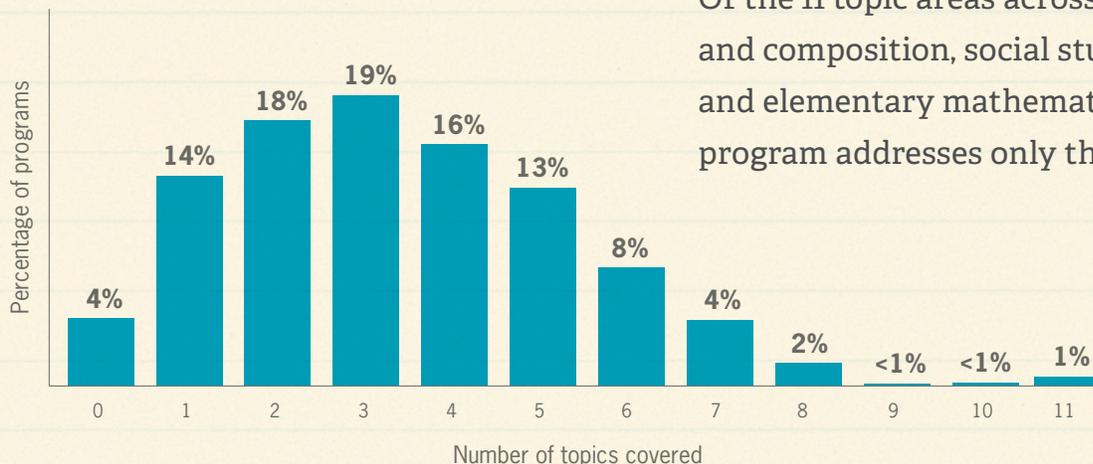
Few programs address even half of the 11 topics.⁴⁶ The average program covers 3.4 topics. Minority-serving institutions (MSIs) have somewhat stronger content requirements. The 119 MSIs with undergraduate prep programs in this study's sample cover an average of 4.0 topics, compared with 3.3 topics in non-MSIs (a statistically significant difference).⁴⁷ Historically Black Colleges and

Universities (32 in the sample) cover an average of 4.8 topics per program, and Hispanic-serving institutions (51 in the sample) cover an average of 4.1 topics.

Given programs' requirements for education majors and their institution's general education requirements, they may think that this analysis overlooks the many history, science, literature, and math courses they do require.

In fact, this analysis considers whether programs test content knowledge at admission, analyzes whether programs require any course in a topic, and evaluates whether required courses align with what elementary teachers need to know. Accounting for all these sources of content coverage, this analysis finds that many programs do not require content aligned with the needs of elementary candidates. For more information about the methodology for this report, see [Appendix C: Methodology](#).

Fig. 6 Undergraduate programs' coverage of essential content topics



Of the 11 topic areas across literature and composition, social studies, science, and elementary mathematics, the modal program addresses only three topics.

Fig. 6 Note (1): Sample includes 811 programs which could be analyzed across all four subject areas.

Fig. 6 Note (2): Topics include composition, children's literature, world literature, American literature, elementary math content, American history, world history, geography, biology, physics and earth science, and chemistry.

Fig. 6 Note (3): Numbers may not add up to 100 percent due to rounding



Few programs identify candidates' knowledge gaps early enough

Most undergraduate teacher prep programs require a formal admissions process separate from admission into the institution, providing a natural starting point for our analysis. The admissions process generally takes place shortly before a candidate's junior year of college. We explored whether programs screened applicants on their content knowledge as a condition of admission, as many of the topics represent content that should have been learned by the end of high school, or at least after two years of general education college coursework. Given ample evidence that high school graduates often do not have a basic grasp of fundamental content, screening should be seen as essential, absent a clear set of course requirements.⁴⁸

Early screening helps direct candidates toward additional coursework to shore up their content knowledge.

Only five of 817 undergraduate programs in the nation screened teacher candidates as part of admissions on all four core areas of elementary content knowledge (at the time of analysis). Only 33 programs – 4 percent of the sample – screen for candidates' knowledge in some (usually one or two) areas, most typically English language arts. Most of these 33 programs are located in Missouri, as the state requires that candidates pass a content test for entry into the program.⁴⁹

This screening can serve several purposes.

First, when applicants are diagnosed early to have a weak grasp of content in a few core areas, the program has an opportunity to direct them toward additional coursework to remedy these gaps. These applicants will likely be more successful when they later take a licensure exam.

For a detailed listing of the content alignment for each program in this study, go to [Appendix A](#).

Second, when applicants are weak in a large proportion of the content they need to know, programs may determine that they fall too far short of the bar to become a teacher candidate. They then can be directed toward a major in which they may have more success. This approach can forestall some applicants from devoting years and tuition dollars in pursuit of a profession they likely cannot enter.

Third, by verifying that entering candidates have this content knowledge, prep programs can turn their attention more fully to how to teach content

We examined each program's criteria for admissions--articulated in course catalogs, degree plans, and institutions' websites--to determine if programs' admission criteria included an assessment of content knowledge (exams taken in high school or college, such as a Praxis content exam, AP exam, or SAT II subject test). Every institution was provided the opportunity to verify the accuracy of the data. Assessments were only counted if they are required at or before admission into the teacher prep program, and if they provide a separate cut-score for the subject (otherwise a candidate's strength in one subject could mask a weakness in another).⁵⁰

Only 4 percent of undergraduate programs screen candidates' content knowledge in any subject before admitting them into teacher prep.



Coursework is often irrelevant and sometimes absent altogether

While screening candidates on their knowledge would be the most efficient way to decide whether to admit a candidate or prescribe additional coursework to fill gaps, programs can look to a more blunt but likely still effective mechanism: requiring all teacher candidates, regardless of their content mastery, to complete the same standard set of coursework requirements that cover all topic areas.

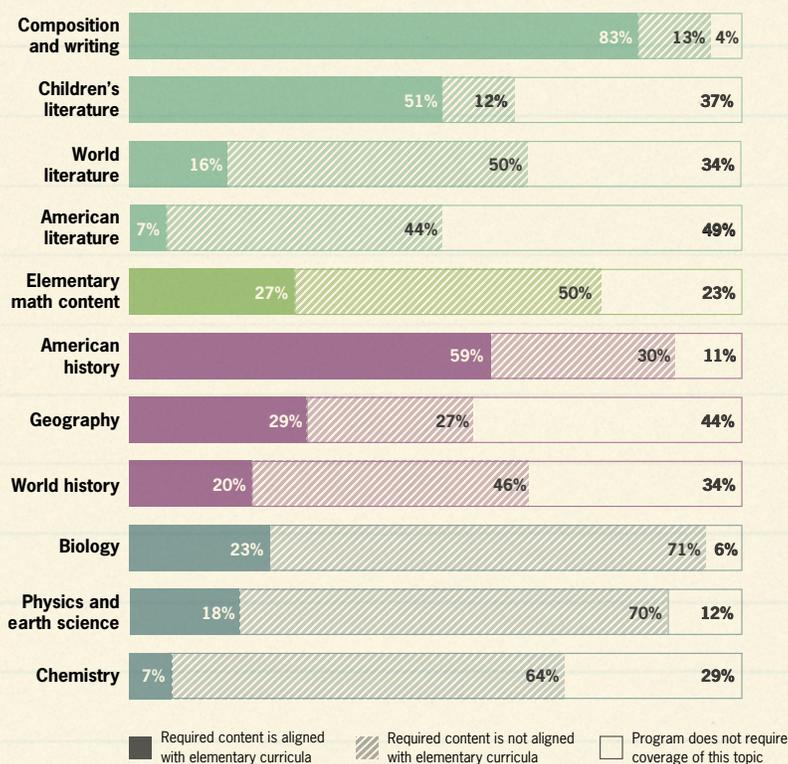
Most of the content courses undergraduate teacher candidates take are through a university's general education requirements (about 80 percent, we estimate).⁵¹ College students usually take about 45 credits, or 15 three-credit courses, of general education coursework.⁵² Analysts determined the course requirements in each subject, looking at these general education requirements (which apply to all students at the institution), as well as restrictions teacher prep programs place on

the courses that can satisfy those general education requirements (e.g., specifying which course teacher candidates can take to satisfy a history general education requirement), and the course requirements for the elementary education program.⁵³

This exercise turned up significant gaps, finding that at many institutions, candidates are not required to take *any* course, relevant or irrelevant, in a number of key topics.

Particularly troubling is that some of the programs that do not require coursework in a topic are located in states that require them to do so. For example, a number of states that use the Praxis test require that programs ensure that their candidates have knowledge of world history and geography. Yet we found evidence that about a quarter of the programs in those same states do not comply with those regulations.⁵⁴

Fig. 7 | Prevalence of content requirements aligned to elementary teaching



While only one in four undergraduate programs provides the content preparation needed to teach elementary mathematics, science is the area programs most often neglect.

Fig. 7 Note: Sample includes 817 undergraduate programs for English language arts, history and geography, and science, and 811 programs for elementary mathematics.



While the absence of any course requirement in a topic is common, a more widespread problem crops up with some of the courses available to meet requirements. Institutions and prep programs do little to ensure that the courses taken by teacher candidates are relevant to the job demands of the elementary teacher, or to the content on the licensing test.

To examine the alignment of a course, we used several criteria: whether the course was relevant, focused on content rather than pedagogy, and sufficiently broad.

- Most programs do require some aligned coursework in **English language arts**, most often in composition. Literature—even children’s literature— gets short shrift. However, programs perform better here than in other subjects: only 10 percent of programs have no relevant required content.
- While math courses are generally required, only one in four programs (27 percent) covers the essential elements of **elementary math**. Half of programs cover some topics. Nearly a quarter of programs (22 percent) have no elementary math content coursework at all.
- American history gets some attention, as aligned courses are required by 59 percent of programs, but far fewer programs require world history or geography. One in three programs (33 percent) does not require a single aligned course in **history** or **geography**.
- Programs rarely require that candidates take an aligned **science** course in any topic – often because candidates can choose from a long list of options to fulfill a general education requirement. In fact, two in three programs do not require candidates to take a single science class aligned with their needs as future elementary teachers. Only 3 percent of programs require aligned coverage of the three topic areas.



For a detailed listing of the content alignment for each program in this study, go to [Appendix A](#).

To prepare for the math content exam I bought all the review books, have taken all the online practice tests I could find, and watched hours of YouTube tutorials that go over questions and explain the answers. I’ve gone to the 6th grade math teacher in the school where I’m working for help.

- Undergraduate teacher candidate from New York who did not pass exam



Programs grant too much latitude in the courses their candidates can take

Often teacher candidates can take a course in a topic that may be interesting but is not best suited to helping them pass the test or teach elementary grades. Some of the common ways these courses fall short of the mark are:

- Courses are too narrow (e.g., a course focusing only on a decade in American history, rather than a broader span; or very specific courses such as *Female Detective Fiction* or *Chemistry and Art*).
- Courses are too broad to adequately cover content in the time allowed (e.g., a course trying to impart the foundations of multiple branches of science in a single semester).
- They are not relevant to what elementary teachers need to know (e.g., courses like *Sex and Western Society*, or a science course taught from a religious perspective).
- They focus on pedagogy rather than content (e.g., a course on “Chemistry for the elementary teacher,” which focuses on teaching techniques rather than core concepts).

A common practice on the part of institutions is to offer a menu of course options to count toward general education requirements. This practice is most prevalent in the sciences but is found frequently in history and literature requirements as well.



What's wrong with a menu of courses?

Often, candidates can choose from a list of courses to satisfy one general education requirement. They may choose a course that will not help them build core content knowledge. At one small private institution, candidates choose one course from the list below to satisfy the only American history course requirement:

- American History to 1820
- American History 1820 - 1920
- American History Since 1920
- Marriage and Family
- Microeconomics

While three of the courses would give the candidate at least a moderate foundation in U.S. history, neither *Microeconomics* nor *Marriage and Family* will steep the candidates in this core content knowledge.



Programs that rise above the others

Only 21 of 817 undergraduate programs reasonably align content coverage with most (though not all) elementary content topics.⁵⁵

Brewton-Parker College (Georgia)	Southern Utah University*
California State University – Northridge	St. Mary’s University (Texas)
Dallas Baptist University (Texas)	Texas A&M University
Ferris State University (Michigan)	Texas A&M University – Texarkana
Lake Superior State University (Michigan)	University of Arkansas
Lewis-Clark State College (Idaho)*	University of Northern Colorado
Longwood University (Virginia)	University of Sioux Falls (South Dakota)
Louisiana State University and Agricultural & Mechanical College	Utah State University*
Louisiana Tech University	Utah Valley University*
Saginaw Valley State University (Michigan)	Washington College (Maryland)*
	West Virginia State University

**Program covers some content through admissions testing.*

Does requiring aligned coursework mean teaching to the test?

No. The recommendation here is to require that candidates take content-rich coursework that dovetails with the subjects that elementary teachers will be expected to teach, the same subjects covered in states’ licensure exams. With few exceptions, these courses are available to any student at the institution, not only to teacher candidates.





We were able to gather pass rate data for several institutions among the 21 whose undergraduate elementary programs have strong content requirements; these institutions are highlighted below. However, too little data are publicly available to determine whether most programs with relevant content requirements also have higher licensing test pass rates after accounting for factors like the selectivity of the programs.

Data limitations are rooted in many complications: states vary in what data they collect and few make

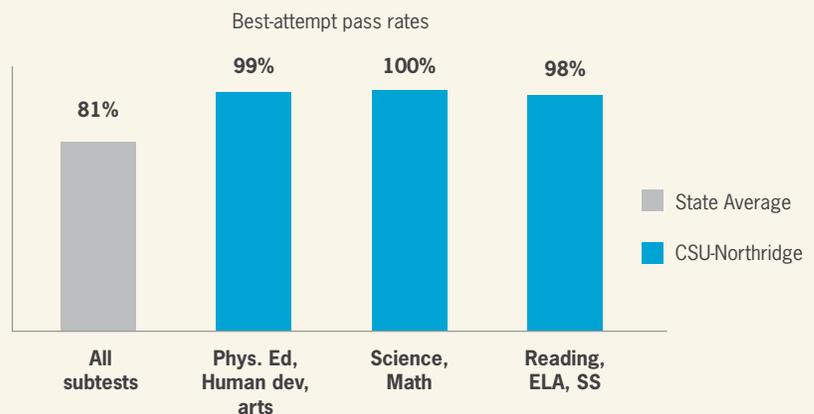
the data publicly available, and testing companies offer databases from which to download reports but rely on self-reported information from test takers on essential points like program name and level and may not offer reports aligned with prep programs' needs. Additionally, prep programs themselves may lack the necessary familiarity with the data systems to extract useful information. The question of how coursework correlates with licensing test pass rates – especially for programs that do not set a high bar for entry – warrants further study.

The following programs have strong requirements and also see high pass rates on their licensing tests, based on data that are publicly available or that they shared with NCTQ.

California State University – Northridge

California

Topics addressed: 8/11	
ELA	●●○○
Math	●
Social Studies	●●●
Science	●●○



Test: California Subject Examinations for Teachers (CSET): Multiple Subjects Test (K-12)

Note: California State University - Northridge's pass rates are for all elementary test takers from this institution, while content requirements are specific to undergraduate elementary candidates. CSU-Northridge's pass rate is based on "other enrolled candidates." Program completers have a pass rate of 100 percent.

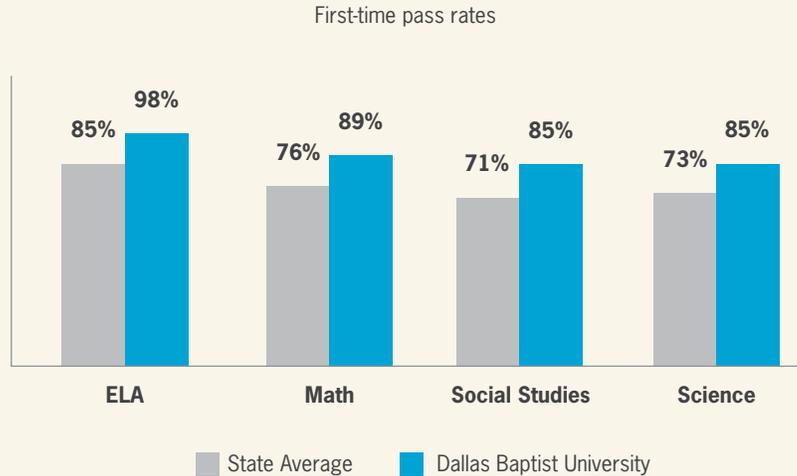
Sources: Commission on Teacher Credentialing. (2018). *Examination data*. Retrieved January 9, 2019, from <https://www.ctc.ca.gov/commission/reports/data/titleii-exam>; Commission on Teacher Credentialing. (2018). *Annual report on passing rates of commission-approved examinations from 2012-2013 to 2016-2017*. Retrieved December 20, 2018, from <https://www.ctc.ca.gov/docs/default-source/commission/reports/exam-passing-rate-fy-2012-13-to-2016-17.pdf?sfvrsn=0>.



Dallas Baptist University

Texas

Topics addressed: 8/11	
ELA	●●●○
Math	●
Social Studies	●●○
Science	●●○



Test: Texas Examinations of Educator Standards (TExES) Core Subjects EC-6

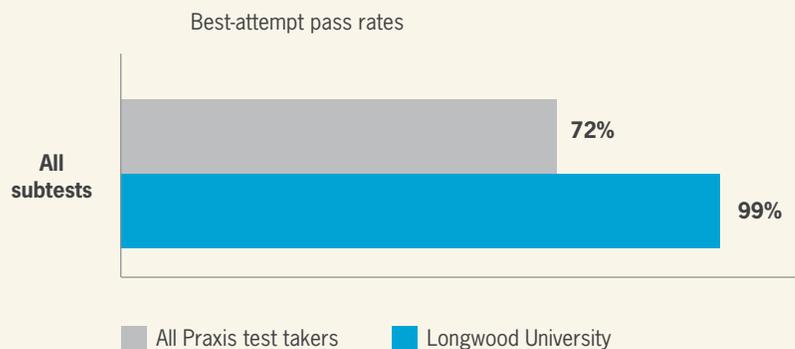
Note: Dallas Baptist University's pass rates are for all elementary test takers from this institution, while content requirements are specific to undergraduate elementary candidates.

Sources: N. Dugger (email correspondence, December 17, 2018) based on data from Pearson ResultsAnalyzer; Texas Education Agency. (2016). *Summary Statistics for Total Scores 2015-16*. Retrieved July 10, 2017, from http://cms.texas-ets.org/files/1114/7741/1086/summary_statistics_for_total_scores_2015-16.pdf.

Longwood University

Virginia

Topics addressed: 7/11	
ELA	●●○
Math	●
Social Studies	●●○
Science	●●○



Test: Praxis Elementary Education: Multiple Subjects

Note: Longwood University's pass rates are for all elementary test takers from this institution, while content requirements are specific to undergraduate elementary candidates.

Sources: Commonwealth of Virginia Department of Education. (2017). *Biennial report: SY2015-2017 approved teacher education programs compliance – accountability measurements 1 through 7*. Retrieved January 9, 2019, from http://www.doe.virginia.gov/teaching/educator_preparation/college_programs/1517biennialreport.pdf; Educational Testing Services. (2018). *Praxis Elementary Education: Multiple Subjects Passing Rate Summary*.



Graduate programs largely leave out content

Regardless of the type of training they offer, teacher prep programs share the same responsibility to produce teachers who are well versed in the content they will teach. This holds as true for graduate programs as it does for undergraduate programs. However, graduate programs frequently last only a year or two, and so they generally require fewer course credits than undergraduate programs—and their candidates have long since completed their general education coursework. In lieu of adding more requirements, these programs need to rely more heavily on screening.⁵⁶

We analyze 250 graduate programs (representing 35 percent of all graduate elementary programs); 213 of these programs have been analyzed in all four subject areas, as 37 could not be analyzed in mathematics. These data were initially collected as part of NCTQ’s 2016-2018 *Teacher Prep Review*.

Lack of content coverage is more apparent in graduate programs than in undergraduate programs.

To ensure adequate coverage, programs should require admissions testing or several courses in each subject; 12 graduate programs (5 percent) require adequate coverage of even three of the four subject areas and none have adequate coverage of all four areas.⁵⁷ Three in four programs (76 percent) do not have adequate coverage of any core subject areas.

Graduate programs have three mechanisms to ensure that their teacher candidates know content before reaching the end of the program. First, and most straightforward, programs can require a content test as a condition of admission into the program. Second, programs can review applicants’ transcripts for evidence that they have taken relevant coursework. Third, programs can require additional coursework where necessary.

Fig. 8 | Content requirements of graduate programs

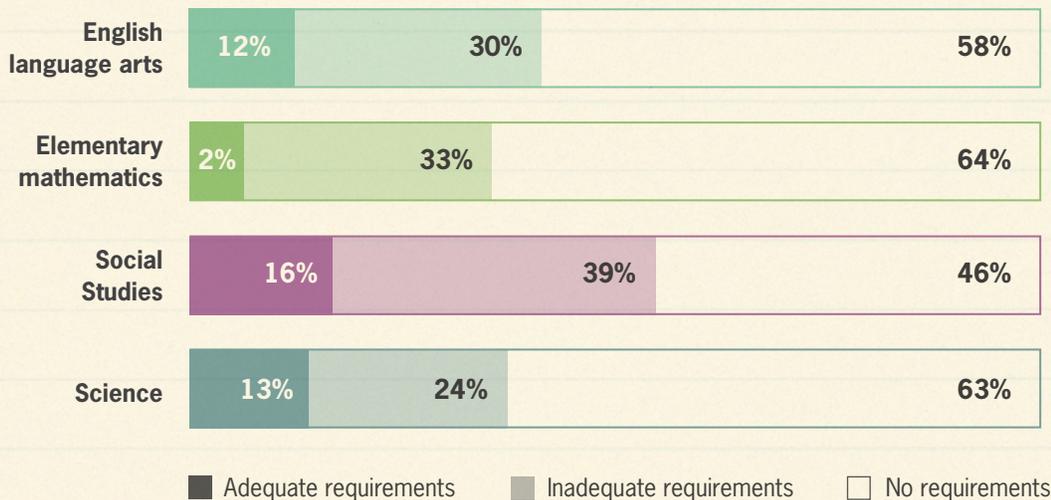


Fig. 8 Note (1): Sample comprises 250 programs in English, social studies, and science and 213 programs in math.

Fig. 8 Note (2): For elementary mathematics, adequate coverage is based on both number of courses required and topics covered within those courses.



Admissions testing

None of the graduate programs screen for content knowledge through admissions testing.

Requiring content through transcript screening and course requirements

Instead of testing, programs may review incoming candidates' transcripts for prior coursework or set requirements for the content coursework candidates must take during the program. Few graduate programs take either route to ensure that candidates take courses in each subject area, and no program sufficiently covers all subject areas.

- More than half of graduate prep programs do not require any coursework in English, elementary math, or science, and nearly half do not require any coursework in history or geography.
- The average program requires just shy of three courses (8.7 credit hours) in total across all four subject areas.
- On average, programs require just over one course in history or geography, and less than three credits in English and in science.

State policies set alternative route programs on the right path

This report examines a limited sample of 28 alternative route programs. These data were initially collected as part of NCTQ's 2016-2018 *Teacher Prep Review*.⁵⁸

For alternative route programs, we only examine admissions test requirements.

Among alternative route programs, 24 programs (86 percent) require adequate testing in at least one area, and 21 programs (75 percent) require testing in all four subject areas. The stronger testing requirements are largely due to state requirements

making it mandatory that teacher candidates pass the tests prior to becoming a teacher of record, as candidates in most alternative route programs become teachers of record (i.e., official classroom teachers) almost immediately upon entering the program.

We do not examine coursework requirements in alternative route programs because content area courses are generally outside the purview of these programs.

For a detailed listing of the content alignment for each program in this study, go to [Appendix A](#).

The stuff elementary teachers are doing in the classroom is more advanced than what I learned in my courses or what was on the exams.

– Teacher from graduate program in New York



Where this matters the most: The classroom

Regardless of their pathway, many teacher candidates reach the end of their preparation program without a firm grasp of core content, meaning that they struggle to pass licensing tests and are not confident in the subject matter they will teach. This is a painful status quo that ultimately hurts students.

For example, there is no shortage of attention to the problem of American school children underperforming in mathematics.⁵⁹ The lack of preparation their elementary teachers receive may offer an explanation. Few undergraduate preparation programs give adequate attention to the core mathematics topics that elementary teachers will teach, leaving many teachers at a loss when they enter the classroom.

On one national survey, only a third of new teachers report that they were very well prepared to teach their subject matter in their first year, and fewer teachers (31 percent) believed they were very well prepared to meet state content standards, even though most of these teachers presumably passed their licensing tests.⁶⁰



Government surveys find that elementary teachers don't have confidence in their content knowledge.⁶¹

ONLY...

54%

feel very well prepared to teach geometry

46%

feel very well prepared to teach early algebra

47%

feel very well prepared to teach social studies

39%

feel very well prepared to teach science

A survey on behalf of the National Science Foundation found that while elementary teachers claimed to feel generally prepared to teach elementary math (77 percent report feeling “very well prepared”), when asked about specific topic areas, their confidence wavered. Only 54 percent felt very well prepared to teach geometry, and just 46 percent felt very well prepared to teach early algebra.⁶² Numerous studies have examined elementary teachers’ anxiety about mathematics, and at least one study suggests that the insecurity held by female teachers (who comprise the vast majority of elementary teachers) undermines their female students’ math achievement.⁶³

The relative weakness of training in science and social studies is also consistent both with lower passing rates on licensing tests in these subjects and with what teachers themselves report.⁶⁴

It is not hard to understand why. Although many programs require at least one science course, the choice of courses presented could be largely irrelevant or simply not foundational enough in its scope. A candidate could take a course on *Herbal Medicines and Functional Food* to satisfy the biology requirement but leave the program knowing nothing about tissues and organs or about how the human eye works. A teacher who has taken only *Chemistry and Art*, a course focused on art restoration, will be ill prepared to answer an item on the licensing test pertaining to atoms and elements or to teach a grade

5 unit on the basics of atomic structure. Similar problems exist with social studies courses: The world history course *History of Dance in Western Civilization* would neither prepare candidates to answer test questions about classical civilizations’ establishment of “rule by law” nor to teach about the concept of feudalism.

The lack of preparation in social studies and science has far-reaching implications, both for whether teachers can perform the job expected of them and whether they can help their students achieve. Common Core State Standards, which have been adopted in some form by forty-one states and the District of Columbia,⁶⁵ expect teachers to provide students with reading across content areas, including social studies, science, and other disciplines.⁶⁶ Yet these are the areas teachers often feel the least prepared to teach.⁶⁷ The Praxis test results confirm this weakness: While first-time passing rates are of concern in all subjects, *they are strikingly low in science and social studies.*

Teachers’ likely difficulty in teaching these subjects may help explain students’ low scores in reading comprehension, as students’ breadth of background knowledge underpins their ability to understand what they read.⁶⁸ As an example, several studies have found that when testing students’ reading comprehension, their knowledge of the topic (in these studies, baseball or soccer) predicted their comprehension more accurately than their



reading ability did.⁶⁹ By equipping students with a thorough understanding of a range of core topic areas, teachers build the vocabulary and background knowledge their students need both to make sense of an array of reading materials and to build the foundational knowledge that will help them succeed in later grades.

Elementary teachers' insufficient content knowledge may also impede their ability to give their students appropriate assignments. A 2018 TNTP study found that "few ... assignments gave [students] the chance to demonstrate grade-level mastery." In data TNTP shared with NCTQ for assignments from kindergarten through grade 5, only a quarter of English language arts assignments (28 percent) and half of math assignments (48 percent) were based on grade-level content.⁷⁰

While research on teachers' elementary content preparation and knowledge is limited, most available research confirms a common sense conclusion—that students learn more when their teachers know more. This relationship between the courses teachers took during preparation or professional development and their students' achievement has been found in English language arts and in science.⁷¹ Another study found that when teachers learned more about an elementary mathematics topic during preparation, they addressed that topic more completely when teaching.⁷² Research suggests that teachers' scores on the licensing tests that measure their content knowledge correlate with their effectiveness as a teacher, especially for mathematics achievement.⁷³

Teachers with gaps in their content knowledge are more likely to work in more disadvantaged (and often lower-achieving) schools – those with higher rates of

poverty and more students of color.⁷⁴ This inequitable distribution of teachers can be self-perpetuating. Aspiring teachers who themselves come from disadvantaged schools where they were more likely to be taught by less knowledgeable teachers (compared with their peers in more advantaged schools) may contribute to an endless cycle, producing more students who go on to become teachers with gaps in their knowledge as well.

Teachers with gaps in their content knowledge are more likely to work in disadvantaged schools.

While our classrooms have many outstanding teachers, some teachers would be the first to admit that they have a tenuous grasp of what they are teaching, that they fear hard questions from students, and that they struggle to do justice to all subjects—especially science, history, and geography, for which they may have only outdated resources and a hazy recollection of what they learned years ago.

Even teachers who seem excellent may be skilled at teaching the content they know well— and give less attention to the subjects with which they are less comfortable. This may deprive students of the chance to learn about a range of areas, and it may become less tenable as states implement curricula aligned with college- and career-readiness standards. Parents may assume that, of *course* teachers have the knowledge they need to teach elementary content. Unfortunately, this assumption is not upheld by reality.



A chance for better data

Few teacher preparation programs and the institutions that house them appear to have taken all available opportunities to mitigate the high rates of test failure. Current data-reporting practices share only the rosier of pictures around passing rates. Programs can avoid making their true failure rates public, most notably by publicly reporting passing rates only for program completers, defining “program completers” as teacher candidates who both complete their coursework and pass their licensing tests.⁷⁵ Consequently, programs’ reported average passing rates on licensure exams hovers around 95 to 96 percent annually, which does not comport with the data released by ETS.

The best way to validate the analysis in this study would be to examine the relationship between individual prep programs’ first-time and highest-score pass rates on licensing tests and their content requirements (considering also their program admissions criteria). Unfortunately, few states make these data available in a way that reflects *all* teacher candidates, and those that do generally do not distinguish between undergraduate and graduate

teacher candidates (even though the training for these two groups at the same institution may be quite different), making such an analysis beyond our reach.⁷⁶

While we cannot prove the correlation between coursework and pass rates, providing only a few examples (see pages 23 - 24), we are confident that requiring meaningful exposure to relevant content is of value. It makes sense on its face that taking courses in core content would mean that teacher candidates better understand that content.

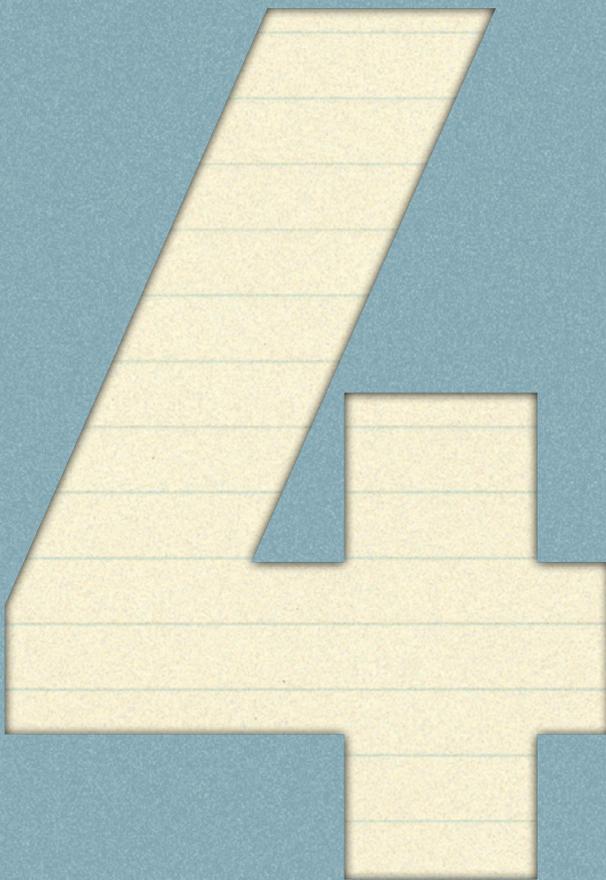
A forthcoming action guide for teacher preparation programs will share examples of programs that have set such requirements and provide more detail about the characteristics of strong coursework.



For a detailed listing of the content alignment for each program in this study, go to [Appendix A](#).

Science content was a weak point of my program. Only one science course was required: Science in Elementary Education. It was very basic and focused on the scientific process and how to engage kids... Even one additional course in science would have helped me be more prepared.

– Undergraduate teacher candidate from Washington



Solutions

Higher education institutions and their teacher preparation programs are well situated to be effective change agents. With minimal additional cost, without any need for government action, and with relatively minor adjustments to their current requirements, they can improve elementary teachers' readiness for the classroom and increase the proportion of candidates of color achieving success on licensing tests.



Institutions already offer the right kind of coursework

Institutions already allot considerable credit hours (an average of 45 credits) to general education requirements. This amount is sufficient to provide the content coursework elementary teachers need (and leave room for other topics). As mathematics necessitates specialized content knowledge targeted to elementary teacher candidates, it could be satisfied by requirements for the major and not general education requirements.

The problem is not that relevant content courses do not exist, but rather that they are not required and are instead presented as options to students with equal priority alongside less useful niche courses. Making content a priority would require tweaks, not seismic shifts, in existing requirements and advising.

An analysis of course offerings at 25 randomly selected institutions revealed that in three out of four instances where undergraduate teacher candidates are not currently required to take aligned coursework in a topic, such coursework is already available at the institution. In these instances, the teacher prep programs would not need to create new courses.

Moreover, in a third of these institutions, candidates already choose from a menu of courses that includes at least one aligned course. By simply setting parameters on which courses a teacher candidate can take to satisfy a general education requirement, these aspiring teachers would be much more likely

to learn essential content, which likely will prepare them to pass their licensing tests and become successful classroom teachers.

Making content a priority would require tweaks, not seismic shifts, in existing requirements.

The buck stops with teacher prep. Prep programs cannot defer this task to their institutions. Programs must instead set their own requirements. This analysis found that four times out of five, when elementary candidates take a course that is well aligned with their needs, it is because of a course requirement set by the program and not by the institution. Programs are the best-positioned actors to advocate on behalf of their candidates by setting targeted course requirements and, in the rare instances where aligned courses do not exist, working with the institution to revise or add new course offerings. Working across departments brings its own set of challenges, but some teacher prep programs have successfully navigated them. These programs share their advice and lessons learned in the forthcoming action guide.



A smart bet, not a silver bullet

Strengthening these course requirements will not address all the challenges to diversifying the workforce – but it may make a big difference. Data from NAEP, the nation’s report card, consistently show that students of color disproportionately finish high school without a firm grounding in content. The percentage of black and Hispanic 12th graders who score proficient in science or U.S. history is in the single digits, and none reached the advanced level.⁷⁷

But these students do better when they have taken more math and science courses in high school.⁷⁸ Shoring up the content knowledge of those who choose to pursue teaching would surely help them succeed on licensing tests. And every additional teacher of color who reaches the classroom can have a measurable impact on his or her students. For example, when a black male student has just one black elementary teacher, that student is significantly less likely to drop out of high school.⁷⁹

Similarly, requiring coursework that aligns with the content of elementary curricula and licensing tests will not result in perfect pass rates. However, making sure that aspiring teachers learn the content they will teach may be the best bet not only to enable more teachers to earn licenses, but also to make sure that the thousands of new teachers each year can provide a content-rich education for their students.

The responsibility for these low passing rates does not rest wholly at the feet of teacher preparation programs. Much of the content elementary teacher candidates struggle with represents material that students should have learned before receiving a high school diploma. Moreover, the liberal arts faculty who offer general education courses (and those who approve these courses) have long sought to offer coursework that appeals to students’ and faculty members’ own interests,⁸⁰ rather than anchoring course offerings to foundational content knowledge for elementary teaching.

But teacher preparation programs are in the best position to take action. While they will clearly face challenges when attempting to set parameters around which courses teacher candidates must take, given their unique positioning, programs’ reckoning with the need to strengthen aspiring teachers’ content knowledge is essential.



For a detailed listing of the content alignment for each program in this study, go to [Appendix A](#).



Three steps higher education institutions and their teacher prep programs can take

1. Provide better parameters for selecting from course options that count toward general education requirements for undergraduate students who indicate an interest in teaching.

Most of the content coursework that aspiring teachers take comes through the institution's general education requirements. If the institution gives candidates too many course choices that are not aligned with what future elementary teachers need, teacher prep programs can take the initiative to set boundaries for these courses. For example, if candidates can currently choose among 12 different history courses, the program can instead require that candidates take the *Early American History* course. While programs may not admit candidates until a year or two into college, they can communicate which courses are necessary through prerequisites or advising guidance, just as many programs encourage or require aspiring teacher candidates to take courses during their freshman year that provide early exposure to teaching.

2. Use the teacher preparation program admissions process for undergraduate, graduate, and alternative route programs as an opportunity to identify weaknesses in content knowledge and then tailor the course of study to fill in the gaps.

Testing for content knowledge as part of admission into the program offers immense promise, as teacher candidates take much of their content coursework before they are admitted into a program. Because teacher prep programs often already have a formal application process, adding a content test would fit

easily into the existing process. Practically speaking, screening needs to occur at an early enough stage in the college career that teacher candidates could take coursework to fill in any gaps, or choose a different major if they are falling far short. This step is especially critical for graduate and alternative route programs, as these programs rarely include time for additional content coursework. This approach is also useful to screen transfer students for content needs. The same test or set of tests can be used for any type of program, as the content teachers need to know is the same regardless of which route they come through. As an alternative to screening through a test, graduate programs could instead review incoming candidates' transcripts for relevant coursework and require additional courses to fill in any gaps.

3. Set undergraduate and graduate program content course requirements to align with what elementary teachers need to know.

General education requirements will not touch on every content area aspiring elementary teachers need. Programs should review their institution's general education requirements to identify gaps in content (or identify common gaps for entering graduate students) and include those courses as part of the requirements for the education program.

While straightforward, these solutions, which would likely produce higher pass rates for all groups of teacher candidates and could help close the gap in passing rates for teacher candidates of color, have been largely missing in current discussions about improving teacher effectiveness and bringing more teachers of color into the workforce.⁸¹



Three steps state policymakers can take

1. Revisit current licensing tests to ensure they capture the content knowledge teachers need to fully prepare students to meet college- and career-readiness standards.

Elementary content licensure tests should have separately scored tests or subtests on: English language arts, elementary mathematics, social studies, and science. Separate scoring enables states to confirm that candidates have an adequate grasp of each subject which they will be expected to teach, unlike tests with combined scores under which a candidate's strong knowledge in one core subject (e.g., social studies) could compensate for and mask insufficient knowledge in another core subject (e.g., mathematics). States that elect to also include other subjects in their current test, such as art history, health, or physical education, should consider a test that assesses these subjects separately from the core content subjects.

2. Understand that the response to low pass rates is not to abandon tests or make them easier to pass, but to hold teacher prep programs accountable for preparing candidates in the content aligned to elementary standards.

After reading about the high failure rates on content licensure exams, an initial reaction may be to lower the scores needed to pass the test, or even to drop the test altogether. Licensure tests, while never perfect, play a critical role, verifying in a more uniform way than college GPAs or performance assessments that people who are licensed to teach elementary grades know the expected content. When candidates are not able to pass their licensing test, it suggests that their educational experiences up to that point have probably been inadequate.

The solution is not to drop these tests, but to hold teacher preparation programs accountable for shoring up those gaps.

3. Publish first-time and highest-score licensing test pass rates for all candidates enrolled in a teacher prep program to give prospective teacher candidates the information they deserve to choose a program where they are more likely to be successful.

Currently, teacher prep programs submit passing rates on licensing tests for their program completers as part of Title II. However, programs often count teacher candidates as "program completers" only if they passed the licensing tests; they do not count teacher candidates who did not pass the test. Therefore, the reported passing rates do not accurately reflect the success rate of all teacher candidates who pass through a preparation program.⁸² Accurate data can provide prospective students with critical information they need when choosing a preparation program.

Adequate multi-subject elementary content tests include:

- Texas Examinations of Educator Standards (TExES) Core Subjects EC-6 (291) exam
- Florida Teacher Certification Examinations (FTCE) Elementary Education K-6 test
- Missouri Educator Gateway Assessments (MEGA) Elementary Education Multi-subject test
- Praxis Elementary Education: Multiple Subjects (5001) test

CONCLUSION

For every four elementary teacher candidates, only two will demonstrate a reasonable grasp of the content they will teach. The two who do not likely spent as much time and paid the same tuition -- and may have earned the same grades -- yet are barred from earning a standard teaching license by a lack of content knowledge. Thousands of these missing teachers are people of color, frustrating school districts' ongoing efforts to build a teacher workforce whose racial and ethnic diversity more closely reflects that of their students.

Even after taking a stronger set of coursework, some teacher candidates will not be able to pass their licensing test, but all should be given a fair chance. For many candidates, their teacher prep programs have not clearly communicated to them what they need to learn to successfully enter the profession.

For districts and parents seeking to bring in more teachers of color, the answer cannot wholly rest

on recruitment, scholarships, and affinity groups— though these are all worth pursuing. A key element in the endeavor to increase diversity in the teaching workforce involves teacher prep programs taking responsibility for helping candidates build the knowledge they need to enter the profession and to succeed in it.

Higher education institutions have some right to bristle at being handed the job of delivering fundamental knowledge in history, geography, science, math, and English language arts to college students. However, by entering into what is effectively a contract with states to prepare teachers, and by accepting aspiring teachers into their programs, the programs assume ownership over delivering prepared, skilled teachers. While the fault for candidates' gaps in content knowledge more appropriately lies with inequitable or uneven K-12 education, higher education leaders and state policymakers must carry the mantle of solutions.

The tests were on stuff I learned in high school and haven't touched in four years. Now I have to teach it.

– Teacher from graduate program in New York



Endnotes

- 1 U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey (SASS), (2011–2012). Public school teacher data file. Retrieved October 31, 2018 from https://nces.ed.gov/surveys/sass/tables/sass1112_2016003_t1s.asp and https://nces.ed.gov/surveys/sass/tables/sass1112_2016008_t1s.asp.
- 2 For each section of the licensing test, between 15 and 22 percent of test takers take the section two or more times, according to data provided by ETS. Educational Testing Services. (2018). *Praxis Elementary Education: Multiple Subjects Passing Rate Summary*.
- 3 According to one study: “[S]tates rely on a panel of education experts who attempt to relate the minimum levels of content and teaching knowledge required of beginning teachers to what is measured by the various licensing tests—the resulting cutoff score is where they deem a minimally qualified teacher candidate should perform.” Goldhaber, D. (2007). Everyone’s doing it, but what does teacher testing tell us about teacher effectiveness? *Journal of Human Resources*, 42(4), 765-794. ETS confirms this approach for their exams. ETS. (2018). *Standard-setting studies*. Retrieved March 29, 2018, from https://www.ets.org/praxis/states_agencies/adoption_process/standard_setting_studies/.
- 4 As a few examples, for information about the content of the Praxis Elementary Education: Multiple Subjects test, see <https://www.ets.org/s/praxis/pdf/5001.pdf>. For information about the content of Florida’s FCTE Elementary Education exam (a Pearson test), see http://www.fl.nesinc.com/StudyGuide/FL_SG_obj_060.htm. California has published information on its work to align the CSET with California Common Core State Standards (https://www.ctc.ca.gov/docs/default-source/commission/agendas/2013-06/2013-06-4c-pdf.pdf?sfvrsn=94b91612_0) and Next Generation Science Standards (<https://www.ctc.ca.gov/docs/default-source/commission/agendas/2016-06/2016-06-2a-pdf.pdf>).
- 5 Most states require aspiring teachers to pass one or more licensing tests on topics such as basic skills, content, and pedagogy as a requirement for becoming licensed to teach. Forty-two states and the District of Columbia require an elementary content exam, while the other eight states have a content test as an option for licensure but offer some flexibility (e.g., in Hawaii a content test is one of five options for how to demonstrate content knowledge). ETS provides licensing tests for 33 states, including 18 that require the Praxis Elementary Education: Multiple Subjects test, several states that make an ETS test optional for license, and several states that require a different ETS test, such as the Praxis II Elementary Education: Curriculum, Instruction and Assessment. Texas worked with ETS to create its own test, the Texas Examinations of Educator Standards (TExES) Core Subjects EC-6 examination. Pearson’s tests are used by 17 states, although these tests are usually designed specifically for each state (e.g., California has its own test, the CSET, and Florida has its own test, the FTCE). For publicly available pass rate data on some of these tests, see [Appendix E: First time pass rates by state](#).
- 6 For details on how we calculate this estimate, see [Appendix C: Methodology](#).
- 7 For details about the topics included on this test and for sample questions, see <https://www.ets.org/s/praxis/pdf/5001.pdf>. Pass rate data was provided by ETS via personal communication. Educational Testing Services. (2018). *Praxis Elementary Education: Multiple Subjects Passing Rate Summary*.
- 8 The Praxis Elementary Education: Multiple Subjects test is required in Alabama, Arkansas, Colorado, Connecticut, District of Columbia, Idaho, Kentucky, Louisiana, Maine, New Hampshire, New Jersey, Rhode Island, South Carolina, Utah, Vermont, Virginia, West Virginia, and Wyoming. It is optional in Alaska, Delaware, Hawaii, South Dakota, and Tennessee.
- 9 ETS provides licensing tests for 33 states, including those that require or make optional the Praxis Elementary Education: Multiple Subjects test, and several states that require a different ETS test, such as the Praxis II Elementary Education: Curriculum, Instruction and Assessment. Texas worked with ETS to create its own test, the Texas Examinations of Educator Standards (TExES) Core Subjects EC-6 examination (although this test is now administered by Pearson). Pearson’s tests are used by 18 states, although these tests are usually designed specifically for each state (e.g., California has its own test, the CSET, and Florida has its own test, the FTCE). The scores required to pass these tests are set to screen out aspiring teachers who lack the minimum necessary content knowledge, and the content knowledge needed to pass is spelled out quite clearly. Several states give candidates an option of several different tests to pass for licensure (Alaska, Iowa, and South Dakota), four states give an option of meeting licensure requirements without passing a test (Arizona, Hawaii, New Jersey, and Ohio), and two states allow some or all teachers to delay tests (North Carolina and Tennessee).



10 Jacobs, S. (2012). *State of the states 2012: All quiet on the preparation front - Area 1: Delivering well-prepared teachers; NCTQ State Teacher Policy Yearbook Brief*. Washington, DC: National Council on Teacher Quality. Retrieved July 26, 2018, from <https://www.nctq.org/publications/State-of-the-States-2012:-All-Quiet-on-the-Preparation-Front---Area-1:-Delivering-Well-Prepared-Teachers;-NCTQ-State-Teacher-Policy-Yearbook-Brief>.

11 Florida Department of Education. (2017). *Florida Teacher Certification Examinations (Ftce) And Florida Educational Leadership Examination (Fele) First-time examinees and percent passing report by field (2017-2017)*. <http://www.fldoe.org/core/fileparse.php/5627/urlt/firsttime-ftce-examinees.pdf>

12 Texas Education Agency. (2016). *Summary Statistics for Total Scores 2015-16*. Retrieved July 10, 2018, from http://cms.texas-ets.org/files/1114/7741/1086/summary_statistics_for_total_scores_2015-16.pdf.

13 American Board of Internal Medicine. (2017). *First-time taker pass rates - Initial certification*. Retrieved March 28, 2018, from <http://www.abim.org/-/media/ABIM%20Public/Files/pdf/statistics-data/certification-pass-rates.pdf>; American Board of Psychiatry and Neurology, Inc. (No Date). *Pass rates for first-time takers*. Retrieved March 28, 2018, from <https://www.abpn.com/wp-content/uploads/2016/08/ABPN-Pass-Rates-5-Year-Summary.pdf>; Illinois Department of Financial and Professional Regulation. (2018). *National Council licensure examination summary data*. Retrieved March 4, 2018, from <http://nursing.illinois.gov/PDF/IIApNursingEdProgPassRates.PDF>; National Conference of Bar Examiners. (2017). 2016 Statistics. *The Bar Examiner*. Retrieved March 28, 2018, from <http://www.ncbex.org/pdfviewer/?file=%2Fdmsdocument%2F205>; National Council of Examiners for Engineering and Surveying. (2017). *PE exam pass rates*. Retrieved March 28, 2018, from <https://ncees.org/engineering/pe/pass-rates/>; Zhang, Y. O. (2006). *Summary of uniform CPA examination candidate test-taking and pass-fail patterns in the first ten windows of computer-based testing (CBT) (04Q2-06Q3)*. American Institute of Certified Public Accountants. Retrieved March 28, 2018, from https://www.aicpa.org/BecomeACPA/CPAExam/PsychometricsandScoring/TechnicalReports/DownloadableDocuments/CPA_Examination_Test-Taking_Patterns.pdf.

14 Exceptions to these unlimited opportunities exist, such as in Texas, which sets a “five attempt limit” for licensing tests (<http://cms.texas-ets.org/texas/core-subjectsgeneralist-tests/>).

15 Pass rate data were provided by ETS. Educational Testing Services. (2018). *Praxis Elementary Education: Multiple Subjects Passing Rate Summary*. See [Appendix C: Methodology](#) for an explanation of how these data were calculated, and see [Appendix B: Estimated state teacher production by race/ethnicity](#) for an estimate of how many black and Hispanic aspiring teachers are unable to earn licenses in each state due to low passing rates. Note that ETS data show that one quarter of the people who do not pass the Praxis Elementary Education: Multiple Subjects test’s four sections are people of color (inclusive of black, American Indian or Alaskan Native, Asian, and Hispanic people). However, when extrapolating these passing rates to the teacher production by race in all 50 states, we estimate that 35 percent of aspiring teachers who do not pass this Praxis exam are people of color (almost all – 32 percent of all non-passers – are black or Hispanic). We estimate that a total of 9,500 people of color, including 8,600 black and Hispanic people, do not become teachers at least in part due to not passing their content licensure exam. Not all states require the Praxis Elementary Education: Multiple Subjects test, although it is the most commonly required test and its pass rates are roughly on par with the pass rates for tests in many other states that report these data. Consequently, we extrapolate the Praxis pass rate to all states. However, if we look at the impact of failing the Praxis test in only those 18 states that require this test, we estimate that of the 14,387 teacher candidates who are enrolled in teacher prep, 4,182 would not pass the test and earn a teaching license, including over 1,000 black and Hispanic teacher candidates.

16 Other teacher pipeline factors also reduce the diversity of the workforce, including the rate at which teachers of color are hired and retained. Putman, H., Hansen, M., Walsh, K., & Quintero, D. (2016). *High hopes and harsh realities: The real challenges to building a diverse workforce*. Brookings Institution. Retrieved October 25, 2018, from <https://www.brookings.edu/research/high-hopes-and-harsh-realities-the-real-challenges-to-building-a-diverse-teacher-workforce/>.

17 To put this in perspective, achieving racial parity between teachers and students would require an additional 635,299 Hispanic teachers and an additional 336,785 black teachers. Hispanic teachers currently represent 9 percent of the teacher workforce, but 25 percent of students are Hispanic. Similarly, black teachers represent 7 percent of the workforce, but 16 percent of students are black. Taie, S., & Goldring, R. (2017). *Characteristics of public elementary and secondary school teachers in the United States: Results from the 2015–2016 National Teacher and Principal Survey First Look (NCES 2017-072)*. U.S. Department of Education. Washington, DC: National Center for Education Statistics. Retrieved March 26, 2018, from <https://nces>.



[ed.gov/pubsearch/pubsinfo.asp?pubid=2017072](https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2017072); U.S. Department of Education, National Center for Education Statistics. (2016). *Table 203.60. Enrollment and percentage distribution of enrollment in public elementary and secondary schools, by race/ethnicity and level of education: Fall 1999 through fall 2026*. Retrieved March 26, 2018, from https://nces.ed.gov/programs/digest/d16/tables/dt16_203.60.asp?current=yes.

18 While the vast majority of teacher candidates take any given section of the Praxis test only once or twice, for each section of the test, 5 to 10 percent of test takers make three or more attempts—at least within a three-year snapshot ETS provided us. Educational Testing Services. (2018). *Praxis Elementary Education: Multiple Subjects Passing Rate Summary*. For information about Praxis fees, see ETS. (2019). *Test and services fees*. Retrieved February 5, 2019, from <https://www.ets.org/praxis/about/fees/>.

19 ETS. (2018). *Standard-setting studies*. Retrieved March 29, 2018, from https://www.ets.org/praxis/states_agencies/adoption_process/standard_setting_studies/.

20 The passing score set by each state is listed here: ETS. (2018). *The Praxis passing scores by test and state*. Retrieved from https://www.ets.org/s/praxis/pdf/passing_scores.pdf. Praxis suggests recommended passing scores in Language Arts and Mathematics subtests here: ETS. (2019). *Multistate standard-setting studies*. Retrieved from https://www.ets.org/praxis/states_agencies/adoption_process/standard_setting_studies/multistate/. The tests for the Science and Social Studies subtests are identical to the subtests in these subjects used for test 5031; the recommended passing scores for these tests were set at 155 (social studies) and 159 (science). Greene, D. (2018). Educational Testing Service. (Personal communication).

21 In fact, the cut-scores that states have set for licensing tests tend to be well below the average score of test takers in that state. Title II reports, “While state minimum cut scores vary from state to state, they are significantly lower than the average score by test takers for nearly all states and program types, suggesting that the bar may be set relatively low across the board. The national average state minimum cut score is set at 60.2 percent of the possible points that can be earned on an assessment. The average score by test takers is 74.4 percent of the possible points that can be earned on an assessment.” U.S. Department of Education, Office of Postsecondary Education. (2016). *Preparing and credentialing the nation’s teachers: The Secretary’s 10th report on teacher quality*. Washington, DC. Retrieved March 29, 2018, from <https://title2.ed.gov/Public/TitleIIReport16.pdf>. Moreover, research on earlier iterations of Praxis tests have found that people who fail

the test do far worse on average than those who pass – suggesting that Praxis licensing tests are generally not blocking many aspiring teachers who “nearly” pass from entering the profession. Making the test a little easier would likely not change the pass rate substantially, and making it considerably easier would diminish its purpose. Gitomer reports, “Individuals who pass these tests have mean and median scores that are approximately two standard deviations higher than those who fail....This finding has two practical implications. First, licensing tests are filtering out individuals who attain very low scores on tests of content knowledge. Second, it is unlikely that many of these low-scoring individuals will achieve a passing score simply through taking the test multiple times without learning more of the content that is measured on the test.” U.S. Department of Education, Office of Planning, Evaluation and Policy Development. (2010). *Policy and program studies service, recent trends in mean scores and characteristics of test-takers on Praxis II Licensure Tests*. Washington, DC. Retrieved March 29, 2018, from <https://files.eric.ed.gov/fulltext/ED527142.pdf>.

22 Aspiring teachers who struggle to pass the Praxis I test of basic skills also struggle to pass Praxis II content tests. Gitomer, D. H., Brown, T. L., & Bonett, J. (2011). Useful signal or unnecessary obstacle? The role of basic skills tests in teacher preparation. *Journal of Teacher Education*, 62(5), 431-445.

23 Under the new CAEP accreditation standards, the teacher preparation program’s cohort of enrolled teacher candidates must have an average GPA of 3.0 and a group average performance in the 50th percentile on a nationally normed assessment (e.g., the SAT or ACT). However, each teacher prep program can decide whether these criteria apply at the point of admission into the program or at some other point during the program, meaning that CAEP does not hold prep programs accountable for setting a reasonably high bar for entry into the program. Council for the Accreditation of Educator Preparation. (2015). *Standard 3: Candidate quality, recruitment, and selectivity*. Retrieved July 20, 2018, from <http://www.ncate.org/standards/standard-3>. Only one in five programs that are not housed in selective institutions require applicants to have at least a 3.0 GPA for admission into the program. Data collected from the National Council on Teacher Quality’s 2016 *Teacher Prep Review*.

24 The American Association of Colleges of Nursing reports that for admission into undergraduate nursing programs, “On a 4.0 scale, admission into the last two years of the nursing program may require a minimum GPA of 2.5 to 3.0 in preprofessional nursing classes. The national average is about 2.8, but the cutoff level varies with each program.” American Association of Colleges



of Nursing. (2018). *Baccalaureate education*. Retrieved March 29, 2018, from <http://www.aacnursing.org/Nursing-Education-Programs/Baccalaureate-Education>. Nursing pass rate comes from Illinois Department of Financial and Professional Regulation. (2018). *National Council Licensure Examination Summary Data*. Retrieved March 4, 2018, from <http://nursing.illinois.gov/PDF/IIApNursingEdProgPassRates.PDF>.

25 For ETS assessments, including all Praxis assessments, there are fairness and validity guidelines to ensure that the construct-irrelevant score variance (that is, differences based on anything other than one's understand of the content) is as small as possible (ETS, (2015). *ETS Standards for Quality and Fairness. Educational Testing Service*. Retrieved May 10, 2018, from <https://www.ets.org/s/about/pdf/standards.pdf>). Guidelines for writing assessment questions are extensive and include terms, topics, and formats to avoid because they have been found to create construct-irrelevant variance between groups (ETS, 2016). *ETS Guidelines for Fair Tests and Communications*. Educational Testing Service. Retrieved November 1, 2018, from https://www.ets.org/s/about/pdf/ets_guidelines_for_fair_tests_and_communications.pdf. In addition, ETS has established Guidelines for Using Accessible Language, which include express direction on vocabulary, sentence structure, and grammar for multiple levels and subjects of assessments (ETS, 2016, Appendix 1).

Despite these guidelines, sometimes there are still differences between how people from certain groups perform on assessment items. To evaluate these variances, ETS assesses differential item functioning (DIF). DIF uses the Mantel-Haenszel (M-H) statistic to calculate statistical differences between the performance of certain identified groups on assessment items (Zieky, M. [2003]). A DIF primer. Center for Education in Assessment. Retrieved November 1, 2018 from https://www.ets.org/s/praxis/pdf/dif_primer.pdf, including constructed-response and performance assessment items (Baldwin, D., Fowles, M., & Livingston, S. [2005]. *Guidelines for constructed-response and other performance assessments*. Educational Testing Service. Retrieved November 2, 1028 from https://www.ets.org/s/praxis/pdf/constructed_response_guidelines.pdf)

ETS standards require that all assessments in the U.S. investigate DIF for the following groups: "African-American, Asian-American, Hispanic-American, and Native-American (as compared to White) users of the product or service, and female (as compared to male)..." In addition, guidelines require that, "[W]hen sample sizes are sufficient, and the information is relevant, [ETS] investigate DIF for test takers with specific disabilities, and those who are English-language learners. Programs designed for nonnative

speakers of English may investigate DIF for relevant subgroups based on native language. If sufficient data are unavailable for some studied groups, provide a plan for obtaining the data over time, if feasible." (ETS, 2015)

When an assessment has been developed, the first step is to pre-test. If a sufficient sample size is collected in the pre-test, the DIF analysis computes an M-H statistic for each item on the assessment. Items are then grouped into three categories: Category A items have no statistical difference between matched groups; Category B items have small to moderate differences between matched groups; and Category C items have the greatest differences between matched groups. Test developers are to prioritize Category A items over B and C, and may only include Category C items if 1) they can be justified as necessary to meet the specifications for content on the assessment, and 2) the item has successfully passed through an independent review (not involving anyone who worked on the test or item development) that certifies that performance on the question is not unfairly related to group membership. If not enough of a sample is available during the pre-test period, the assessment must undergo the DIF analysis after the first administrations of the assessment but before any scores are reported to test takers. Any item that is a Category C must go through the independent review process and be certified to be counted toward scores and remain on the test (Zieky, 2003). Other test developers follow similar rigorous practices.

26 In New York, the court has ruled against the last three literacy tests used as part of the state's certification process. A lawsuit against the original LAST (the Liberal Arts and Sciences) test, which was administered from 1993 to 2004, found the test to be discriminatory because it had a disparate impact on Black and Hispanic test takers. The final court decision was issued in 2012. A revised version of this test, the LAST-2, which was administered between 2004 and 2012, was also found to be discriminatory in a 2015 ruling. Most recently the same judge who ruled against the LAST-2 found that New York's newest licensing exam, the Academic Literacy Skills Test (ALST), was not discriminatory. People of color tended to score poorly, but the test evaluated teacher candidates on the skills necessary to their profession. However, in March 2017, the NY State Board of Regents, in response to charges of racial bias, dropped the requirement that teachers pass the Academic Literacy Skills Test. Goodman, E. J. (2003, Sept. 15). Challenging a test the teachers must take. *Gotham Gazette*. Retrieved November 1, 2018, from <http://www.gothamgazette.com/education/1960-challenging-a-test-the-teachers-must-take>; Garden City Group, LLC. (2018). *Gulino v. Board of Education Frequently Asked Questions*. Retrieved



November 1, 2018, from <http://www.gulinolitigation.com/faq>; Barnum, M. (2015). Raising the bar might bar too many when it comes to teacher certification tests. *The 74*. Retrieved November 1, 2018, from <https://www.the74million.org/article/raising-the-bar-might-bar-too-many-when-it-comes-to-teacher-certification-tests/>; Harris, E.A. (2015, June 5). Judge rules second version of New York teachers' exam is also racially biased. *New York Times*. Retrieved November 1, 2018, from <https://www.nytimes.com/2015/06/06/nyregion/judge-rules-second-version-of-new-york-teachers-exam-is-also-racially-biased.html>; Taylor, K. (2017, March 13). Regents drop teacher literacy test seen as discriminatory. *New York Times*. Retrieved November 1, 2018, from <https://www.nytimes.com/2017/03/13/nyregion/ny-regents-teacher-exams-alst.html>.

27 An unsuccessful challenge was brought against the Massachusetts test in 2009. *Alston v. Massachusetts*, 661 F. Supp. 2d 117 (D. Mass. 2009). Retrieved November 1, 2018, from <https://www.courtlistener.com/opinion/2409904/alston-v-massachusetts/>. Alabama suspended its licensing tests for several decades as a result of such a challenge but initiated new tests in 2000. Associated Press. (2010, Feb. 2) Alabama case on racial bias in testing of teachers ends after 30 years. *Education Week*. Retrieved November 1, 2018, from <https://www.edweek.org/ew/articles/2010/02/03/20brief-6.h29.html>. Claims that these tests had disparate impacts on aspiring teachers of color were also the focus of two older and also unsuccessful legal challenges in California and Texas. *Fields v. Hallsville Independent School District*, 906 F.2d 1017 (5th, 1990). Retrieved November 1, 2018, from <https://openjurist.org/906/f2d/1017/fields-v-hallsville-independent-school-district>; *Association of Mexican-American Educators v. State of California*, 231 F.3d 572 (9th, 2000). Retrieved November 1, 2018, from <http://www.freelawreporter.org/flr3d/f3d/231/231.F3d.572.96-17131.97-15422.html>.

28 A growing body of research demonstrates the many ways that students of color benefit from having teachers who look like them – including greater academic achievement (Egalite, A., Kisida, B., & Winters, M. [2015]. Representation in the classroom: The effect of own-race teachers on student achievement. *Economics on Education Review*, 45, 44-52; Goldhaber, D., & Hansen, M. [2010]. Race, gender and teacher testing: How informative a tool is teacher licensure testing and how does it impact student achievement? *American Educational Research Journal*, 47(1), 218-51; Dee, T. S. [2004]. Teachers, race, and student achievement in a randomized experiment. *The Review of Economics and Statistics*, 86(1), 195-210); being held to higher academic expectations (Gershenson, S., Holt, S. B., & Papageorge, N. W. [2016]. Who believes in me? The effect of student-teacher demographic match on teacher expectations. *Economics of Education Review*, 52, 209-

224), and being recommended to gifted and talented programs at higher rates (Grissom, J.A., & Redding, C. (2016). Discretion and disproportionality: Explaining the underrepresentation of high-achieving students of color in gifted programs. *AERA Open*, 2(1), 1-25).

29 Goldhaber, D., & Hansen, M. (2010). Race, gender, and teacher testing: How informative a tool is teacher licensure testing? *American Educational Research Journal*, 47(1), 218-251.

30 Cherng, H. Y. S., & Halpin, P. F. (2016). The importance of minority teachers: Student perceptions of minority versus White teachers. *Educational Researcher*, 45(7), 407-420.

31 In fact, research suggests that the gap in passing rates is largely driven by a gap in basic skills and not race: "African-American test takers who passed the Praxis I tests successfully on their first try were nearly as likely to pass their Praxis II tests as were White test takers with similar success on the Praxis I tests and similar undergraduate grade point averages." Tyler, L. (2011). Toward increasing teacher diversity: targeting support and intervention for teacher licensure candidates. *Educational Testing Service*. Retrieved March 29, 2018, from https://www.ets.org/s/education_topics/teaching_quality/pdf/support_intervention_teacher_licensure.pdf. This statement interprets research from Gitomer, D. H., Brown, T. L., & Bonett, J. (2011). Useful signal or unnecessary obstacle? The role of basic skills tests in teacher preparation. *Journal of Teacher Education*, 62(5), 431-445. Retrieved March 29, 2018, from https://www.researchgate.net/profile/Drew_Gitomer/publication/258160267_Useful_Signal_or_Unnecessary_Obstacle_The_Role_of_Basic_Skills_Tests_in_Teacher_Preparation/links/5447df230cf2d62c305230ca.pdf.

32 ETS. (2018). *Standard-setting studies*. Retrieved March 29, 2018, from https://www.ets.org/praxis/states_agencies/adoption_process/standard_setting_studies/.

33 Goldhaber, D., & Hansen, M. (2010). Race, gender, and teacher testing: How informative a tool is teacher licensure testing? *American Educational Research Journal*, 47(1), 218-251; Goldhaber, D. (2007). Everyone's doing it, but what does teacher testing tell us about teacher effectiveness? *Journal of Human Resources*, 42(4), 765-794; Clotfelter, C. T., Ladd, H. F., & Vigdor, J. L. (2006). Teacher-student matching and the assessment of teacher effectiveness. *Journal of Human Resources*, 41(4), 778-820. It is worth noting that since these studies tend to take advantage of differences in required passing scores (due to changes in requirements over time, or due to differences in cut-scores among states) to determine the relationship between passing the test



and performance in the classroom, researchers are generally not able to measure the effectiveness of someone who never passes the licensing test, because that person rarely makes it into the classroom. (Or if she does, she often cannot stay for more than a year, or may have exceptional qualities that make her experience not representative of the broader population of aspiring teachers who fail licensing tests.) For example, a study of teachers in North Carolina used changes in the required passing score, finding that these data “suggest that teachers who pass the test produce, on average, student achievement gains that are in the range of 3 to 6 percent of a standard deviation higher (in math) than those who fail.” Goldhaber, D. (2007).

34 Numerous studies have found that with the exception of an advanced degree in mathematics for secondary math teachers, having a masters degree does not make a teacher more effective. For example, see Bastian, K. C. (2018). A degree above? The value-added estimates and evaluation ratings of teachers with a graduate degree. *Education Finance and Policy*, (Just Accepted), 1-46; Walsh, K., & Tracy, C. O. (2004). *Increasing the odds: How good policies can yield better teachers*. National Council on Teacher Quality. Retrieved August 31, 2018, from <https://www.nctq.org/publications/Increasing-the-Odds:-How-Good-Policies-Can-Yield-Better-Teachers>.

35 Walsh, K. (2015). Are big teacher shortages around the corner? *Teacher Quality Bulletin*. Washington, DC: National Council on Teacher Quality. Retrieved November 1, 2018, from <https://www.nctq.org/blog/Are-big-teacher-shortages-around-the-corner->.

36 For information about schools, see Cowan, J., Goldhaber, D., Hayes, K., & Theobald, R. (2016). Missing elements in the discussion of teacher shortages. *American Institutes for Research*. Retrieved May 10, 2018, from <https://caldercenter.org/sites/default/files/Teacher%20Shortage%20Explainer%20%2812-15-16%29.pdf>. In the U.S. Department of Education’s annual Teacher Shortage Area listing, 13 states and the District of Columbia reported elementary education as a teacher shortage area for the 2017-2018 school year (Arizona, District of Columbia, Georgia, Idaho, Illinois, Louisiana, Missouri, Nevada, New Mexico (kindergarten only), North Dakota, Oklahoma, Virginia, West Virginia, and Wyoming). The prior school year, 11 states and the District of Columbia reported elementary education as a shortage area, and two of these only specified kindergarten. Cross, F. (2017). *Teacher shortage areas nationwide listing: 1990-1991 through 2017-2018*. United States Department of Education. Retrieved May 15, 2018, from <https://www2.ed.gov/about/offices/list/oep/pol/bteachershortageareasreport201718.pdf>.

37 These states were Alabama, Arkansas, Connecticut, Delaware, the District of Columbia, Hawaii, Idaho, Kentucky, Maine, New Hampshire, New Jersey, Rhode Island, South Carolina, Vermont, Virginia, and West Virginia.

38 In addition, New Jersey instituted a content test exemption, and Nevada permits teachers who have not demonstrated relevant subject-matter expertise to teach in underperforming schools for up to three years. Note that Nevada’s policy applies to teachers who are hired as a result of a shortage.

39 Gorman, N. (2017). Survey finds teachers spend 7 hours per week searching for instructional materials. *Education World*. Retrieved February 3, 2019, from https://www.educationworld.com/a_news/survey-finds-teachers-spend-7-hours-week-searching-instructional-materials-490526015.

40 Griffith, D., & Duffett, A. M. (2018). *Reading and writing instruction in America’s schools*. Washington, DC: Thomas B. Fordham Institute. Retrieved July 23, 2018, from <http://edex.s3-us-west-2.amazonaws.com/publication/pdfs/%2807.19%29%20Reading%20and%20Writing%20Instruction%20in%20America%27s%20Schools.pdf>.

41 U.S. Department of Education, National Center for Education Statistics. (2012). *Schools and Staffing Survey (SASS) (2011-2012). Public school teacher data file*. Retrieved November 1, 2018, from https://nces.ed.gov/surveys/sass/tables/sass1112_2016003_t1s.asp and https://nces.ed.gov/surveys/sass/tables/sass1112_2016008_t1s.asp; Banilower, et al. (2013). Report of the 2012 National Survey of Science and Mathematics Education. *Horizon Research, Inc.* Retrieved November 1, 2018, from <http://www.horizon-research.com/2012nssme/wp-content/uploads/2013/02/2012-NSSME-Full-Report1.pdf>.

42 Note that this report does not address whether teachers learn how to teach children to read and write, although these are essential roles for elementary teachers. This report focuses on whether teachers learn content, not pedagogy. For more on whether programs are preparing elementary teachers to teach reading, see the most recent findings from NCTQ’s *Teacher Prep Review*. Findings on graduate and alternative route programs can be found at: https://www.nctq.org/dmsView/2018_Reading_Findings. Findings on undergraduate programs can be found at: https://www.nctq.org/dmsView/NCTQ_-_Standard_2_How_Programs_Stack_Up. A more in-depth look at preparation in early reading can be found at: https://www.nctq.org/dmsView/What_Ed_Schools_Arent_Teaching_About_Reading_NCTQ_Report.



43 For elementary mathematics, analysis considers the required admissions tests and course requirements and descriptions used to analyze all other subjects, and also considers the topics addressed in courses (as outlined by course syllabi) as well as the content of required textbooks. Further, in other subjects, college-level content coursework designed for the general college population is appropriate, whereas elementary mathematics coursework should be designed specifically for elementary teacher candidates. For more on how all subjects are analyzed, see the [Appendix C: Methodology](#).

44 CAEP standards and NCTQ analysis align closely in mathematics, both including attention to numbers and operations, algebraic thinking, measurement, statistics and probability, and geometry. CAEP and NCTQ also align in science content, although the categories are slightly different (CAEP includes physical science, life science, and earth and space sciences, while NCTQ looks for coursework under biology, chemistry, and physics/earth sciences). CAEP also includes engineering, which NCTQ does not. CAEP and NCTQ also mostly align regarding social studies topics, although CAEP includes economics (which NCTQ does not) and civics (which NCTQ folds into American history) and provides less detail about history, whereas NCTQ specifies that history should encompass early and modern world and American history. The one area of divergence comes in English language arts: CAEP emphasizes literacy, and while NCTQ separately reviews teacher preparation programs for instruction in how to teach reading, the content section of our analysis focuses on literature and composition. CAEP (2018). *CAEP 2018 K-6 Elementary teacher preparation standards [initial licensure programs]*. Washington, DC: Council for the Accreditation of Educator Preparation. Retrieved July 26, 2018, from <http://www.ncate.org/~media/Files/caep/standards/2018-caep-k-6-elementary-teacher-prepara.pdf?la=en>.

45 In elementary mathematics, the sample comprises 811 programs; six programs' coursework is currently under review.

46 The sample for this chart represents the 811 programs for which we have data in elementary mathematics in addition to the other three subject areas, excluding the six programs for which we only have data in English language arts, science, and social studies.

47 MSIs are defined as those that the College Scorecard flags as a Historically Black College and University, a predominantly black institution, an Alaska Native or Native Hawaiian serving institution, a tribal college and university, an Asian American

Native American Pacific Islander-serving institution, a Hispanic-serving institution, or a Native American non-tribal institution. U.S. Department of Education. (2018). *College scorecard data*. Retrieved May 15, 2018, from <https://collegescorecard.ed.gov/data/>.

48 Surveys reveal that many college graduates fall short in their knowledge of life science, physical science, and earth science (the three sciences areas included in NAEP's grade 4 science assessment. (Funk, C., & Goo, S. K. [2015]. *A look at what the public knows and does not know about science*. Pew Research Center. Retrieved November 1, 2018, from <http://www.pewinternet.org/2015/09/10/science-knowledge-is-higher-among-highly-educated-adults/>.) Knowledge of history is no better. In 2009, the American Revolution Center conducted a short survey quizzing Americans on their knowledge of the country's founding. On average, college graduates got about 14 of the 27 questions right – only about two questions more than the noncollege graduates also included in the nationally representative sample. (The American Revolution Center. [2009]. *The American Revolution. Who cares? Americans are yearning to learn, failing to know* [survey]. A college-educated adult's engagement with literature also cannot be taken for granted. A recent survey conducted by the National Endowment for the Arts and the U.S. Census Bureau found that around 40 percent of college graduates had not read any literature in the last year. (National Endowment for the Arts. [2016]. *Results from the Annual Arts Basic Survey (2013-2015)*. Retrieved November 1, 2018 from <https://www.arts.gov/artistic-fields/research-analysis/arts-data-profiles/arts-data-profile-10>).

49 NCTQ. (2017). *Program Entry: Missouri*. Washington, DC: National Council on Teacher Quality. Retrieved May 15, 2018, from <https://www.nctq.org/yearbook/state/MO-Program-Entry-81>. Note that the *Teacher Prep Review* does not give the MoGEA credit for addressing science and social studies because it combines these two subjects into one test with one score (see https://www.mo.nesinc.com/TestView.aspx?f=HTML_FRAG/MO066_TestPage.html), or for mathematics because it does not focus on elementary mathematics.

50 Jacobs, S. (2012). *State of the states 2012: All quiet on the preparation front - Area 1: Delivering well-prepared teachers; NCTQ state teacher policy yearbook brief*. Washington, DC: National Council on Teacher Quality. Retrieved July 26, 2018, from <https://www.nctq.org/publications/State-of-the-States-2012:-All-Quiet-on-the-Preparation-Front---Area-1:-Delivering-Well-Prepared-Teachers;-NCTQ-State-Teacher-Policy-Yearbook-Brief>.



51 We estimate that this is based on an analysis of 23 programs' content coursework, finding that approximately 40 credits of content coursework are taken in the first two years of college, while just shy of 10 credits of content coursework are taken in the last two years.

52 Ratcliff, J. L., Johnson, D. K., La Nasa, S. M., & Gaff, J. G. (2001). *The status of general education in the year 2000: Summary of a national survey*. Association of American Colleges & Universities. Retrieved November 1, 2018, from <https://files.eric.ed.gov/fulltext/ED463684.pdf>.

53 During the scoring process, NCTQ implements a "RevStat" process to ensure validity and reliability, meant to guarantee that individual analyses remain consistent over time, and to verify that all analysts' decisions are consistent with one another's and with the protocol. As an additional level of verification, 20 percent of programs are selected for a random double-blind accuracy check, in which a second analyst analyzes the same program, and scoring discrepancies are examined by a team lead who implements additional training when warranted. Finally, teacher preparation programs have the opportunity to review and correct judgments reached about their course and exam requirements. In elementary math content, expert analysts look beyond the course requirements to consider the content of courses (specifically, whether lectures and assignments address the 12 essential elementary math sub-topics identified by experts, whether textbooks address these topics, and what proportion of course time is devoted to teaching about these topics).

54 Of the 109 programs across 13 states that require the Praxis test and require that programs ensure that their candidates have in-depth knowledge of these subjects, 20 percent do not require a world history course and 25 percent do not require a geography course. Many programs that do require courses in these areas allow aspiring teachers to take coursework that would be unaligned with their needs -- 44 percent of the 109 programs in world history and 31 percent in geography. Only 36 percent have aligned coverage (that is, coverage best suited to the needs of elementary teachers) of world history, and 44 percent of geography.

55 The 21 programs listed here have an admissions test or aligned coverage of at least two topics in ELA, science, and social studies and have adequate coverage in elementary mathematics.

56 Data for graduate programs comes from NCTQ's 2018 *Teacher Prep Review*, collected between 2014 and 2018.

57 These graduate programs are located at Troy University (AL), Johns Hopkins University (MD), Loyola University Maryland, Mount St. Mary's University (MD), Notre Dame of Maryland University, University of Nevada - Reno, Eastern Oregon University, Western Governors University (UT), George Mason University (VA), Radford University (VA), University of Mary Washington (VA), and Virginia Polytechnic Institute and State University. Three more institutions have adequate requirements in three subjects and could not be evaluated in mathematics. These are located at Jacksonville State University (AL), University of Nevada - Las Vegas, and Evergreen State College (WA).

58 Data for alternative route programs comes from NCTQ's 2018 *Teacher Prep Review*, collected between 2014 and 2018.

59 On the National Assessment of Educational Progress (NAEP, also known as The Nation's Report Card), only 40 percent of grade 4 students were at or above the level of proficient in mathematics, meaning that they demonstrate solid academic performance for that grade level. U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. (2015). *Percentage of fourth-grade students at or above Proficient lower compared to 2013*. Retrieved March 27, 2018, from https://www.nationsreportcard.gov/reading_math_2015/#mathematics/acl?grade=4. On the 2015 international assessment TIMSS, "U.S. fourth-graders' average score in mathematics was 539, which was higher than the average scores of students in 34 education systems and lower than the average scores of students in 10 education systems." Provasnik, S., Malley, L., Stephens, M., Landeros, K., Perkins, R., & Tang, J. H. (2016). *Highlights from TIMSS and TIMSS Advanced 2015: Mathematics and science achievement of U.S. students in grades 4 and 8 and in advanced courses at the end of high school in an international context* (NCES 2017-002). U.S. Department of Education, National Center for Education Statistics. Washington, DC. Retrieved March 27, 2018, from <https://nces.ed.gov/pubs2017/2017002.pdf>. The Smarter Balanced tests find that less than half of third through sixth grade students are proficient in math. Smarter Balanced Assessment Consortium. (2018). *Answers to questions about Smarter Balanced 2017 test results*. Retrieved April 4, 2018, from <http://portal.smarterbalanced.org/library/en/answers-to-questions-about-2017-test-results.pdf>.

60 U.S. Department of Education, National Center for Education Statistics. (2012) Schools and Staffing Survey (SASS), (2011–2012). Public school teacher data file. Retrieved October 31, 2018 from https://nces.ed.gov/surveys/sass/tables/sass1112_2016003_t1s.asp and https://nces.ed.gov/surveys/sass/tables/sass1112_2016008_t1s.asp.



- 61 Banilower, et al. (2013). Report of the 2012 National Survey of Science and Mathematics Education. Horizon Research, Inc. Retrieved November 1, 2018, from <http://www.horizon-research.com/2012nssme/wp-content/uploads/2013/02/2012-NSSME-Full-Report1.pdf>.
- 62 Banilower, et al. (2013). Report of the 2012 National Survey of Science and Mathematics Education. Horizon Research, Inc. Retrieved November 1, 2018, from <http://www.horizon-research.com/2012nssme/wp-content/uploads/2013/02/2012-NSSME-Full-Report1.pdf>.
- 63 Note that this study had a small sample size (17 teachers), and so the generalizability of findings may be limited. Beilock, S. L., Gunderson, E. A., Ramirez, G., & Levine, S. C. (2010). Female teachers' math anxiety affects girls' math achievement. *Proceedings of the National Academy of Sciences*, 107(5), 1860-1863. Other studies on teachers' math anxiety include but are not limited to: Brown, A. B., Westenskow, A., & Moyer-Packenham, P. S. (2011). Elementary pre-service teachers: Can they experience mathematics teaching anxiety without having mathematics anxiety? *Issues in the Undergraduate Mathematics Preparation of School Teachers*, 5; Yazıcı, E., Peker, M., Ertekin, E., & Dilmaç, B. (2011). Is there a relationship between pre-service teachers' mathematical values and their teaching anxiety in mathematics? *Electronic Journal of Research in Educational Psychology*, 9(1), 263-282; Tatar, E., Zengin, Y., & Kagizmanli, T. B. (2015). What is the relationship between technology and mathematics teaching anxiety? *Journal of Educational Technology & Society*, 18(1), 67.
- 64 Just like in mathematics, when asked about specific topics within science, teachers' feeling of preparedness declines: less than 30 percent of teachers felt very well prepared in any given area of science (life science, physical science, earth science, and engineering). Banilower, et al. (2013). *Report of the 2012 National Survey of Science and Mathematics Education*. Horizon Research, Inc. Retrieved November 1, 2018, from <http://www.horizon-research.com/2012nssme/wp-content/uploads/2013/02/2012-NSSME-Full-Report1.pdf>.
- 65 Common Core Standards Initiative. (2018). *Standards in your state*. Retrieved October 25, 2018, from <http://www.corestandards.org/standards-in-your-state/>.
- 66 Common Core State Standards Initiative. (2010). *Common Core State Standards for English language arts, & literacy in history/social studies, science, and technical subjects*. Retrieved November 2, 2018, from http://www.corestandards.org/wp-content/uploads/ELA_Standards1.pdf. National Governors Association Center for Best Practices, Council of Chief State School Officers. (2010). Introduction: History/Social Studies. *Common Core State Standards Initiative*; <http://www.corestandards.org/ELA-Literacy/RH/introduction/>.
- 67 U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey (SASS). 2011–2012. Public school teacher data file. Retrieved November 1, 2018, from https://nces.ed.gov/surveys/sass/tables/sass1112_2016003_t1s.asp; U.S. Department of Education, National Center for Education Statistics. (2012). *Schools and Staffing Survey (SASS), "Public School Teacher Data File," 2011–12*. Retrieved from https://nces.ed.gov/surveys/sass/tables/sass1112_2016008_t1s.asp; Banilower, et al. (2013). Report of the 2012 National Survey of Science and Mathematics Education. Horizon Research, Inc. Retrieved November 1, 2018, from <http://www.horizon-research.com/2012nssme/wp-content/uploads/2013/02/2012-NSSME-Full-Report1.pdf>.
- 68 E.D. Hirsch, professor emeritus at the University of Virginia and founder of the Core Knowledge Foundation, asserts, "A deficit of factual knowledge and the deficit in language it entails are the causes of the so-called fourth-grade slump that many children experience.... Children who lag in comprehension in early grades tend to fall even further behind in later years. For children to make substantial progress in reading, they must make early and substantial progress in knowledge." (Hirsch, E.D. [2006]. *The knowledge deficit*. New York: Houghton Mifflin Harcourt Publishing Company.) This analysis means that what hinders children's literacy is in part a failure to build the *knowledge* that helps children draw meaning from what they read. (Willingham, D. T. [2006]. How knowledge helps: It speeds and strengthens comprehension, learning — and thinking. *American Educator*, 30(1), 30-37). Past research supports the need for students to be familiar with the content in a reading passage (measured as students knowing 95 percent of the words in a passage) in order to understand it. Laufer, B. (1989). What percentage of text-lexis is essential for comprehension? In C. Lauren & M. Nordman (Eds.), *Special language: From humans thinking to thinking machines* (pp. 316-313). Philadelphia: Multilingual Matters LTD.
- 69 Recht, D. R., & Leslie, L. (1988). Effect of prior knowledge on good and poor readers' memory of text. *Journal of Educational Psychology*, 80(1), 16; Schneider, W., Körkel, J., & Weinert, F. E. (1989). Domain-specific knowledge and memory performance: A comparison of high- and low-aptitude children. *Journal of educational psychology*, 81(3), 306.



70 B. Cato. (2018). *The opportunity myth: What students can show us about how school is letting them down – and how to fix it*. Retrieved October 17, 2018, from <https://opportunitymyth.tntp.org/>. (personal communication based on data from TNTP).

71 Research on teacher preparation programs (both traditional and alternative) in New York City found that the amount of English Language Arts (ELA) coursework completed by teacher candidates correlated with increased ELA student achievement in the second year of teaching, (Boyd, D. J., Grossman, P. L., Lankford, H., Loeb, S., & Wyckoff, J. [2009]. Teacher preparation and student achievement. *Education Evaluation and Policy Analysis*, 31(4), 416-440.) Another study found no correlation between teachers' content courses and students' achievement. (Harris, D. N., & Sass, T. R. (2011). Teacher training, teacher quality and student achievement. *Journal of Public Economics*, 95, 798-812. Note that this study's findings run contrary to the conclusions of most strong research in the field. Research conducted in another large urban district also revealed a positive relationship between teachers' science knowledge and student achievement (Diamond, B. S., Maerten-Rivera, J., Rohrer, R. E., & Lee, O. [2014]. Effectiveness of a curricular and professional development intervention at improving elementary teachers' science content knowledge and student achievement outcomes: Year 1 results. *Journal of Research in Science Teaching*, 51(5), 635-658.) Another study in which teachers completed coursework aimed at improving their content knowledge also found improvement in student performance relative to a control group. This study relied on professional development coursework designed for teachers, rather than the general population. However, it provides supporting evidence that teachers' content knowledge influences student learning (Heller, J. I., Daehler, K. R., Wong, N., Shinohara, M., & Miratrix, L. W. [2012]. Differential effects of three professional development models on teacher knowledge and student achievement in elementary science. *Journal of Research in Science Training*, 49(3), 333-362.)

72 A study of teachers' preparation in elementary mathematics found that their lesson plans give more attention and address topics more fully when they learned about those topics in their teacher preparation coursework. Morris, A. K., & Hiebert, J. [2017]. Effects of teacher preparation courses: Do graduates use what they learned to plan mathematics lessons? *American Educational Research Journal*, 54(3).

73 Goldhaber, D., & Hansen, M. (2010). Race, gender, and teacher testing: How informative a tool is teacher licensure testing? *American Educational Research Journal*, 47(1), 218-251; Goldhaber,

D. (2007). Everyone's doing it, but what does teacher testing tell us about teacher effectiveness? *Journal of Human Resources*, 42(4), 765-794; Clotfelter, C. T., Ladd, H. F., & Vigdor, J. L. (2006). Teacher-student matching and the assessment of teacher effectiveness. *Journal of Human Resources*, 41(4), 778-820.

74 One study found that "disadvantaged students are between 5 and 10 percentage points more likely to be exposed to a teacher with a low licensure test score than nondisadvantaged students." (Goldhaber, D., Quince, V., & Theobald, R. [2016]. *Has it always been this way? Tracing the evolution of teacher quality gaps in U.S. public schools* [CALDER Working Paper 171]. Washington, DC: National Center for Analysis of Longitudinal Data in Education Research). Other research drawing similar conclusions includes Clotfelter, C., Ladd, H. F., Vigdor, J., & Wheeler, J. (2006). High-poverty schools and the distribution of teachers and principals. *NCL Rev.*, 85, 1345; Goldhaber, D., 2007. Another study found that on measures including whether a teacher passed the NTE General Knowledge Test or the NYSTCE Liberal Arts and Science exam on the first attempt, the competitiveness of the teacher's college, and certification status and years of experience, less skilled teachers across all attributes were much more likely to teach in low-achieving, high-poverty, high-minority schools. Lankford, H., Loeb, S., & Wyckoff, J. (2002). Teacher sorting and the plight of urban schools: A descriptive analysis. *Educational Evaluation and Policy Analysis*, 24(1), 37-62. Also, teachers in higher-poverty schools are less likely to report feeling well prepared to teach their subject matter than teachers in lower-poverty schools (by a difference of 10 percentage points) or meet state content standards (by a difference of 12 percentage points). Bowsher A., Sparks, D., & Hoyer, K. M. (2018). *Preparation and support for teachers in public schools: Reflections on the first year of teaching*. Washington, DC: U.S. Department of Education. Retrieved April 4, 2018, from <https://nces.ed.gov/pubs2018/2018143.pdf>.

75 U.S. Department of Education, Office of Postsecondary Education. (2016). Preparing and credentialing the nation's teachers: *The Secretary's 10th report on teacher quality*. Washington, DC. Retrieved March 11, 2016, from <https://title2.ed.gov/Public/TitleIIReport16.pdf>.

76 Greenberg, J. (2015). *Incoherent by design*. Washington, DC: National Council on Teacher Quality. Retrieved May 11, 2018, from <https://www.nctq.org/publications/Incoherent-By-Design>.



77 U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2010 U.S. History Assessment. NAEP Data Explorer. Retrieved July 26, 2018, from <https://www.nationsreportcard.gov/ndecore/xplore/nde>; U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2015 Science Assessment. *NAEP Data Explorer*. Retrieved July 26, 2018, from <https://www.nationsreportcard.gov/ndecore/xplore/nde>.

78 While not causal, NAEP data show that like all students, black and Hispanic students did significantly better on NAEP grade 12 grade mathematics and science tests when they took a rigorous course of study in high school. U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. (2009). *High School Transcript Study (HSTS)*, 2009; *National Assessment of Educational Progress (NAEP) 2009 Mathematics Assessment*. Retrieved August 31, 2018, from https://www.nationsreportcard.gov/hsts_2009/race_naep.aspx?tab_id=tab1&subtab_id=Tab_1#chart; U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. (2009). *High School Transcript Study (HSTS)*, 2009; *National Assessment of Educational Progress (NAEP) 2009 Science Assessment*. Retrieved August 31, 2018, from https://www.nationsreportcard.gov/hsts_2009/race_naep.aspx?tab_id=tab2&subtab_id=Tab_1#chart.

79 This study found that a black male student who had a single black teacher in grades 3 to 5 was almost 50 percent less likely to drop out of high school. Gershenson, S., Hart, C., Lindsay, C., & Papageorge, N. W. (2018). The long-run impacts of same-race teachers. *National Bureau of Economic Research*.

80 The American Council of Trustees and Alumni have long documented the problem of general education requirements that pass over essential content, most recently in their 2017 report. American Council of Trustees and Alumni. (2017). *What will they learn? 2017-18. A survey of core requirements at our nation's colleges and universities*. Retrieved May 11, 2018, from <https://www.goacta.org/images/download/What-Will-They-Learn-2017-18.pdf>.

81 As one example, a 2011 report from ETS and the National Education Association focused on increasing teacher diversity, and especially supporting aspiring teachers of color in passing licensing tests, centers its recommendations around test preparation and only highlighted one example of improved content training. Tyler, L. (2011). Toward increasing teacher diversity: Targeting support and intervention for teacher licensure candidates. *Educational Testing Service*. Retrieved March 30, 2018, from https://www.ets.org/s/education_topics/teaching_quality/pdf/support_intervention_teacher_licensure.pdf. Many state-led efforts focus on recruitment and mentoring, rather than on core skills and knowledge. Camera, L. (2018). States to prioritize hiring teachers of color. *U.S. News*. Retrieved March 30, 2018, from <https://www.usnews.com/news/education-news/articles/2018-03-28/states-to-prioritize-hiring-teachers-of-color>.

82 A 2002 Ed Trust report drew attention to this problem (Huang, S., Yi, Y., & Haycock, K. (2002). *Interpret with caution: The first state Title II reports on the quality of teacher preparation*. Washington, DC: The Education Trust. Retrieved July 24, 2018, from <https://edtrust.org/resource/all-talk-no-action-putting-an-end-to-out-of-field-teaching/>, but even recent U.S. Department of Education reports point to this issue in the way pass rate data are reported to Title II. (U.S. Department of Education, Office of Postsecondary Education. [2016]. Washington, DC. Retrieved March 11, 2016, from <https://title2.ed.gov/Public/TitleIIReport16.pdf>).