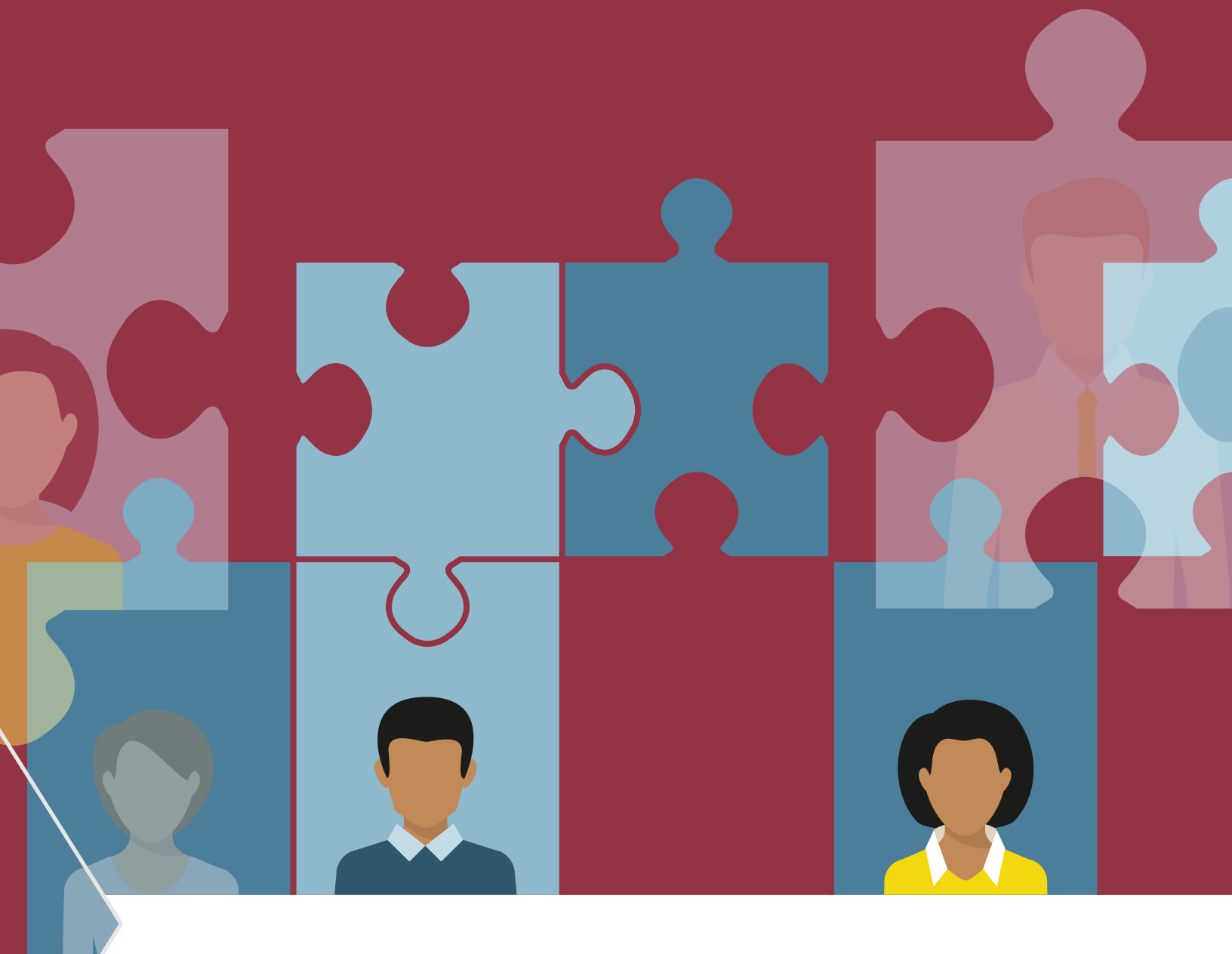


JANUARY 2019

Nuance in the Noise

The Complex Reality of Teacher Shortages



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Introduction and Background

For decades, talk of a looming teacher shortage crisis has caused anxiety in education policy and practice circles. A 1984 report warned that “shortages of qualified teachers in subjects such as mathematics and science are expected to grow into a more generalized teacher shortage.”¹ A 1999 report predicted the need for an outsized number of new teachers.² Most recently, a 2016 report suggested there would soon be a national teacher shortage crisis.³

But a generic, national teacher shortage has yet to materialize — at least in the way these reports warned. In the '80s and '90s researchers assumed large numbers of teachers would retire and that the new teacher supply would be unable to keep up with increases in student enrollment. Three decades later, we now know these reports predicted incorrectly: The new teacher supply has more than kept pace with increases in student enrollment.⁴

A recent report on teacher supply and demand raised the warning of a teacher shortage again.⁵ It received extensive coverage in the national press, but it suffered from two main flaws. It ignored candidates who had trained to become teachers but, for whatever reason, couldn't find a teaching job, which resulted in the misperception that there are fewer available teachers in the candidate pool. And it treated all teachers as interchangeable, when in reality school districts must hire teachers with licenses that certify them to teach specific age ranges and subject areas. That oversimplified the situation and unhelpfully combined areas of surplus with areas that are chronically undersupplied. These inaccurate portrayals of teacher supply and demand have filtered into the public conversation and have mischaracterized the teacher shortage problem as a generic, national crisis.

Contrary to popular talking points, there is no generic shortage of teachers. The biggest issue districts face in staffing schools with qualified teachers is not the lack of certified teachers *overall*, but a chronic and perpetual misalignment of teacher supply and demand. Across 50 states and the District of Columbia, six different territories and more than 13,000 distinct districts, there are unique teacher shortages in specific subject areas, school types, and geographies.⁶

The specific nature of teacher shortages is now a well-documented reality,⁷ but many in the education community, including journalists, researchers, policymakers, and practitioners, continue to characterize teacher shortages as one, nonspecific national crisis. In turn, broad solutions proposed to “fix” teacher shortages do not target the specific needs of states, districts, and schools and the individualized contexts in which they operate.

Specific shortages have real impact on schools, students, and communities. A gap of one teacher in a school means diminished opportunities for students. And, like many challenges in public education, the pain of teacher shortages is not distributed equitably: The communities that suffer the most from teacher shortages are often low-income and under-resourced.⁸ Treating specific teacher shortage challenges with broad solutions does a disservice to the communities that are most impacted.

To get a clearer picture of trends in teacher subject-area shortages across the country, we analyzed national data on teacher shortage areas submitted by states and territories to the U.S. Department of Education.⁹ Like many other data sets used to track and better understand teacher shortages, this one has limitations. First, states have an incentive, but are not required to submit these data to the U.S. Department of Education, and there is no standard framework states must use to define what constitutes a shortage area in their state. Our analysis details the years for which each state submitted data and relies on a framework we created to categorize states’ submissions based on trends revealed in the data (See Appendix 1).

Also, the data as currently reported to the public do not represent the magnitude of need. States report that a subject area shortage exists, but they do not indicate how dire the shortage is – it may be one teacher or 100 teachers. Therefore, while our analysis shows trends in teacher subject-area shortages, it *does not detail how many* teachers are needed for each shortage area. Put another way, our analysis identifies where and in which subject areas shortages exist with the most consistency over time; it does not detail where there are the highest number of shortages. The limitations in this data set and other teacher shortage data pose challenges to tailored solutions that are necessary to meet schools’ specific needs.

Nonetheless, our findings add depth and breadth to existing teacher shortage data analyses and further demonstrate that there is no generic, national teacher shortage. Specifically, our report confirms trends in states’ most dire teacher shortage subject areas that other

data analysis has shown: States consistently report trouble staffing **special education, mathematics, science, foreign language, and English as a second language** classrooms. Also similar to other reporting on the topic, career and technical education emerges as a significant teacher shortage area. Yet states' experiences with shortages in these subject areas vary widely. Some states struggle to fill mathematics classrooms, while others have a more serious need in science.

Outside of these trends, states' reporting on subject area shortages is extremely variable. Some states submitted data on teacher shortages over 17 or 18 different subjects while other states submitted only a handful. Some shortages appear year after year in a state, while others appear rarely or perhaps cyclically. And outside of the top five to 10 subject shortages, there is almost no consistency among states in the types of teachers they need most. These data show just how inconsistent teacher shortages are within and between states, further challenging the national, generic teacher shortage narrative.

Though many policies exist to address teacher shortage areas, the problems remain. These problems are exacerbated by incomplete, inconsistent data at all levels of educational governance, which will only spur marginal change and progress. To fully solve specific teacher shortages, better data collection and reporting are needed. Districts, states, and the federal government must get serious about creating a system that accurately portrays teacher shortage pain points by specific location on a consistent basis. Until then, the teacher shortage narrative will continue to misrepresent the real story, and policies to address teacher shortages will not have the needed impact.

Where Does the Generic, National Teacher Shortage Crisis Narrative Come From?

The generic, national teacher shortage narrative is pervasive. This narrative has likely taken hold because there is no single, comprehensive data source on teacher shortages. The way districts and states collect these data are unique to local contexts, and the way they report to the U.S. Department of Education varies by state. Many who tell the teacher shortage story often consider teacher shortage data sources in isolation and tend to overgeneralize specific problems to the profession as a whole. When all data connected to teacher shortages are considered together, the specificity of problems emerges. However, to fully understand teacher shortages, more detailed, consistent data and data collection practices at all levels of governance are needed.

Data showing a decline in the number of students enrolling in and completing teacher preparation programs serves as one main driver of this narrative. Tables 1 and 2 show that year over year, the number of students enrolling in and completing teacher preparation programs has decreased in recent years.

Table 1

Teacher Preparation Enrollment, Title II Reporting¹⁰

Academic Year	Number of Enrolled Teachers	Annual Percent Decrease in Enrolled Teachers
2010-11	684,801	
2011-12	623,190	9 percent
2012-13	499,800	20 percent
2013-14	455,328	9 percent
2014-15	418,573	8 percent
2015-16 ¹¹	441,439	5 percent

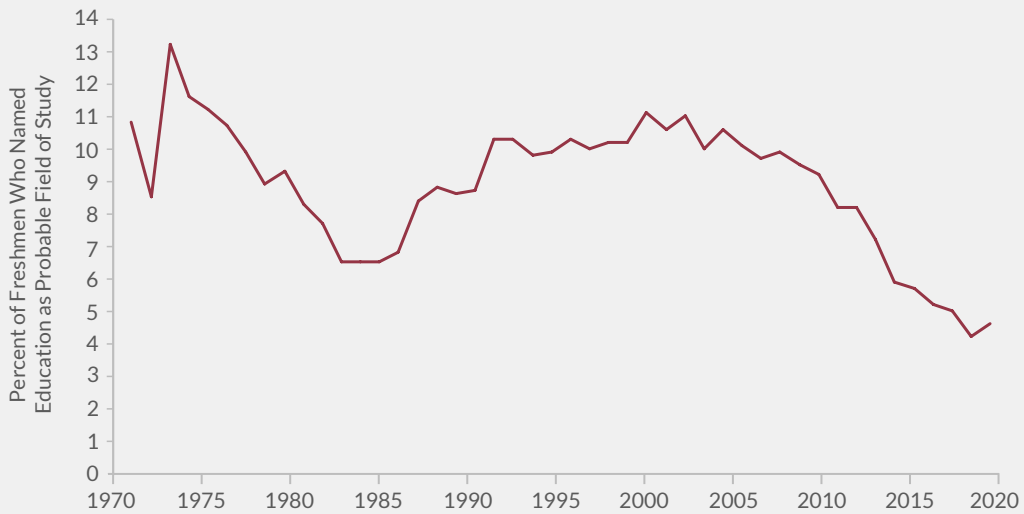
Table 2

Teacher Preparation Program Completers, Title II Reporting

Academic Year	Number of Prepared Teachers	Annual Percent Decrease in Program Completers
2010-11	216,630	
2011-12	203,175	6 percent
2012-13	192,459	5 percent
2013-14	180,750	6 percent
2014-15	172,139	5 percent
2015-16 ¹²	159,598	7 percent

In addition, college freshmen report less interest in majoring in education than in past decades, further driving the narrative. As shown in Figure 1, in 1973, 13.2 percent of the nation's incoming college freshmen planned to study education, compared to 4.6 percent in 2016.

Figure 1 Probable Field of Study, Education, 2016¹³



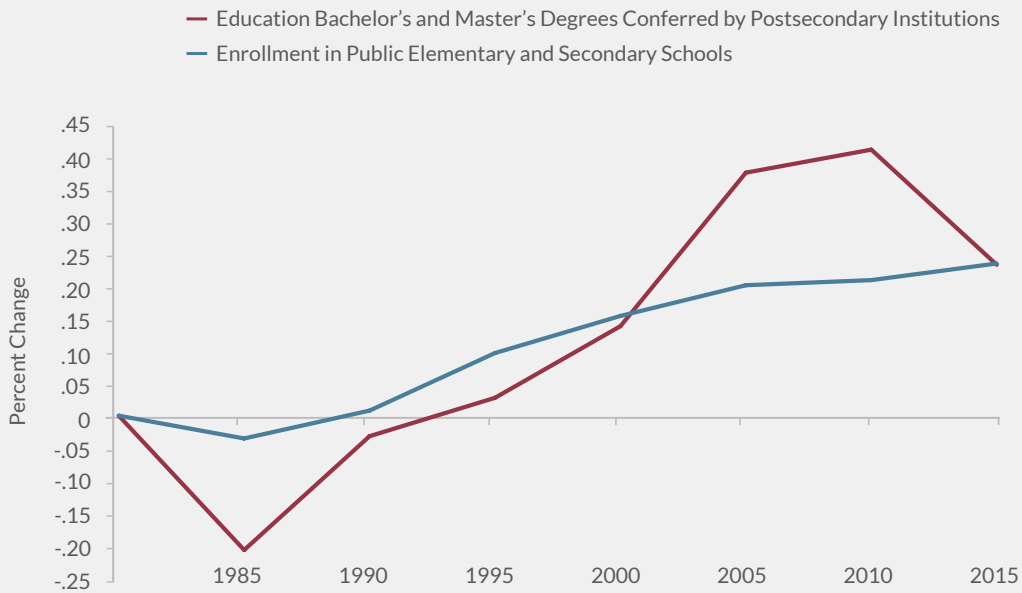
Source: Higher Education Research Institute, via The Chronicle of Higher Education, available at <https://www.chronicle.com/interactives/freshmen-survey>.

It is important to note that these data do not show variation between states, which may be quite large. Nonetheless, these facts together might lead to assumptions that a national teacher shortage must be on the horizon. But they don't tell the whole story.

Researchers at the American Institutes for Research James Cowan, Dan Goldhaber, Kyle Hayes, and Roddy Theobald have documented teacher supply and demand data to show a more complete picture.¹⁴ As Figure 2 shows, although there have been fewer education graduates in recent years, teacher production has grown steadily since the mid-1980s and outpaced the increase in student enrollment in public schools across the country.¹⁵

Figure 2

Change in Education Graduates and Enrollment in K–12 Schools Since 1980¹⁶



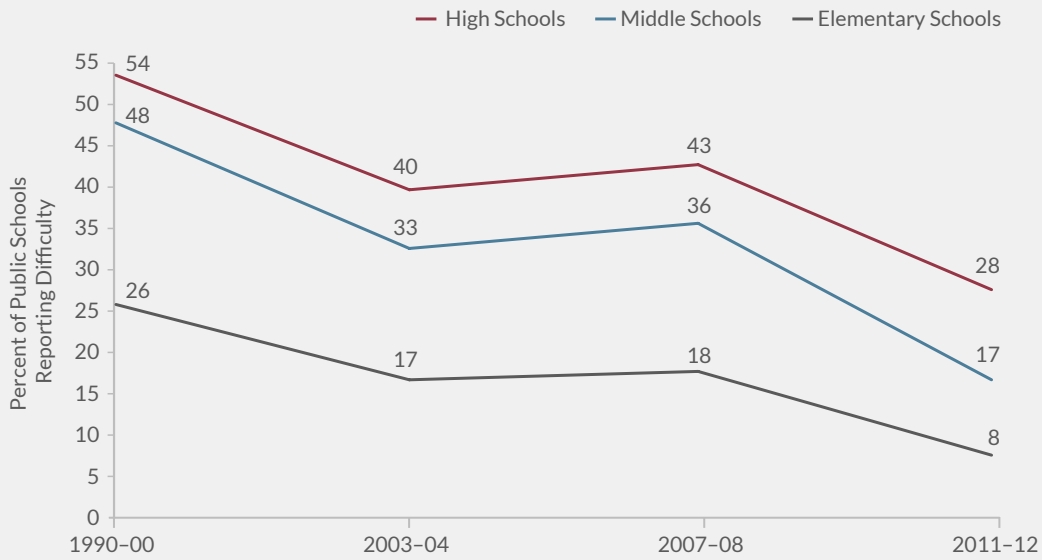
Source: Authors' analysis of the Bachelor's and Master's Degrees conferred by Postsecondary Institutions, derived from National Center for Education Statistics, available at https://nces.ed.gov/programs/digest/d17/tables/dt17_322.10.asp?current=yes. Authors' analysis of enrollment in public elementary and secondary schools, derived from National Center for Education Statistics, available at https://nces.ed.gov/programs/digest/d16/tables/dt16_203.10.asp.

This trend coincided with a decrease in the number of students per teacher for more than 50 years at both public and private schools. As evidence, in 1955, the student/teacher ratio was 27 to 1. In 2012, it was 16 to 1.¹⁷ There were over 3.8 million public school teachers in the 2015–16 school year — an increase of 13 percent since 2012, while the student population has stayed constant during that same period.¹⁸ In short, even though the percentage of undergraduate and graduate students completing degrees in education is not as high as it once was, there are still more teachers produced than classrooms to fill, even as the number of students served per teacher has declined.¹⁹

In addition, about half of teachers who have degrees in education do not teach. In 2011, there were approximately 300,000 education graduates and less than 100,000 of those teachers were hired into the profession.²⁰ As a result, there are many credentialed teachers across all states who could enter the teaching workforce. These eligible teachers are often overlooked when considering the teacher supply.²¹

Given these trends, it is not surprising that school leaders today have an easier time staffing their schools than in previous years. As Figure 3 shows, high schools have the most difficulty, but still are generally better able to staff their schools along with elementary and middle school principals compared to the early 2000s.²²

Figure 3 > Percent of Public Schools That Had at Least One Difficult-to-staff Teaching Position, by School Level, 2000–2012²³

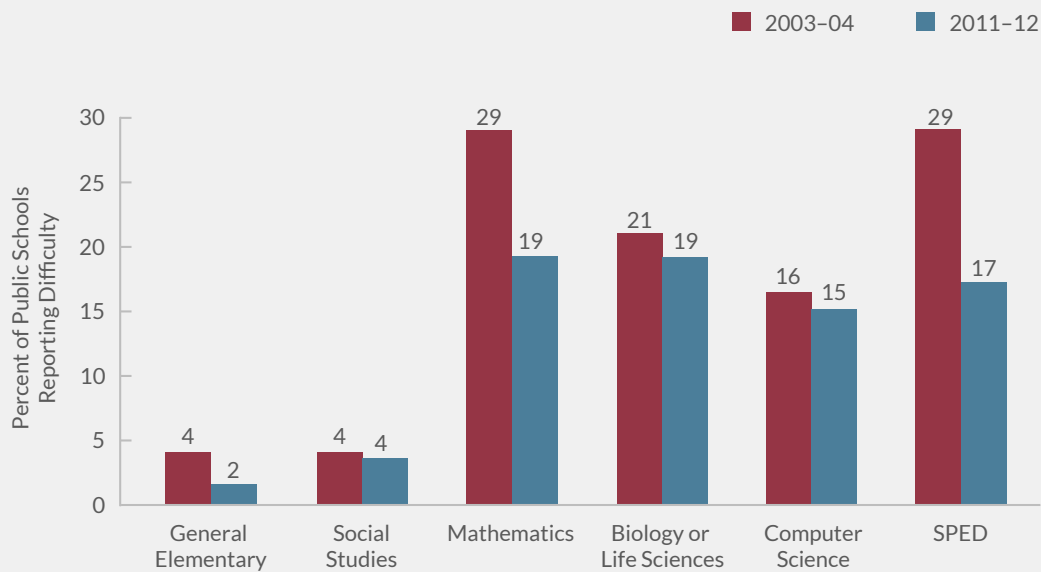


Source: National Center for Education Statistics, available at <https://nces.ed.gov/pubs2015/2015065.pdf>.

However, schools find that some subjects are consistently more difficult to staff than others, as are positions in schools with specific characteristics (See Sidebar 1). As Figure 4 shows, schools report much more difficulty filling mathematics, science, computer science, and special education teacher vacancies than social studies and general elementary vacancies.²⁴

Figure 4

Percent of Public Schools Reporting Difficulty Filling Vacancies with Specific Disciplines²⁵



Source: National Center for Education Statistics, available at https://nces.ed.gov/surveys/sass/tables/Sass1112_480_s1n.asp and https://nces.ed.gov/surveys/sass/tables/sass_2004_16.asp.

Yet, despite the perpetual need for certified mathematics, science, and special education teachers and relatively lower demand for elementary education teachers, teacher preparation programs continue to produce far more elementary school teachers than those certified to teach highly in-demand subjects. As shown in Table 3, there are far more teacher candidates who complete elementary education teacher preparation programs — both traditional and alternative — than those in all other program subjects. In traditional teacher preparation programs, there are more than double the number of teachers prepared in elementary education than in special education and six times as many when compared to mathematics teacher preparation program completers. Because elementary school teachers teach fewer students, there are more elementary school teachers needed overall in the market, but this figure clearly shows an oversupply of those teachers when compared to the demand mentioned in Figure 4.

Table 3

Percent of Teacher Preparation Program Completers, by Type of Program and Most Common Subject Areas: AY 2012–13²⁶

Traditional		Alternative (IHE-Based)		Alternative (not IHE-Based)	
Subject	% Program Completers	Subject	% Program Completers	Subject	% Program Completers
Elementary Education	42%	Elementary Education	24%	Elementary Education	26%
Special Education	16%	Special Education	20%	Special Education	17%
Early Childhood Education	13%	English/ Language Arts	9%	Early Childhood Education	13%
English/ Language Arts	9%	Mathematics	8%	Mathematics	12%
Mathematics	7%	Early Childhood Education	7%	English/ Language Arts	11%
English as a Second Language	6%	Social Studies	5%	General Science	8%
Social Studies	5%	General Science	4%	English as a Second Language	7%

To illustrate the point further, a recent Bellwether analysis examined Illinois State Board of Education Employment Information System data. The analysis found that the state is licensing about 12 social studies teachers for every one that gets hired in the state. In contrast, for every three special education teachers the state produces, two find jobs.²⁷

The misalignment between teacher supply and demand is where the teacher shortage crisis is born and lives. And the misinformed narrative about generalized teacher shortages contributes to the problem. It creates false impressions among teacher candidates about the job market, leaving many to assume that job prospects will be similar regardless of the type of certification they pursue. It also leads policymakers to create broad rather than

targeted solutions to acute problems. The result is a teacher market that leaves many elementary education teachers without jobs and many schools with mathematics, science, and special education teacher vacancies. The first step in addressing teacher shortages is to understand the specific challenges much more deeply, recognizing the variation across contexts and fluctuations over time so that policy solutions solve specific district and school problems. In many places, however, updated, comprehensive data that would illuminate the full story are lacking.

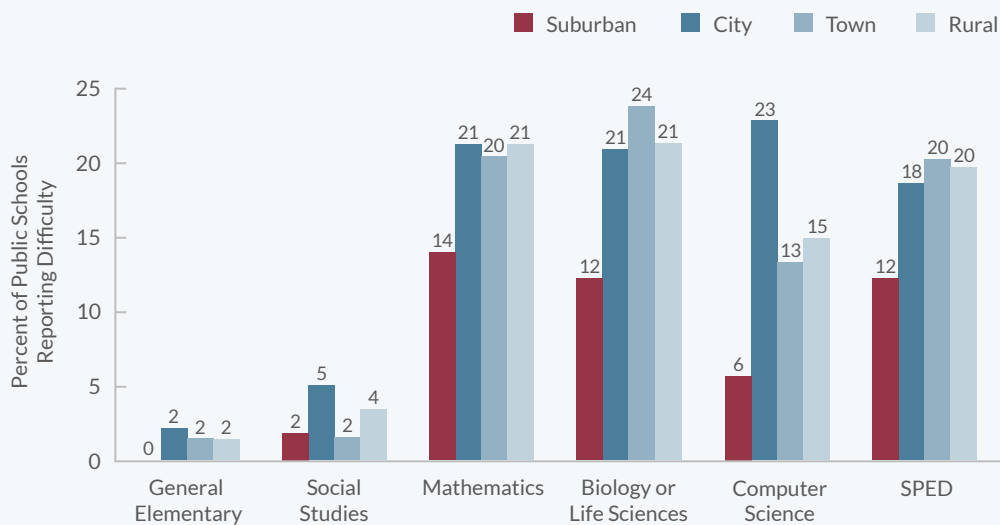
Sidebar 1

Teacher Shortages by Schools with Specific Characteristics

Teacher shortages are often confined to schools with specific characteristics. Schools in urban and rural settings experience greater difficulties filling teacher vacancies compared to schools in suburban areas. Likewise, schools that serve a higher percentage of minority students have more difficulty with teacher shortages than schools that serve a lower percentage of minority students. A school's Title I eligibility also has an effect on teacher vacancies. Schools that are eligible for schoolwide Title I funding report more teacher vacancies than those that are not eligible.ⁱ

As shown below, National Center for Education Statistics School and Staff Survey data highlight the divide between urban, rural, and suburban schools.ⁱⁱ While all schools have an easier time staffing elementary school classrooms, no suburban schools report difficulty compared to 2.4 percent of urban schools and 1.5 percent of schools in towns and rural areas. For more in-demand subject areas like mathematics, nearly 14 percent of suburban schools report difficulty filling vacancies, but more than 20 percent of schools in urban and rural areas and in towns report difficulty.

Percent of Public Schools Reporting Difficulty Filling Vacancies by School Location, 2011-12

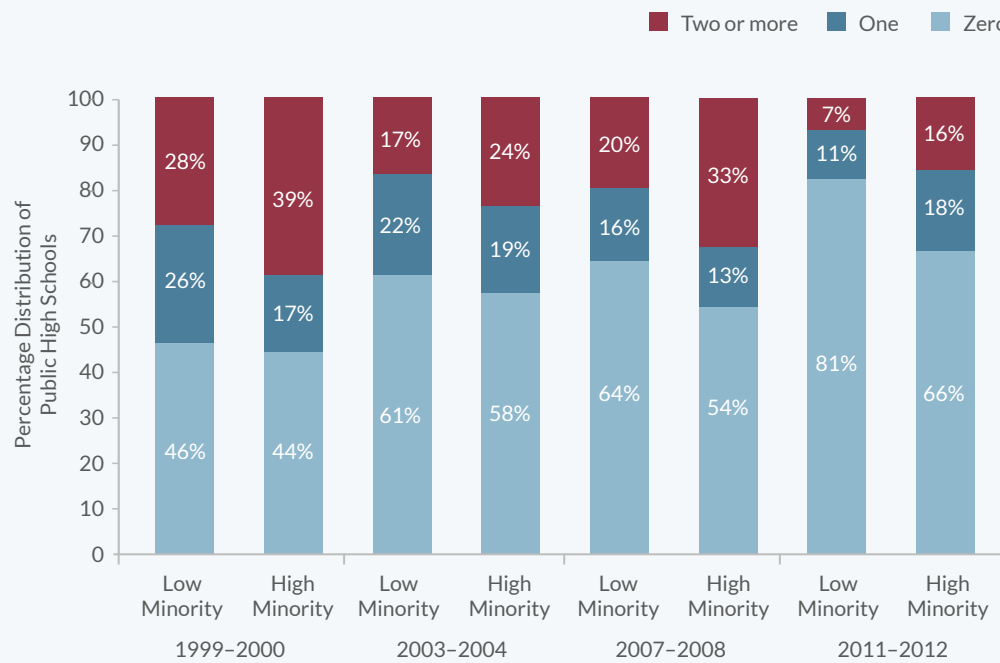


Source: National Center for Education Statistics, available at https://nces.ed.gov/surveys/sass/tables/Sass1112_480_s1n.asp.

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Similarly, there are differences in staffing difficulty depending on the percentage of minority students served. As shown below, high schools serving a higher percentage of minority students report more subject areas with difficult-to-staff teaching positions than schools serving a lower percentage of minority students.ⁱⁱⁱ

Percentage Distribution of Public High Schools That Had Zero, One, or Two or More Subject Areas with Difficult-to-staff Teaching Positions, by Minority Student Composition ^{iv}

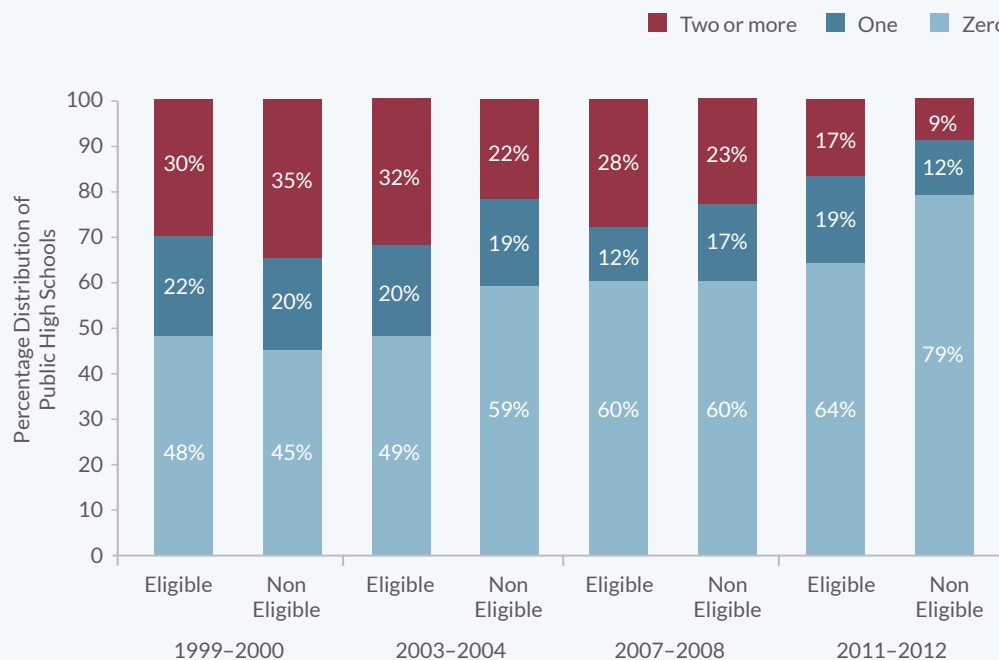


Source: National Center for Education Statistics, available at <https://nces.ed.gov/pubs2015/2015065.pdf>.

Lastly, schools serving more low-income families have a harder time filling vacancies. As shown below, schools that are eligible for schoolwide Title I funding^v report more subject areas with difficult-to-staff teaching positions than schools not eligible for schoolwide Title I funds.

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Percentage Distribution of Public High Schools That Had Zero, One, or Two or More Subject Areas with Difficult-to-staff Teaching Positions, by Schoolwide Title I Eligibility Status



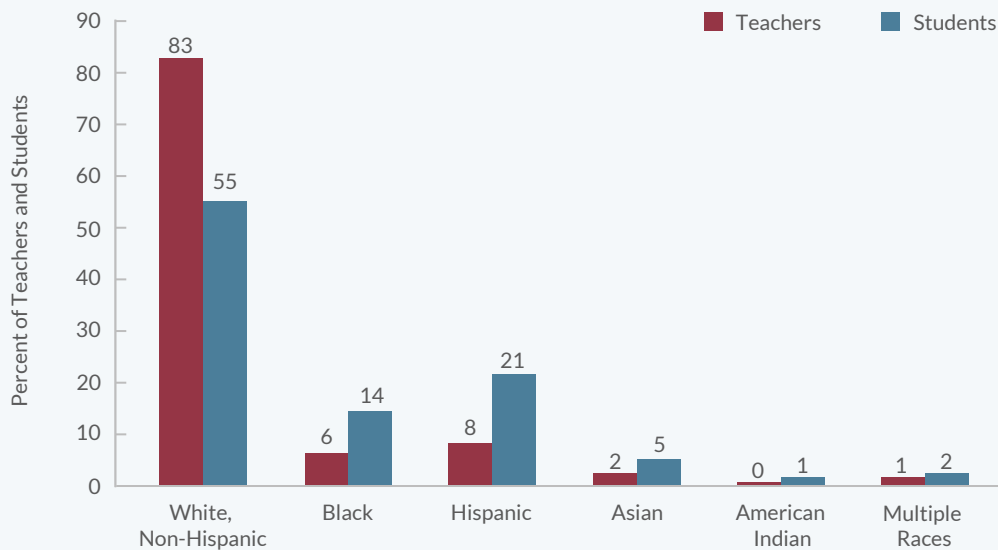
Source: National Center for Education Statistics, available at <https://nces.ed.gov/pubs2015/2015065.pdf>.

- i Malkus et al., “Teaching Vacancies and Difficult-to-staff Teaching Positions in Public Schools,” <https://nces.ed.gov/pubs2015/2015065.pdf>.
- ii “Schools and Staffing Survey: Of Public Schools That Had Teaching Vacancies in Various Fields for the Current School Year, Percentage That Found it Very Difficult or Were Not Able to Fill the Vacancies in These Fields, by Selected School Characteristics: 2011-12,” National Center for Education Statistics, https://nces.ed.gov/surveys/sass/tables/Sass1112_480_s1n.asp.
- iii “Low minority” public high schools had less than 5 percent minority enrollment. “High minority” public high schools had 50 percent or more minority enrollment. “Minority students” refers to black, Hispanic, Asian, Pacific Islander, American Indian/Alaska Native students, and students of two or more races.
- iv Malkus et al., “Teaching Vacancies and Difficult-to-staff Teaching Positions in Public Schools,” <https://nces.ed.gov/pubs2015/2015065.pdf>.
- v Schools in which children from low-income families make up at least 40 percent of enrollment are eligible to use Title I funds for programs that serve all children in the school.

Shortages of Teachers from Diverse Racial and Ethnic Backgrounds

In addition to teacher shortages by subject and school characteristics, states, districts, and schools face a shortage of teachers from diverse racial and ethnic backgrounds. As is seen below, as the student body in the U.S. grows increasingly diverse, the teaching workforce remains predominantly white.ⁱ One recent report found that one-third of all New York state schools have zero Latino or black teachers.ⁱⁱ Research shows that students of color perform better academically when they have at least one teacher of the same race during their schooling, which makes the lack of diversity in the teacher population problematic, particularly in a district that serves high proportions of students of color.ⁱⁱⁱ

Percent of Teachers and Students by Race and Ethnicity, 2011–12^{iv,v}



Source: Shanker Institute, available at: http://www.shankerinstitute.org/sites/shanker/files/The%20State%20of%20Teacher%20Diversity_0.pdf.

In order to address teacher diversity issues, the entire teacher pipeline must be considered, including the experience and outcomes for students of color in their K–12 schooling. Challenges to diversifying the teacher workforce begin with the fact that black and Hispanic students graduate high school at lower rates than their white and Asian peers.

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This translates into a smaller proportion of black and Hispanic populations entering college and earning college degrees.^{vi} In addition, nonwhite students who enter college tend to choose education as a major less frequently, making teacher preparation programs less diverse than universities as a whole. In 2013, 73 percent of individuals enrolled in teacher preparation programs in institutions of higher education identified as white, compared to 63 percent across programs at universities.^{vii} Adding to the problem, research shows that black and Hispanic teachers are hired and retained in teaching jobs at lower rates than white teachers.^{viii}

In addition, tracking this important issue can be difficult due to lack of accurate, accessible data. One report found that six states do not collect any district- or school-level data on teacher race and ethnicity and two states collect only district-level data. Of the 43 states that do collect school-level data, 38 make these data reasonably available to the public, and only 17 do so on their websites.^{ix}

- i Constance A. Lindsay, Erica Blom, and Alexandra Tilsley, “Diversifying the Classroom: Examining the Teacher Pipeline,” Urban Institute, October 5, 2017, <https://www.urban.org/features/diversifying-classroom-examining-teacher-pipeline>.
- ii “One-third of All New York Schools Have No Latino or Black Teachers, New Report from Ed Trust – NY Reveals,” The Education Trust – New York, October 17, 2017, <https://newyork.edtrust.org/press-release/one-third-new-york-schools-no-latino-black-teachers-new-report-ed-trust-ny-reveals/>.
- iii Constance Lindsay and Cassandra Hart, “Exposure to Same-race Teachers and Student Disciplinary Outcomes for Black Students in North Carolina,” *Educational Evaluation and Policy Analysis* 39, no. 3 (2017): 485–510, <http://journals.sagepub.com/doi/abs/10.3102/0162373717693109>; Anna Egalite, Brian Kisida, and Marcus Winters, “Representation in the Classroom: The Effect of Own-race Teachers on Student Achievement,” *Economics of Education Review* 45 (2015), https://www.researchgate.net/publication/272101860_Representation_in_the_classroom_The_effect_of_own-race_teachers_on_student_achievement; Thomas Dee, “A Teacher Like Me: Does Race, Ethnicity or Gender Matter?,” *American Economic Review* (2005), <https://cepa.stanford.edu/content/teacher-me-does-race-ethnicity-or-gender-matter>; Dee, “Teachers, Race, and Student Achievement in a Randomized Experiment,” *The Review of Economics and Statistics* 86, no. 1 (2004): 195–210, <https://www.mitpressjournals.org/doi/abs/10.1162/003465304323023750>.
- iv *The State of Teacher Diversity in American Education* (Washington, DC: Albert Shanker Institute, 2015), http://www.shankerinstitute.org/sites/shanker/files/The%20State%20of%20Teacher%20Diversity_0.pdf.
- v Lindsay, Blom, and Tilsley, “Diversifying the Classroom: Examining the Teacher Pipeline,” <https://www.urban.org/features/diversifying-classroom-examining-teacher-pipeline>.
- vi Emily Tate, “Graduation Rates and Race,” *Inside Higher Ed*, April 26, 2017, <https://www.insidehighered.com/news/2017/04/26/college-completion-rates-vary-race-and-ethnicity-report-finds>.
- vii *Preparing and Credentialing the Nation’s Teachers: The Secretary’s 10th Report on Teacher Quality*, <https://title2.ed.gov/Public/TitleIIReport16.pdf>.
- viii Hannah Putman et al., “High Hopes and Harsh Realities: The Real Challenges to Building a Diverse Workforce,” Brown Center on Education Policy at Brookings, 2016, https://www.brookings.edu/wp-content/uploads/2016/08/browncenter_20160818_teacherdiversityreportpr_hansen.pdf.
- ix Matthew Di Carlo and Klarissa Cervantes, “The Collection and Availability of Teacher Diversity Data: A Survey of 51 State Education Agencies,” research brief, Albert Shanker Institute, 2018, http://www.shankerinstitute.org/sites/shanker/files/teacherracedataFINAL.pdf?utm_source=newsletter&utm_medium=email&utm_campaign=cb_bureau_national.

What Data Did We Analyze?

Beginning in the 1990–91 school year, the U.S. Department of Education created a nationwide listing of teacher shortage areas.²⁸ Every year since then, states have submitted subject shortage areas to the department, which uses the data to create an annual “Teacher Shortage Areas Nationwide Listing” report. The nationwide listing has several different purposes. It is a resource for licensed teachers to see which subject areas and grade levels have open teaching positions throughout the country. This list also serves as a source of information on shortage areas that may qualify a teacher for forgiveness of federal student financial aid. Teacher candidates can apply for federal loan forgiveness if they teach in a shortage area as defined by the department’s report. These types of financial benefits have been shown to drive college graduates’ behavior.²⁹

States report shortage areas to the U.S. Department of Education based on three criteria:

- 1 Teaching positions that are unfilled;
- 2 Teaching positions that are filled by teachers who are certified by irregular, provisional, temporary, or emergency certification; and
- 3 Teaching positions that are filled by teachers who are certified, but who are teaching in academic subject areas other than their area of preparation.

The data as collected and reported do have limitations. First, states are incentivized and encouraged to submit the teacher shortage data, but they are not required. Therefore, just because a state didn’t report a shortage in a certain year, or for a certain subject in a certain year, it does not mean a shortage didn’t exist. Also, there is no standard reporting framework that states must use. States can define their own subject areas. As a result,

data are reported inconsistently across states. For example, some states reported a “mathematics” shortage, while other states reported “mathematics 6–8” and “mathematics 9–12,” and others reported “middle school mathematics” and “high school mathematics.” This lack of standardization makes comparisons across states challenging.

Lastly, and perhaps most importantly, the data do not provide a measure of the magnitude of need. For example, a state may report a shortage in “middle school science” for one year, but the reporting does not indicate *how many* middle school science teaching positions were vacant — it could be one or 1,000. Nor does the reporting indicate whether those positions are unfilled, filled by emergency certified teachers, or filled by certified teachers teaching in an academic subject outside of their preparation area.

In addition to limitations tied to data and reporting technicalities, it is important to remember that identified shortages reflect the absence of a teacher who meets state qualifications for the role. Teacher credentialing requirements vary across states. As a result, states may experience shortages differently based on the variation in state policies defining what “counts” as a qualified teacher for a given role.

Despite these limitations, these data are one of the best sources we have to analyze trends in subject area shortages across the country and for each particular state. Our goal is to add data analysis to the teacher shortage conversation to better understand in which areas teacher shortages exist so that policies can be designed to address specific needs.

Our Methodology

We created our own analysis to aggregate the data from the U.S. Department of Education’s report.³⁰ Though the department recently began collecting the data in an online database, we ultimately created our own analysis from the department’s comprehensive PDF report. For each individual state and territory, we took inventory of all subject shortage areas reported between the 1998–99 and 2017–18 school years.

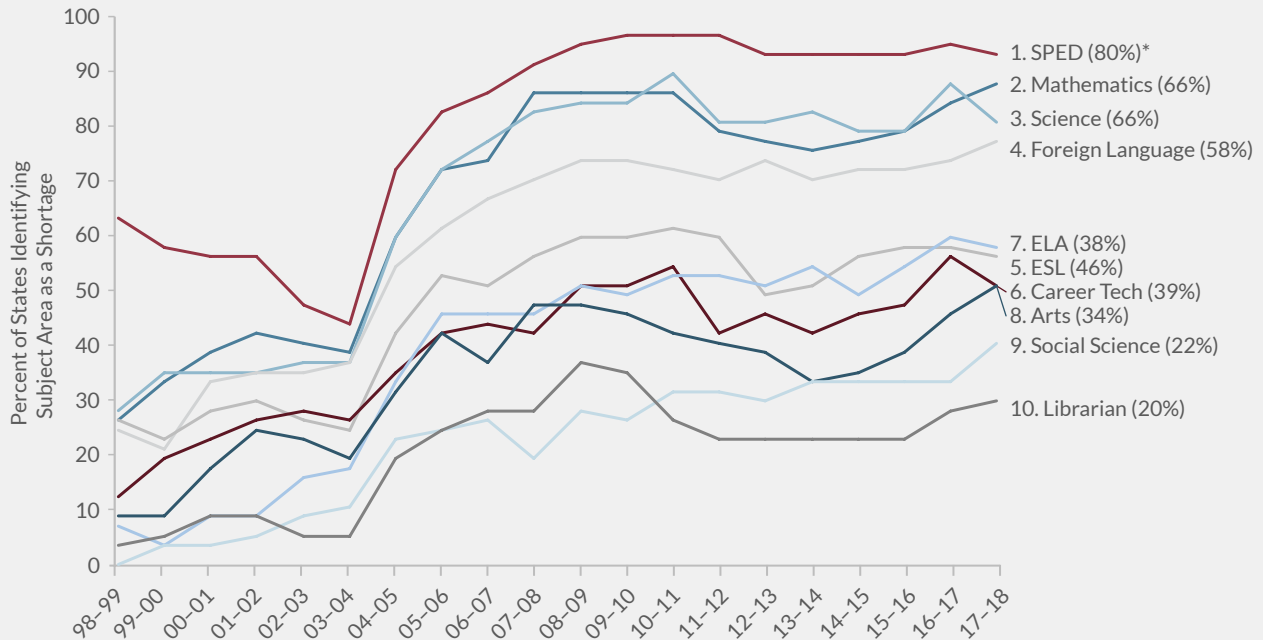
We sorted data into 25 shortage categories (See Appendix 1). Some states during some years reported shortages by geographic area. In those instances, we included the subject shortage areas, but because geographic reporting was not consistent across states during the 20 years of data reporting, our analysis does not show the specific geographic data reported by states.

In our analysis, we only count each category once each year. For example, if a state reported a shortage in “middle school science” and “high school science” in the same year, we only count science once. We took this approach because these submissions provide no magnitude of need. Therefore, just because one state may have been more nuanced in its reporting (various science categories vs. only one science category) does not mean its need for teachers in that subject area was necessarily greater.

What Do the Data Reveal?

Our analysis of the USED data confirms that there is significant variation in teacher shortages by subject area and across states. When data for all states are combined, trends similar to SASS data emerge. For example, a higher proportion of states report subject area shortages in special education, mathematics, science, and English as a second language. Special education in particular is a clear pain point for states: On average, 80 percent of states identified special education as a subject shortage area from 1998-2018. But, as seen in Figure 5, there are also less-talked-about shortages that rise to the top of this data set, including foreign language, career technologies, and the arts.

Figure 5 Top 10 Subject Area Shortages Reported Nationally, 1998–2018³¹



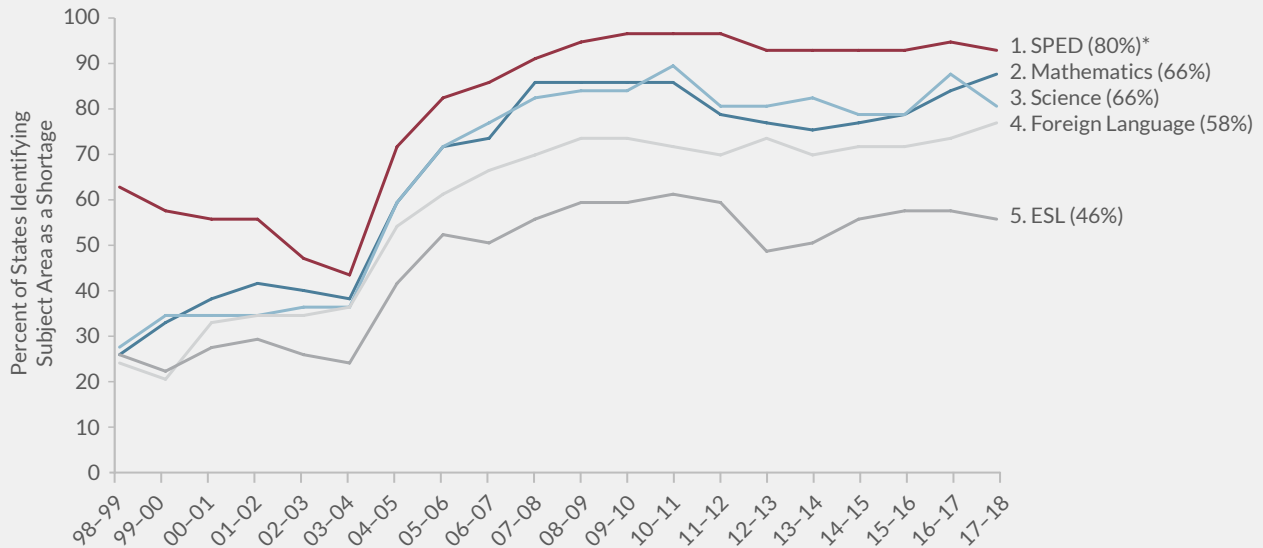
Source: Derived from U.S. Department of Education Teacher Shortage Areas Nationwide Listing, available at <https://www2.ed.gov/about/offices/list/oep/pol/ateachershortageareasreport2017-18.pdf>.

* The percentage in the parentheses denotes the average percent of states that reported the specific subject area as a shortage over the 20 year period.

As seen in Figure 6, the top five most commonly reported subject area shortages in order are special education, mathematics, science, foreign language, and English as a second language. With the exception of mathematics and science, which switch back and forth from the second and third most commonly reported shortages between 2006 to 2018, the order of the subject area shortages is consistent over time.

Figure 6

Top 5 Subject Area Shortages Reported Nationally, 1998–2018



Source: Derived from U.S. Department of Education Teacher Shortage Areas Nationwide Listing, available at <https://www2.ed.gov/about/offices/list/oep/pol/ateachershortageareasreport2017-18.pdf>.

* The percentage in the parentheses denotes the average percent of states that reported the specific subject area as a shortage over the 20 year period.

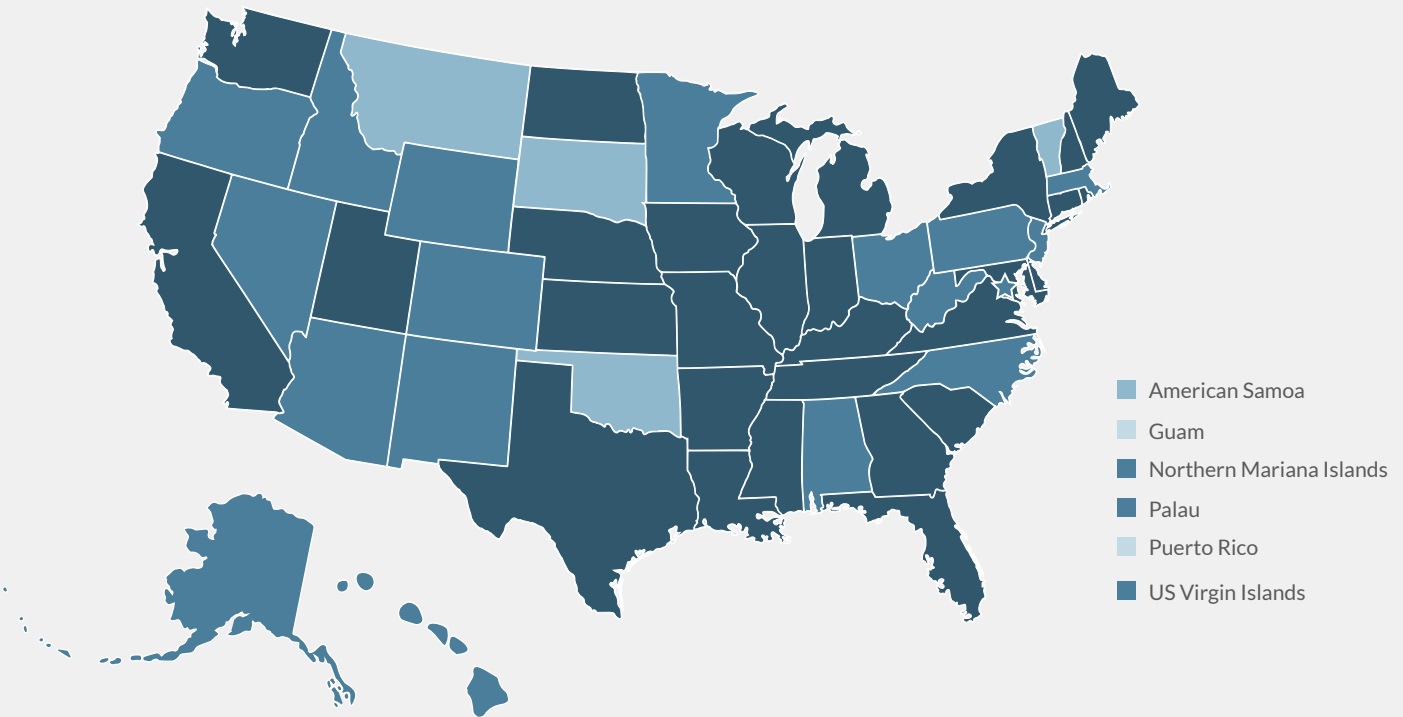
The top five most common shortage areas for all states are chronic, with states on average experiencing these shortages for approximately half or more of the time from 1998–2018. However, there is variation in the degree to which states experience each of the top five most common shortage areas. One state may have more of a chronic need in mathematics, while another may experience a chronic need in science or foreign language. The maps below show how often on average each state experienced each of the top five shortage areas.

As Map 1 shows, many states experience shortages in special education 80 percent of the time or more. But there is even fluctuation within special education needs. States like Oklahoma, Montana, South Dakota, and Vermont experience special education shortages much less consistently than other states throughout the country. Meanwhile, nine states total – Florida, Iowa, Kansas, Kentucky, Louisiana, Maine, Nebraska, Texas, and Wisconsin – reported special education as a subject area shortage for all 20 years.

Map 1

Percent of Years States Experienced a Special Education Teacher Shortage, 1998–2018

81%–100%
 61%–80%
 41%–60%
 21%–40%
 1%–20%
 Not Reported



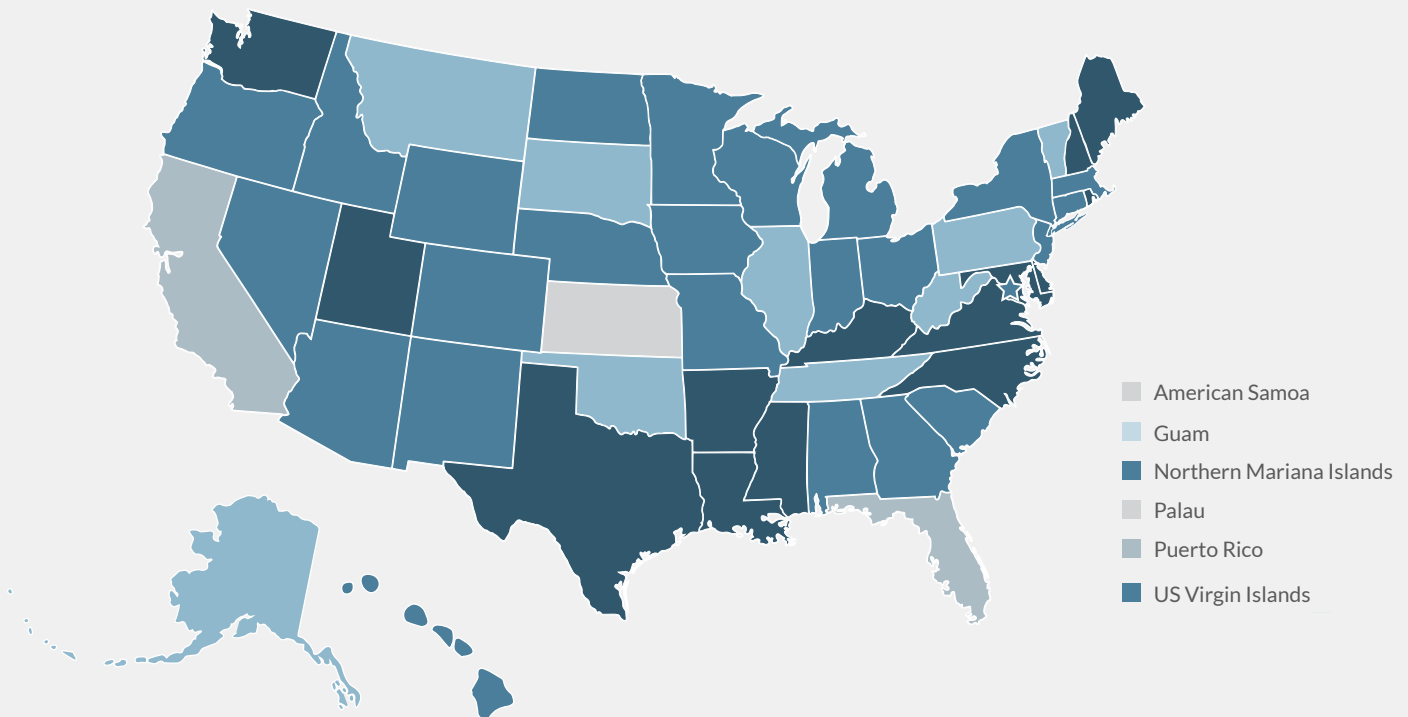
Source: Derived from U.S. Department of Education Teacher Shortage Areas Nationwide Listing, available at <https://www2.ed.gov/about/offices/list/ope/pol/ateachershortageareasreport2017-18.pdf>.

Mathematics shortages are not as chronic as special education across all states. But needs vary by state. For example, as Map 2 shows, California reported mathematics shortages less than 20 percent of the time, but in Map 1, the state reported special education shortages 80 percent of the time or more. And while nine states reported special education shortages for all 20 years of our analysis, just four states did so for mathematics: Louisiana, Maine, North Carolina, and Texas.

Map 2

Percent of Years States Experienced a Mathematics Teacher Shortage, 1998–2018

81%–100%
 61%–80%
 41%–60%
 21%–40%
 1%–20%
 Not Reported



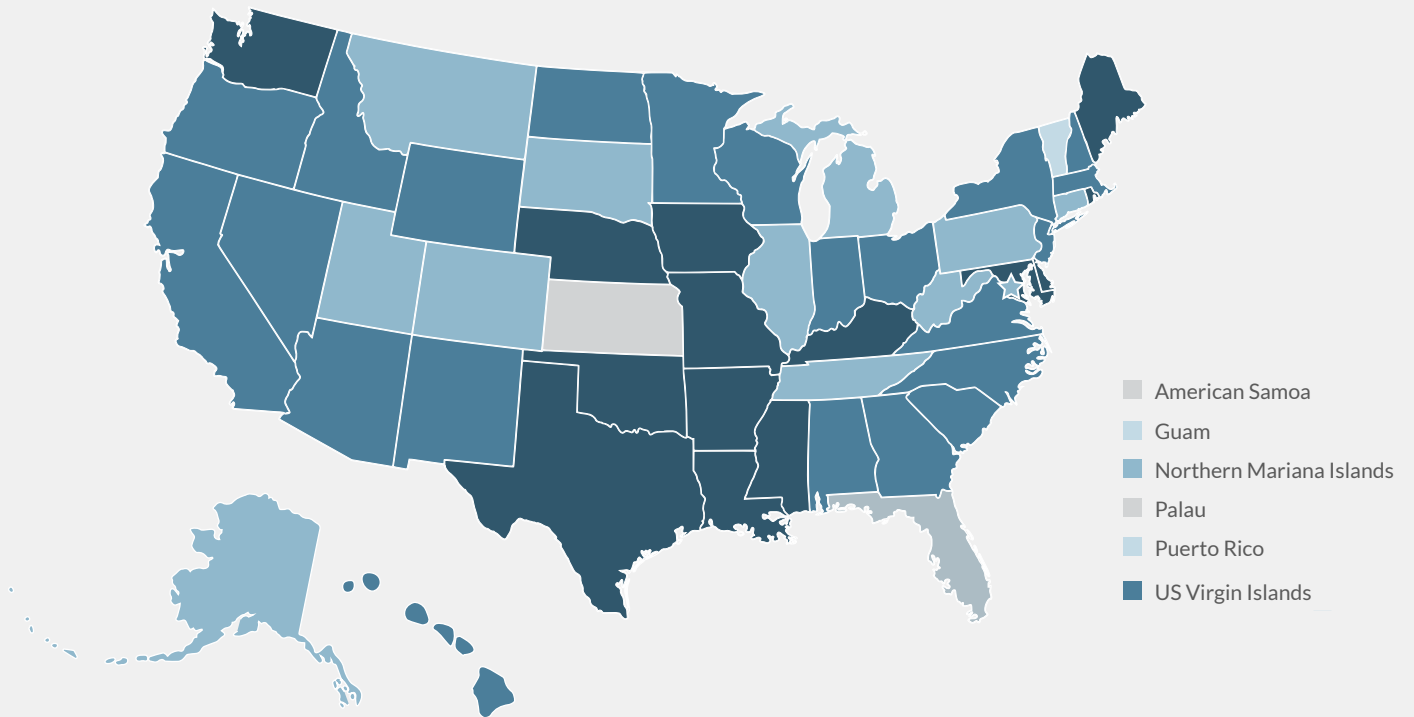
Source: Derived from U.S. Department of Education Teacher Shortage Areas Nationwide Listing, available at <https://www2.ed.gov/about/offices/list/ope/pol/ateachershortageareasreport2017-18.pdf>.

According to Map 3, there appears to be a concentrated regional need for science teachers. The South and Midwest reported the most consistent science shortage areas.

Map 3

Percent of Years States Experienced a Science Teacher Shortage, 1998–2018

81%–100% 61%–80% 41%–60% 21%–40% 1%–20% Not Reported



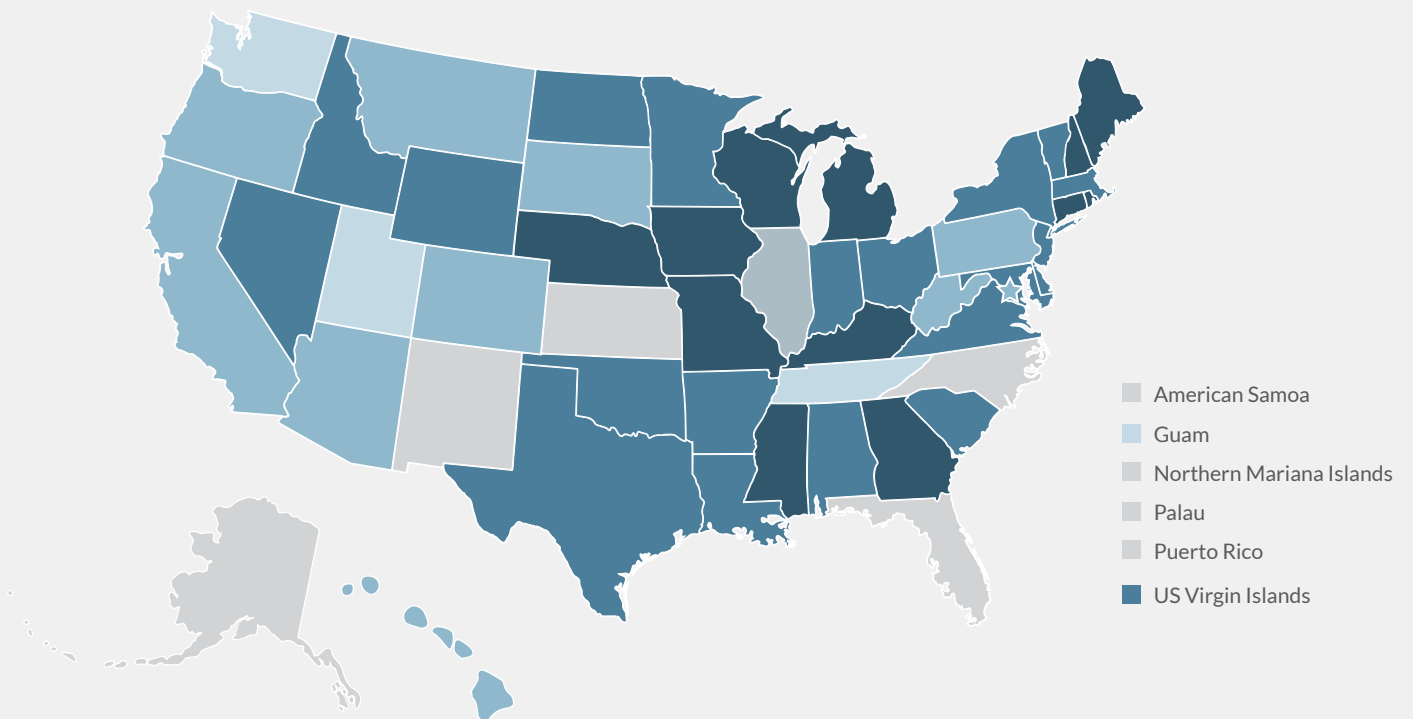
Source: Derived from U.S. Department of Education Teacher Shortage Areas Nationwide Listing, available at <https://www2.ed.gov/about/offices/list/ope/pol/ateachershortageareasreport2017-18.pdf>.

Maps 4 and 5 detail foreign language and English as a second language shortages by state. These shortages are less chronic across all states, but there are still some states that struggled with each of these shortages for more than 80 percent of the time of our analysis period.

Map 4

Percent of Years States Experienced a Foreign Language Teacher Shortage, 1998–2018

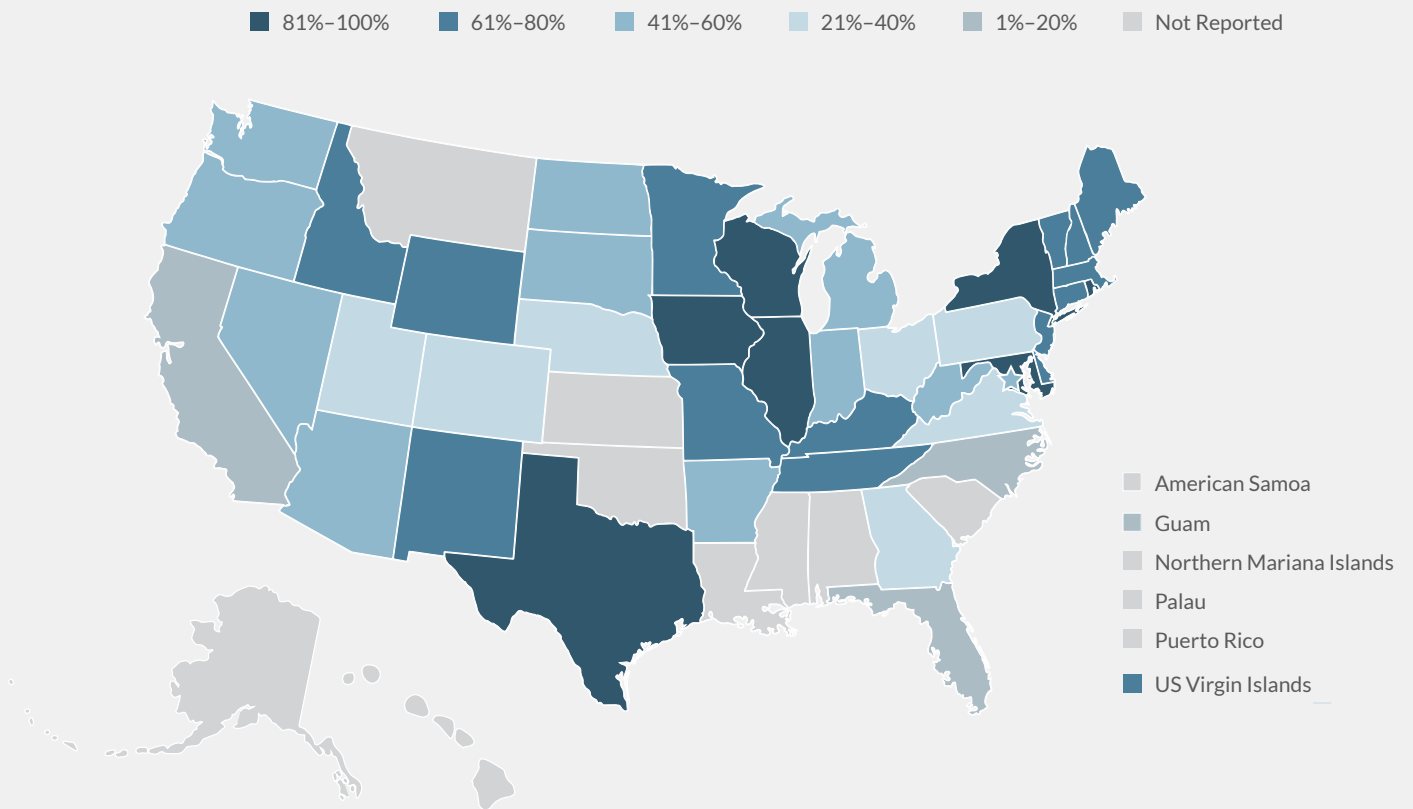
81%–100% 61%–80% 41%–60% 21%–40% 1%–20% Not Reported



Source: Derived from U.S. Department of Education Teacher Shortage Areas Nationwide Listing, available at <https://www2.ed.gov/about/offices/list/ope/pol/ateachershortageareasreport2017-18.pdf>.

Map 5

Percent of Years States Experienced an ESL Teacher Shortage, 1998–2018



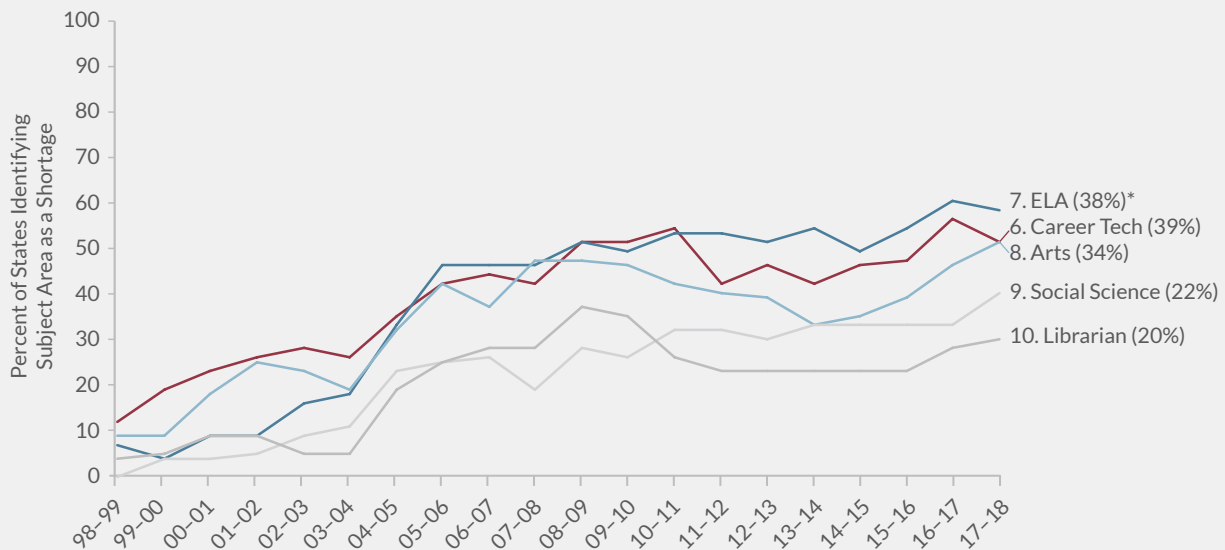
Source: Derived from U.S. Department of Education Teacher Shortage Areas Nationwide Listing, available at <https://www2.ed.gov/about/offices/list/ope/pol/ateachershortageareasreport2017-18.pdf>.

As the maps show, the generic, national teacher shortage narrative does not hold true even among the top five most common shortage areas across the country. While states on average experience these shortage areas with consistency, within each shortage area there is variation across states.

After the top five most common shortage areas, more variation emerges on average across states. Figure 7 shows the top six to 10 shortages based on the percent of states reporting each year: career technologies, English language arts, the arts, social science, and librarian. These shortages fluctuate and intersect more over the 20-year period compared to the top five shortage areas. For example, on average, a greater percentage of states report career technologies as a shortage area, but it is outpaced by English language arts (ELA) beginning in 2010-11. These fluctuations suggest more of a cyclical pattern in these subject

area shortages. However, for almost all of the top ten subject area shortages, the trend lines slope upward, suggesting that labor markets are tightening across all of these subject areas even though some are more chronic than others. This may merely be part of a cycle of subject area shortage needs, or it may be a longer-term trend.

Figure 7 Top 6 to 10 Subject Area Shortages Reported Nationally, 1998–2018

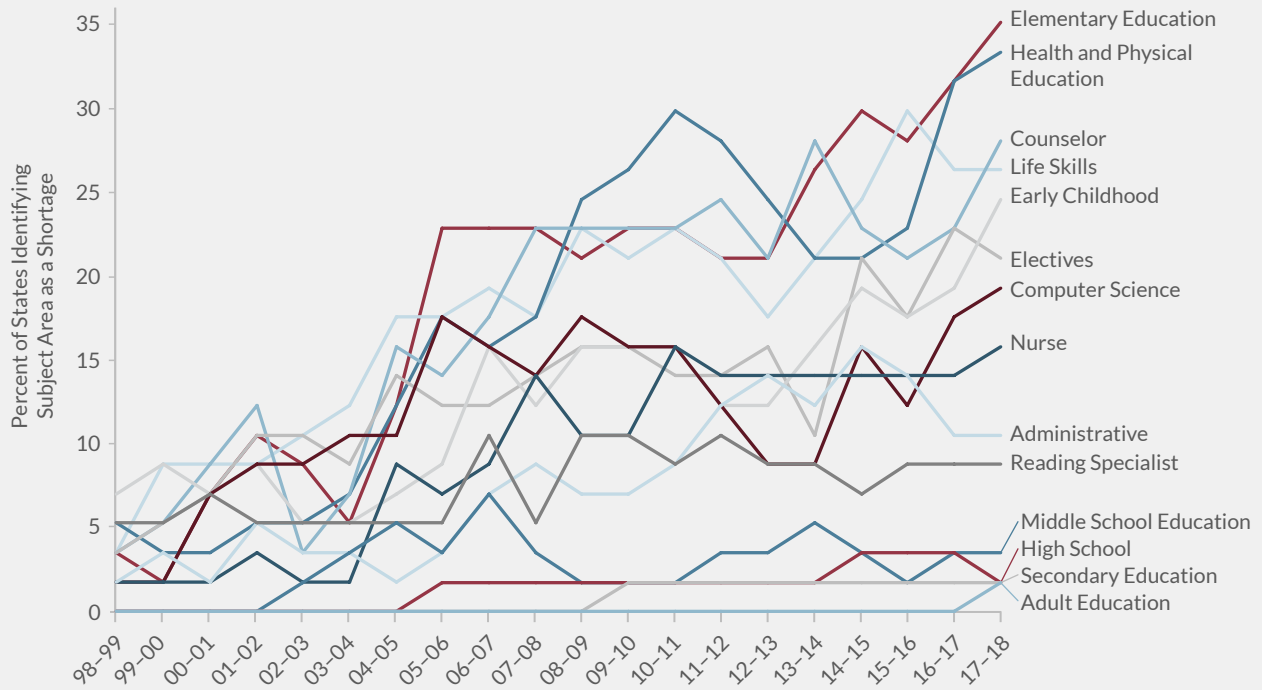


Source: Derived from U.S. Department of Education Teacher Shortage Areas Nationwide Listing, available at <https://www2.ed.gov/about/offices/list/ope/pol/ateachershortageareasreport2017-18.pdf>.

* The percentage in the parentheses denotes the average percent of states that reported the specific subject area as a shortage over the 20 year period.

The bottom 14 subject area shortages based on percent of states reporting a shortage each year show extreme fluctuations and variation over time. As Figure 8 shows, there is almost no consistency with these subject area shortages. Subject areas that emerge as shortages in one year may not in another and increase in volatility as fewer states report them over time. While these data may reflect temporary vacancies that affect fewer schools and students, they are undoubtedly meaningful for the schools and students they do affect. These shortages show just how dynamic specific teacher shortage issues are across states.

Figure 8 Bottom 14 Subject Area Shortages Reported Nationally, 1998–2018³²

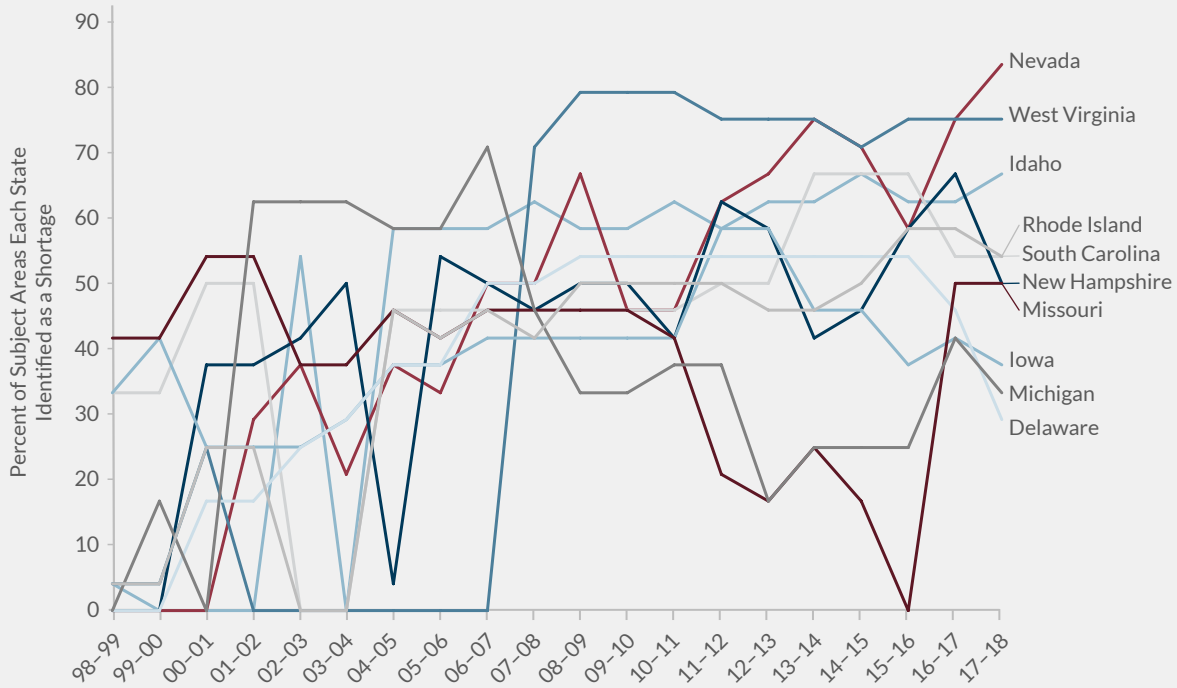


Source: Derived from U.S. Department of Education Teacher Shortage Areas Nationwide Listing, available at <https://www2.ed.gov/about/offices/list/ope/pol/ateachershortageareasreport2017-18.pdf>.

Similar to subject area trends, categorizing teacher shortages by state demonstrates high volatility and few predictable patterns. As Figure 9 shows, states that reported the greatest number of total subject area shortages over 20 years experience significant variation in their reporting. Some states such as Nevada, West Virginia, and Idaho experienced a general upward trend in the number of subject area shortages. However, New Hampshire, Michigan, Iowa, and Delaware experienced extreme upward and downward trends during the 20-year period.

Figure 9

Top 10 States with the Greatest Reported Subject Area Shortages, 1998–2018

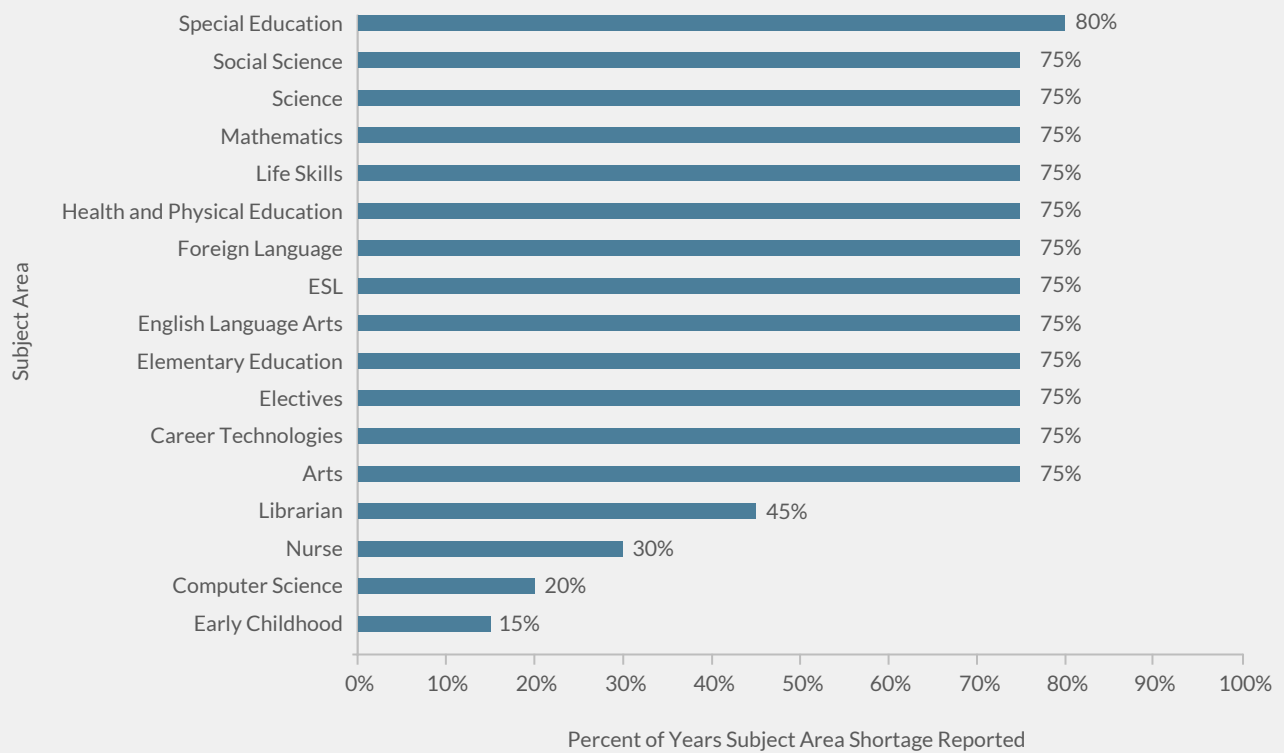


Source: Derived from U.S. Department of Education Teacher Shortage Areas Nationwide Listing, available at <https://www2.ed.gov/about/offices/list/oep/pol/atteachershortageareasreport2017-18.pdf>.

Importantly, as previously stated, the states in Figure 9 may not have the highest number of teacher shortages as these data do not reveal magnitude of teacher need. Instead, these states reported the widest variation in subject area shortages most consistently over time.

A closer look at state-level data further demonstrates the wide variation of subject area shortage needs across states. (See teacher subject area shortage data by state in Appendix 2.) For example, in Figure 10, Idaho identified 17 different teacher subject shortages, identifying the majority of those subject areas each year included in our analysis. Specifically, Idaho reported 13 of the subject area shortages 75 percent of the time or more between 1998 and 2018.

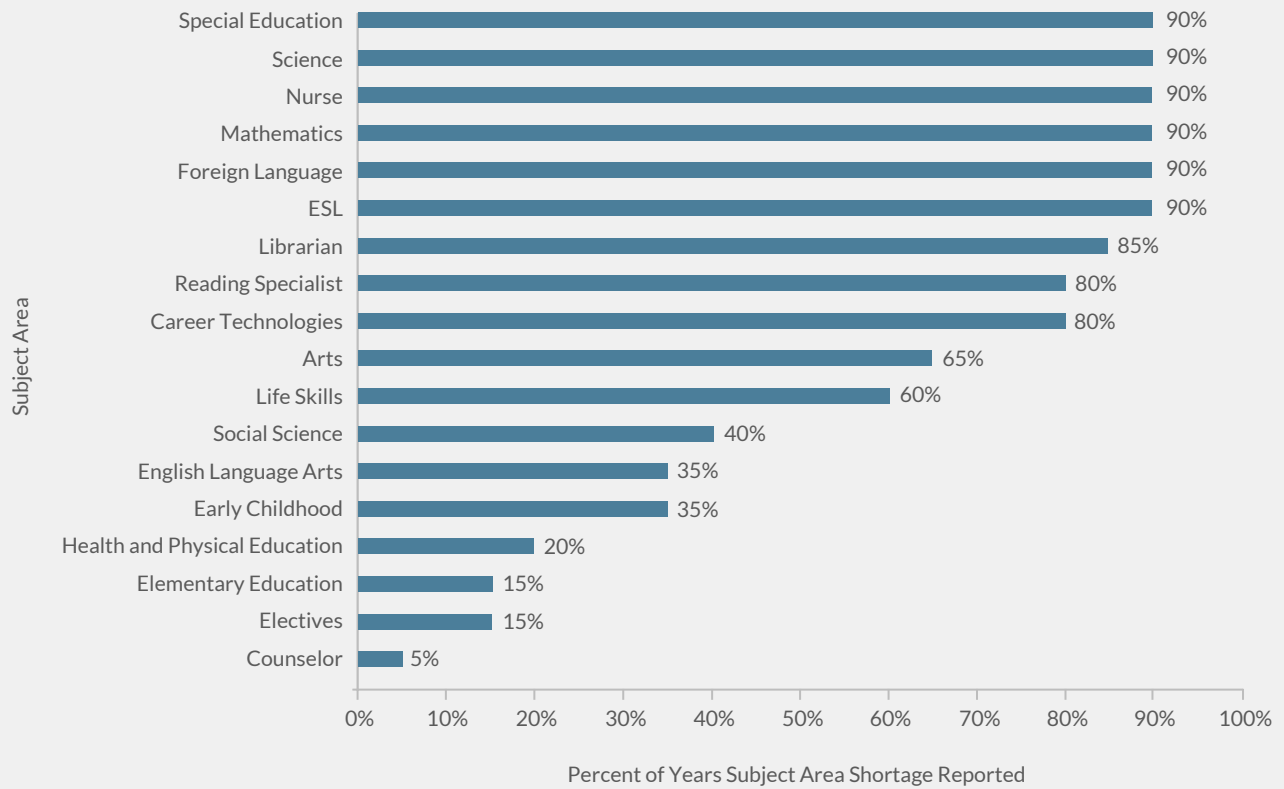
Figure 10 Idaho: Percent of Years Shortage Reported by Subject Area, 1998–2018



Source: Derived from U.S. Department of Education Teacher Shortage Areas Nationwide Listing, available at <https://www2.ed.gov/about/offices/list/oep/pol/ateachershortageareasreport2017-18.pdf>.

Similarly, Rhode Island (Figure 11) reported 18 different teacher subject shortages with consistency for the majority of those shortage areas over time.

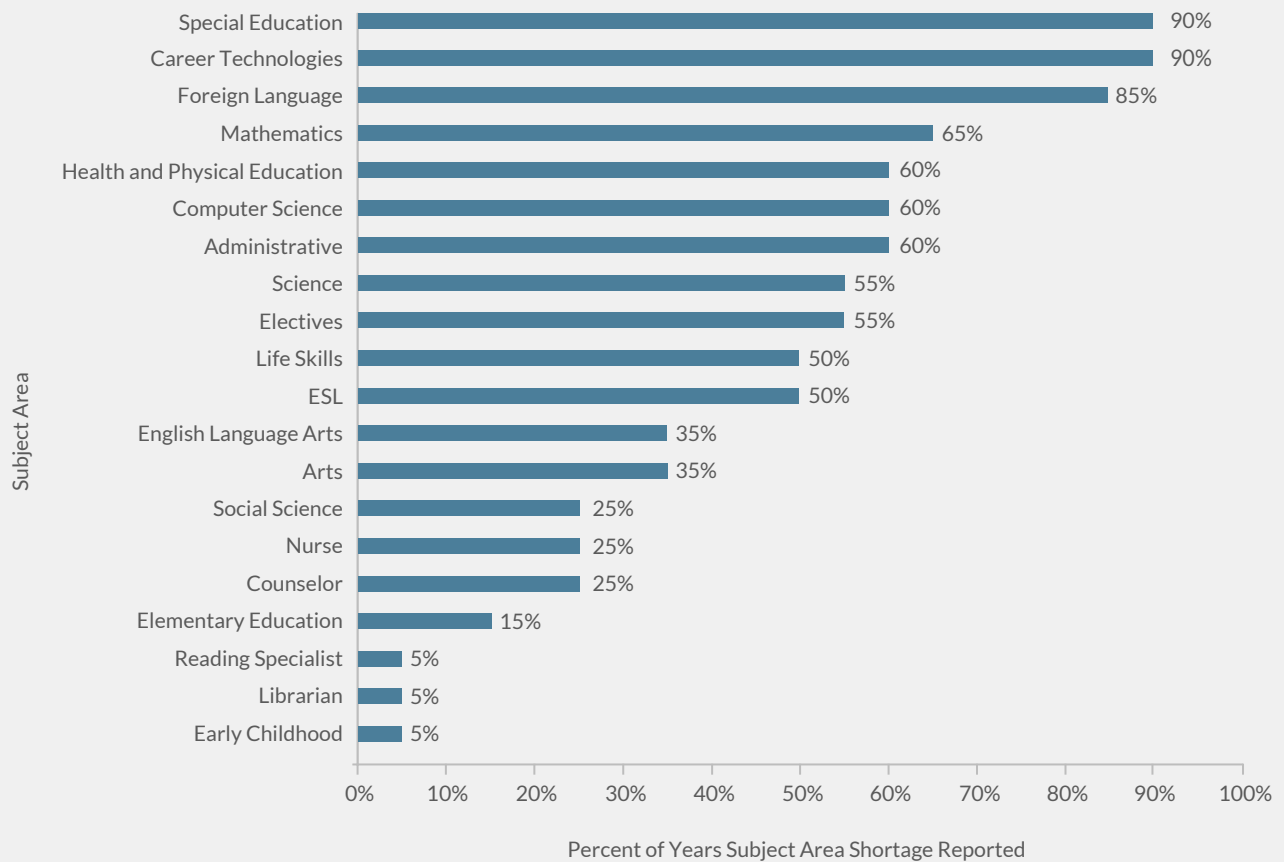
Figure 11 Rhode Island: Percent of Years Shortage Reported by Subject Area, 1998–2018



Source: Derived from U.S. Department of Education Teacher Shortage Areas Nationwide Listing, available at <https://www2.ed.gov/about/offices/list/ope/pol/ateachershortageareasreport2017-18.pdf>.

Michigan (Figure 12) reported many shortage areas over time, but less consistently than states like Idaho and Rhode Island. For example, Rhode Island reported nine subject area shortages 80 percent of the time or more. In Michigan, only three shortage areas were reported for 80 percent of the time or more, but like Idaho and Rhode Island, many different subject area shortages were reported over the 20-year period analyzed.

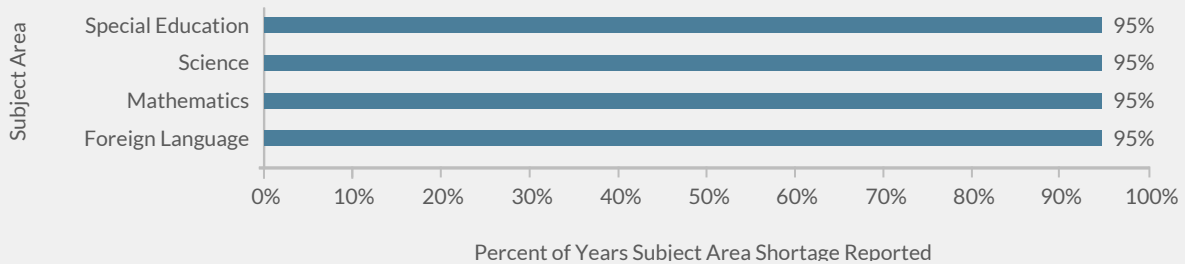
Figure 12 Michigan: Percent of Years Shortage Reported by Subject Area, 1998–2018



Source: Derived from U.S. Department of Education Teacher Shortage Areas Nationwide Listing, available at <https://www2.ed.gov/about/offices/list/oep/pol/ateachershortageareasreport2017-18.pdf>.

In contrast, Mississippi (Figure 13) only reported four subject area shortages over 20 years, but reported shortages in those subject areas consistently: For 19 out of the 20 years in our analysis, the state named the same four shortage areas (foreign language, mathematics, science, and special education).

Figure 13 Mississippi: Percent of Years Shortage Reported by Subject Area, 1998–2018



Source: Derived from U.S. Department of Education Teacher Shortage Areas Nationwide Listing, available at <https://www2.ed.gov/about/offices/list/ope/pol/ateachershortageareasreport2017-18.pdf>.

As the examples above demonstrate, there is enormous variation in states' subject area shortages. But there are a few overarching trends. Chronic shortages in special education exist within and across most states. Most states also experience chronic shortages in mathematics and science. However, after that, there are few trends across all states. As these data show, suggesting that teacher shortages are generic ignores the extreme variation these data reveal, which could drive solutions that aren't tailored to the specific needs of states, districts, and schools. It also sends the wrong message to prospective teachers about the teacher labor market. This can lead to uninformed decision-making about which teacher certification subject area to pursue.

Although the generic teacher shortage narrative is pervasive, some policies and strategies to address teacher shortages take variation into account. But the adoption of targeted policies has not taken hold in many states, districts, and schools. In addition, effectiveness of these strategies varies, but could be strengthened with better, more consistent data.

What Are Policies and Strategies Geared Toward Addressing Teacher Shortage Areas and How Effective Are They?

Policymakers at the federal, state, and district levels have implemented multiple strategies in an attempt to address teacher shortages. Policies targeting shortages aim to influence the teacher labor market all along the teacher pipeline, including providing incentives to attract more candidates to the profession as well as strategies to retain them once they've entered the classroom. The most common strategies fall into four broad categories and have varying degrees of proven effectiveness: financial incentives, teacher licensure, ensuring diverse teacher preparation pathways, and retention strategies.

Financial Incentives

Loan Forgiveness and Grants

A plethora of loan forgiveness and grant programs are aimed at mitigating teacher shortages by providing assistance with burdensome college loans. Some of these programs are offered through the federal government, while others are state-sponsored. Teachers may qualify for both federal and state loan forgiveness, but must consider which programs can and cannot be combined. All loan forgiveness programs and grants rely on states to determine which areas have shortages, i.e., the data we analyzed in this report.

Loan forgiveness programs entice potential candidates into the profession by relieving higher education debt, usually in exchange for teaching in high-need subjects, geographic areas, and/or schools for a predetermined amount of time. Reducing the cost of entry into the teaching profession is an incentive for college graduates to choose teaching over other professional opportunities that might be more highly paid. Examples of loan forgiveness policies include:

Federally sponsored loan forgiveness and grants

- **Teacher Loan Forgiveness Program.** Teachers are eligible for forgiveness of up to \$17,500 on Direct Subsidized and Unsubsidized Loans. In order to participate, teachers must teach full-time for five complete and consecutive academic years in a low-income school.
- **The Teacher Education Assistance for College and Higher Education (TEACH) Grant.** The TEACH Grant Program provides grants of up to \$4,000 per year to students who are completing or plan to complete coursework needed to begin a career in teaching. TEACH Grant recipients must commit to teaching in a high-need field at a school that serves low-income families for at least four complete academic years.

State-sponsored loan forgiveness and grants

Approximately 40 states offer their own loan forgiveness programs for teachers, particularly if teachers serve in a high-need area.³³ A few state examples include:

- **Arkansas State Teacher Education Program (STEP).**³⁴ This program provides assistance for eligible licensed teachers with repayment of outstanding federal student loans. STEP recipients may receive loan repayment for federal student loans in the amount of \$3,000 per year for each year teaching.
- **New York City Loan Forgiveness Program.**³⁵ This program offers a tax-free grant to New York state certified classroom teachers and school-based pedagogic clinicians working in specified shortage areas and bilingual education, newly hired to the New York City Department of Education.
- **Oklahoma Teacher Shortage Employment Incentive Program.**³⁶ This program reimburses eligible student loan expenses or pays an equivalent cash benefit to teachers trained in Oklahoma who have teaching certificates in math or science and agree to teach in an Oklahoma public secondary school for at least five years.

There is some evidence to suggest that teacher loan forgiveness programs can influence teacher recruitment and retention in high-need subjects and districts, but research is limited and program results vary. What is known is that the amount of the loan forgiveness matters: The higher the amount forgiven, the larger the effect. Numerous studies have found that loan forgiveness covering a significant portion of tuition is effective, while small amounts are less successful in attracting and retaining teachers.³⁷

In addition, particular subjects might need higher loan forgiveness amounts than others. One study of a teacher loan forgiveness program in Florida found that the program decreased attrition of teachers in shortage areas, but the effort produced different results across subject areas studied.³⁸ Modest annual forgiveness amounts in the \$500–\$1,000 range were effective at reducing attrition among middle and high school math and science teachers, but larger amounts of \$2,500 were necessary for retaining special education teachers. The structure and ease of program participation also matters. A U.S. Government

Accountability Office study of the federal TEACH Grant Program found that one-third of TEACH grant recipients were not on track to fulfill the program's teaching requirements, due mostly to burdensome annual paperwork and an ineffective appeals process for recipients whose grants had been mistakenly converted to loans.³⁹

Differential Pay

Most teacher compensation systems determine pay primarily on years of experience and degree attainment. However, some states and districts provide higher salaries, annual supplements, or one-time bonuses — often referred to as “differential pay” — to incentivize teachers to work in high-need subjects and schools as well as to retain effective teachers in those areas.

Research suggests that differential pay incentives need to be large in order to influence teacher behavior.⁴⁰ But when the incentives are large enough, differential pay can be an effective way to entice teachers to move to subjects and schools with teacher shortages. A study of a teacher pay incentive policy in Washington state that awards a \$5,000 bonus to National Board Certified Teachers who choose to work in high-poverty schools found that the bonus policy increased the proportion of these teachers in the bonus-eligible schools.⁴¹ A study of 10 districts that provided high-performing teachers \$20,000 to teach in their districts' low-performing schools for two years found that 88 percent of the districts' targeted vacancies in low-performing schools were filled by high-performing teachers.⁴²

Differential pay can also be an effective retention strategy. A study in North Carolina found that paying math, science, and special education teachers in high-poverty schools \$1,800 bonuses reduced teacher turnover by 17 percent.⁴³ Another study in Tennessee found that a \$5,000 retention bonus for effective teachers in Tennessee's Priority Schools was an effective strategy for retaining teachers.⁴⁴ And in Georgia, an annual \$1,000 stipend for math and science teachers in grades K–5 and salary increases for new math and science teachers in grades 6–12 were effective at retaining teachers. A study found that the pay incentives in Georgia reduced math and science teacher turnover rates by 35 percent.⁴⁵

Teacher Licensure

To mitigate teacher shortages, states may reconsider systems for licensing teachers to allow for more flexibility. This is particularly true for the laws governing various tiers states maintain for licenses and licensure reciprocity between states.

Tiered Licensure

Most states maintain teacher licensing systems with multiple tiers of licensure. Twenty states have two tiers of licensure and another 26 have three or four levels of licensure.⁴⁶ To mitigate teacher shortages, some states are reforming their licensure systems to

allow teacher candidates to enter the teacher pipeline at different points depending on experience and credentials. A tiered licensure system can help bring experienced field professionals — in STEM fields, career technology, etc. — into the teaching profession at a lower tier to fill teacher vacancies while they work toward full licensure.

As an example, a 2017 Minnesota law established a new four-tiered licensure system.⁴⁷ Tier one of the new system allows professionals who have a bachelor's degree, associate degree, professional credential, or five years of work experience in a relevant content area to enter the teaching workforce regardless of whether they have any teacher preparation training. Under this license, a school must affirm that the candidate has the necessary knowledge and skills to teach in the content area and that the school has been unable to hire a licensed teacher. Schools must post the position every year and try to find a licensed teacher before renewing someone with this type of license.⁴⁸

Sidebar 3

Emergency Certification

Many states also issue emergency or temporary licenses for individuals who do not meet the traditional requirements for a full license but are deemed qualified for a specific teaching assignment or are needed due to some extenuating circumstance.ⁱ Emergency certification allows teacher candidates to begin teaching immediately, while working toward long-term certification. Requirements vary from state to state, but most states require a bachelor's degree.

While this option may provide a short-term fix to an immediate problem if a school year is beginning and a classroom is without a teacher, filling open positions with underprepared teachers can create challenges. One study found clear negative effects on achievement for students taught by teachers with provisional or emergency licenses compared to those with regular licenses.ⁱⁱ Another study found that uncertified teachers were more prevalent among high-poverty schools, schools with high percentages of students of color, urban schools, and schools with high proportions of English learners than among all schools.ⁱⁱⁱ Emergency certification contributes to the problem of inequitable distribution of effective teachers, which leads to economically disadvantaged students and students of color being less likely to have effective teachers than their white and more advantaged peers.^{iv} Alternative certification (see page 41) is one strategy states and districts use to make emergency certification less pervasive.

i Tooley and White, *Rethinking Relicensure: Promoting Professional Learning through Teacher Licensure Renewal Policies*, https://s3.amazonaws.com/newamericadotorg/documents/Rethinking_Relicensure_FINAL.pdf.

ii Charles Clotfelter, Helen Ladd, and Jacob Vigdor, "How and Why Do Teacher Credentials Matter for Student Achievement?," CALDER working paper 2, 2007, https://caldercenter.org/sites/default/files/1001058_Teacher_Credentials.pdf.

iii *Prevalence of Teachers Without Full State Certification and Variation across Schools and States* (Washington, DC: US Department of Education, 2016), <https://www2.ed.gov/rschstat/eval/teaching/teachers-without-certification/report.pdf>.

iv Glenda Partee, *Attaining Equitable Distribution of Effective Teachers in Public Schools* (Washington, DC: Center for American Progress, 2014), <https://cdn.americanprogress.org/wp-content/uploads/2014/04/TeacherDistro.pdf>.

Licensure Reciprocity

Licensure reciprocity refers to policies that allow teachers certified in one state to seamlessly transfer their certification to another state and become licensed teachers of record with few additional requirements. Certified teachers who could help mitigate teacher shortages in their states may be hampered by restrictions on licensure reciprocity.

The expensive and timely pursuit of recertification can cause teachers to stop teaching when moving between states or to choose not to leave their state to pursue teaching in a shortage area. A study that focused on the Washington-Oregon state line found that teachers were more likely to move far across their state than cross state lines. Specifically, the study found that even among school districts near the state border, almost three times as many teachers make a within-state move of 75 or more miles than make any cross-state move.⁴⁹ Surveys of teachers also prove the strong effect licensure reciprocity has on teachers' decision-making. Another study of worker mobility found that state-specific licenses limit mobility more than national licenses. As a group, the study found that teachers had low mobility rates overall, and they had especially low rates of cross-state mobility.⁵⁰ Additionally, an analysis of federal data showed that 40 percent of former teachers who would consider returning to the profession cited "state certification reciprocity" as very or extremely important in their consideration.⁵¹

Ensuring Diverse Teacher Preparation Pathways

In the context of teacher shortages, teacher preparation reforms can be created to provide quicker pathways to teaching credentials for potential teacher candidates with bachelor's or master's degrees. Other teacher preparation reforms are specifically geared to recruiting, training, and retaining teachers to fill known shortages and/or diversify the teaching profession.

Alternative Certification

Alternative certification exists to provide a quicker path into teaching than traditional preparation. This can help with teacher shortages by enticing people to enter the teaching profession by providing a faster and, at times, less expensive way to become a certified teacher. Regulations and programs for alternative certification vary by state. By and large, these programs operate between emergency certification, which is an almost immediate pathway into teaching with minimal preparation, and traditional teacher preparation, which often takes many years to complete. Alternative programs may be attractive to professionals with a background in high-need subjects who want to make a career change into teaching, but who may not want to spend the time and money required for a traditional pathway. Teaching fellows programs are a type of alternative certification that provide teaching candidates with several weeks of training and programmatic induction, typically

in the summer, before candidates become teachers of record. Most of these programs also offer ongoing support and training after candidates become full-time classroom teachers. Teach For America is a well-known example.

Research shows that alternatively certified teachers disproportionately teach in high-need schools and subjects.⁵² And although results vary, studies find that the students of teachers who enter the profession through highly selective alternative routes experience better achievement gains than the students of unlicensed teachers and comparable achievement gains as traditionally certified teachers. However, alternatively certified teachers are retained at lower rates than their traditionally prepared peers.⁵³

Teacher Residency Programs

Teacher residency programs are another pathway teacher candidates can pursue. There is wide variation in the goals, structure, and quality of residency programs, though most of them are structured so that teaching candidates receive the bulk of their training while working in pre-k through 12 classrooms and participate in course content that is tightly linked to and supports their everyday teaching in the classroom.⁵⁴ Teacher residency programs are often considered to be alternative certification programs, though candidate commitments in these programs are often more involved than other types of alternative certification programs such as teaching fellows programs or Teach For America. Most residency programs have an extended clinical practice that can be available through either alternative or traditional programs. Residency programs are operated through a partnership between the residency operator and the school where the resident is placed and can be utilized as a pipeline into high-need schools.

A growing number of school districts are embracing the teacher residency model as a solution to teacher shortage needs. The partnership between districts and residency programs encourages those programs to be more responsive to districts' shortage needs. Studies show that teachers who are prepared through residency programs are more likely than other teacher candidates to focus on common shortage areas, such as secondary mathematics, science, or special education.⁵⁵ Teacher residency programs offer examples of how teacher preparation programs can partner with districts to design programs and recruitment around the employment markets their graduates are entering to better fit the needs of districts, particularly in shortage areas. Moreover, residency graduates are also more likely to be from diverse backgrounds and are retained at higher rates.⁵⁶

Grow Your Own Teacher Preparation Programs

“Grow your own” teacher preparation programs proactively recruit teacher candidates while they are in high school to pursue a path that leads them to teach in their community schools. These programs are small, targeted to the needs of particular communities, and often used to ensure that the teaching population better reflects the diversity of the student population.

Maestros Para el Pueblo, a grow your own teacher training program in Washington state, was designed to create a pathway from high school through college and teacher education for Latino/a students in the Skagit Valley Community.⁵⁷ Another grow your own program in North Carolina, the North Carolina Teacher Cadet Program, has been operating since 1997.⁵⁸ The program provides a structured course of study that encourages high school students to consider entering the teaching profession. Implemented in cooperation with school districts across the state, the program encourages high school students to attend college and to eventually teach in North Carolina public schools, with a particular focus on rural and economically disadvantaged counties. The nonprofit organization Generation Teach provides potential teaching candidates early exposure to the profession through summer teaching fellowships for high school and undergraduate students before eventually placing them in teaching positions in community partner schools in Massachusetts, Rhode Island, and Colorado.⁵⁹ There is not yet a body of research to assess the effectiveness of individual grow your own programs and of the model as a whole, but they can be used as one strategy to mitigate teacher shortages by recruiting promising teacher candidates while they are considering their professional interests.

Teacher Preparation Programs for Paraprofessionals

Many small teacher preparation programs have been created for professionals working in schools as teacher's assistants or paraprofessionals who want to work toward full-time teacher licensure. Many of these programs operate as residency programs or have residency-like or "grow your own"-like features (see above), but some traditional teacher preparation programs also market opportunities for paraprofessionals to earn a teaching license while continuing to assist in the classroom. Often in these programs, candidates are working as full-time paraprofessionals and completing certification coursework simultaneously.

For example, Minneapolis Public Schools launched the Minneapolis Residency Program (MRP) in 2015 to provide a pathway for current employees, including paraprofessionals, to earn their elementary education licenses.⁶⁰ Another program in the St. Paul-Minneapolis region, the Southeast Asian Teachers (SEAT) licensure program, recruits and trains candidates from underrepresented backgrounds who are employed as non-licensed staff in a Minnesota school district. Graduates of the program receive either a bachelor's degree and/or teacher licensure, depending on their current level of educational attainment.⁶¹ An alternative teacher certification program administered by the Arkansas Department of Education called the Arkansas Professional Pathway to Educator Licensure (APPEL) allows a candidate with a bachelor's degree or higher to be employed as a classroom teacher while completing the necessary requirements for a Standard Arkansas Teaching License.⁶² APPEL candidates tend to be professionals who are already working in schools, but are not yet licensed to be full-time teachers, such as paraprofessionals or teacher aides.

There is no comprehensive source for data on the effectiveness of these programs, but teacher preparation programs targeted to non-licensed staff in schools could help to fill teacher shortage needs with adults who are already working in school communities. Paraprofessionals play a significant role in meeting the needs of special education students and English language learners. In fact, in 2013, there were more special education paraprofessionals employed than there were special education teachers.⁶³ However, successful programs need to provide support to candidates to navigate the bureaucratic, financial, and academic burdens associated with earning a teaching license.⁶⁴

Retention Strategies

To mitigate teacher shortages, states and districts strive to help teachers feel supported in their work and successful at their craft in order to retain them. These efforts include providing new teachers support and ongoing professional development and opportunities for leadership as teachers advance in their careers. Though many of these strategies tend to be universal or school-wide, the smartest retention strategies target the retention of effective teachers in subjects, grade levels, and locations that are hardest to staff.

New Teacher Training

In new teacher training — often referred to as “induction” — teachers are typically assigned an experienced teacher as a mentor who provides ongoing, constructive feedback and support during the beginning stages of a teacher’s career.⁶⁵ Some districts are experimenting with new teacher training and induction. In a pilot program in seven high-poverty schools in Denver Public Schools (DPS), new teachers teach part-time and spend the rest of their time planning, observing, and learning. The long-term vision is for all novice teachers hired to work in DPS to first spend time training in one of its high-poverty schools as an associate teacher, a teacher resident, a student teacher, or in some other role.⁶⁶

Induction and mentoring programs have been shown to improve teacher retention, though the design of the program influences effectiveness, and the general culture of the school is also a contributing factor to induction programs’ success.⁶⁷ A study by the U.S. Department of Education found that teachers who were assigned a mentor and participated in induction during their first year of teaching were more likely than teachers without these supports to teach for at least five years.⁶⁸ In addition, research shows that induction support such as mentor teacher pairing, coaching and feedback from more experienced teachers, and classroom assistance can reduce attrition rates for new teachers that serve students of color and low-income families.⁶⁹

Teacher Leadership and Career Ladders

Many districts provide opportunities for teachers to develop in their careers by taking on leadership opportunities. Research directly linking teacher leadership opportunities and increased retention is limited, though interest in pursuing leadership opportunities is a reason teachers cite for leaving a school or district. A Bellwether study of DC Public Schools teacher exit survey data found that high-performing teachers named lack of leadership opportunities as one of the top three reasons for leaving the district.⁷⁰ Similarly, a survey of teachers found that teachers “who have opportunities to share their expertise” experience greater job satisfaction and are more likely to stay in the profession.⁷¹

The construct of teacher leadership is not well defined, conceptually or operationally, but there are districts and states that have realized its importance in retaining teachers — especially those in high-need schools and subjects. Teacher leader roles are typically at the organizational or instructional levels or centered on professional development.⁷² One type of teacher leadership structure that districts use is a “career ladder” structure that offers different types of opportunities for leadership and specialization that teachers can pursue.⁷³ This often requires district and school leaders to restructure staffing and scheduling so that teacher leaders can take on additional leadership responsibility and a lighter direct teaching load.

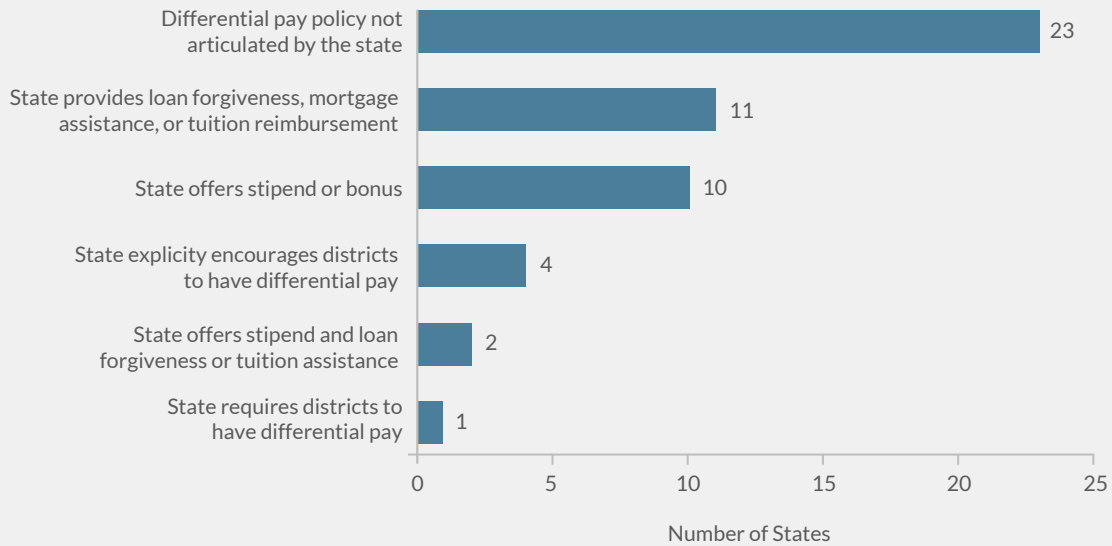
Overall, policymakers at the national and local levels have created many strategies to recruit and retain teachers, especially in high-need subject areas. Many of these strategies show promising evidence of effectiveness when they are well-structured and connected to specific needs. But innovative, proven solutions are still only happening in pockets. There is a long way to go for these strategies to spread into states, districts, and schools to impact teacher shortage areas at scale. And the implementation of these strategies must reflect what data show: Programs that target specific in-demand subjects with specific incentives work; broad, universal solutions aren’t as effective.

How Are States Implementing Policies That Address Teacher Shortages?

There are many workable policies to mitigate teacher shortages that have promising evidence behind them. However, states are not adopting these policies at scale and, in some cases, the policies are not targeted to the teaching positions in most need.

This issue is seen most strikingly with differential pay policies. Differential pay is perhaps the most well-researched policy aimed at addressing teacher shortages, but states have yet to implement it at scale. While 35 states have some policy regarding differential pay, only 28 states have policies on the books for differential pay for high-need subjects (Figure 14).⁷⁴ Further, the majority of those policies come in the form of loan forgiveness, mortgage assistance, and tuition reimbursement, which in some cases may not equate to the amount needed to make differential pay effective, according to research.⁷⁵ The lack of state differential pay policies has an effect on district-level adoption. Teachers in most districts continue to be bound by a single salary schedule: In 2011–12, just 14 percent of districts used extra pay incentives for teachers in shortage areas.⁷⁶

Figure 14 State Differential Pay Policies for High-Need Subjects⁷⁷



Source: Authors' analysis of National Center on Teacher Quality's Teacher Contract Database, available at <https://www.nctq.org/contract-database/home>.

Licensure reciprocity is another policy area that could address teacher shortages, but in most states, it is difficult for teachers to transfer a license from one state to another when relocating across state lines. Currently, only a handful of states offer full reciprocity for teaching licenses.⁷⁸ Instead, in most states, teachers must take additional coursework, trainings, or assessments to be certified in a new state, which is often time-consuming and expensive. And the process for recertification can be burdensome and difficult to navigate.⁷⁹ All of these issues cause many teachers to stop teaching when they move to a different state, even if there is demand for teachers in their field. There is some evidence that states are showing an appetite for changing licensure reciprocity regulations. But in the meantime, states can make it easier for teachers to get employment when crossing state lines and help them understand the processes for doing so.⁸⁰

States should reconsider licensure requirements for incoming out-of-state teachers while remaining cognizant of tradeoffs that may sacrifice quality for volume. However, research to date finds a weak correlation between licensure requirements and teacher quality. For example, a study of the relationship between teacher licensure test scores and student achievement in Washington state found varying results depending on subject

area.⁸¹ The state's basic skills test served as a modest predictor of student outcomes in math and ninth-grade biology. And the state's subject-specific biology licensure test was a statistically significant predictor of student achievement. However, the subject-specific math licensure test was much less effective in predicting student performance. Given this limited and mixed evidence, states should not impede teachers' ability to teach the same subject in a new state but should consider ensuring access for incoming out-of-state teachers to evidence-based resources that support their effectiveness. For certified teachers who would like to change subject areas in a new state, states could be more strategic to meet the demand for teacher shortages by providing temporary licenses in specific subject areas. Such strategies must include targeted support to ensure that teachers meet the needs of the new subject area requirements.

Rather than enacting policies such as differential pay and licensure reciprocity, states tend to create reactive policies to address teacher shortages. One of the go-to policies states implement when experiencing a teacher shortage crunch is lowering admissions standards for teacher preparation programs. States use this strategy as a quick and easy way to increase preparation program enrollment numbers and obtain more teachers, even though there is no evidence that this strategy helps with teacher shortages. Nevertheless, this is an observable trend. In late 2015, when policymakers and administrators began fearing that the supply of potential teachers was becoming less abundant, many states began lowering admissions standards. The number of states requiring a GPA of 3.0 or higher for preparation program admissions dropped from 25 in 2015 to 11 in 2016, and in 2016 only three states required a college-level test before program entry, down from 19 in 2015.⁸²

States would be wise to implement forward-looking, research-backed policies targeted to specific teacher shortages rather than relying on reactive policies to mitigate shortages as they arise. If states get in the bad habit of reactive policymaking, it becomes all the more difficult to create comprehensive policy solutions to teacher shortage needs.

Recommendations

Teacher shortage challenges are specific to each state. As such, states need to develop policies that fit their unique context and challenges. However, there are foundational practices that apply to all states:

- 1** The first step is diagnosing the specific teacher shortage problem. The foundation for understanding teacher shortage needs and designing targeted policies for those specific needs is a robust data system connecting teacher supply and demand. From there states can forecast subject-area and geographic challenges and then design policies to address current needs and mitigate future problems.
- 2** After understanding the specific problem, states and districts should communicate with institutions that supply teachers about specific and urgent needs to better align on supply and demand of teacher candidates. Teacher residency programs are examples of programs already operating this way with districts. States and districts should work with higher education institutions and other alternative preparation pathways to create similar partnerships.
- 3** States should also consider other research-backed policies mentioned in this report to attract and retain teachers in high-demand subjects and geographies. Those policies should be targeted initiatives that address the particular challenge instead of general solutions that may affect the profession as a whole, but could potentially have little impact on specific shortage areas.

Conclusion

Our analysis of the USED teacher shortage listing shows that teacher shortage subject areas vary by state and time period. And many states report difficulties in hiring in certain subject areas year over year. While specific chronic and cyclical shortages are unique to each state, many states struggle with chronic teacher shortages in special education, mathematics, science, and foreign language. Policy solutions for addressing shortage areas exist, but states lack the ability to diagnose teacher shortage problems unique to local context due to opaque, out-of-date teacher shortage data.

Teacher shortage problems are complicated further by an inaccurate narrative suggesting a generic, national teacher shortage. This narrative signals that the field simply needs more teachers of any kind to prevent shortages. The result is an imbalance between teacher supply and demand, with far more certified elementary education teachers than there are jobs available and not enough special education, mathematics, and science teachers to fill open positions.

Teacher shortage problems are solvable. But the field must first recognize the unique nature of the problem before policy solutions can address specific issues at scale. At the same time, districts, states, and the federal government must create better data collection and reporting systems to guide policymaking.

Appendix 1

Subject Area Shortages Categories

The authors created this framework to categorize each unique teacher shortage submitted by states and territories. The “state examples” list is not exhaustive, but rather a representation of the types of shortages that are included in each category.

Category	State Examples
Administrators	<ul style="list-style-type: none">• 5th/6th Grade Endorsement• Administrative• Algebra 1 Middle School Endorsement• Building Maintenance• Child and Custodial Care• Child Care and Guidance• Food Management• Parent and Family Education• Social Service / Attendance• Teacher Coordinator: Work-Based Learning• Testing and Evaluation Coordinator
Arts	<ul style="list-style-type: none">• Art• Band• Chorus• Dance• Drama• Drama / Speech• Elementary Visual Arts – Statewide• English / Drama / Humanities• Music• Music (Grades 7-12)• Theater

Category	State Examples
Career Technologies	<ul style="list-style-type: none"> • Air Transportation • Aircraft Mechanics • Auto Body Repair • Auto Mechanics • Automobile Technician • Automotive Technology • Business and Office Technology • Business Technology Education • Cabinet and Millwork • Career Clusters • Career Clusters (Grades 9–12) • Career Education • Career Education (Grades 9–12) • CTE-Dual enrollment – Statewide • Diversified Occupations • Diversified Occupations (Grades 9–12) • Health Careers • Industrial Arts • Intervention and Career Connections Program – CTI • JROTC • Manufacturing Sciences • Manufacturing Sciences – Engineering Science • Marketing and Distribution • Marketing Education • Marketing, Sales, and Services • Mechanical – Automotive • Mechanical – Aviation • Mechanical Occupations (Including DCT) • Occupational Subject, Vocational Technical • Personal Services Occupations • Personal Services Occupations – Includes Cosmetology • Precision Production – Welding • Public Health and Medical Occupations • Technology Education • Technology Education (Industrial Arts) • Technology Education (Pre-K–Grade 12) • Trade and Industry • Vocational • Vocational/Technical • Woodshop

Category	State Examples
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Computer Science

- Computer Programming
- Engineering
- Engineering and Information Technology
- Engineering Technology
- Information Technology
- Information Technology (Grades 9–12)
- Information Technology and Advanced Placement
- Mathematics/Computer Education
- Mathematics/Computer Science
- Microcomputer Applications
- Program Teacher

Counselor

- Guidance and Counseling (Grades 7–12)
- Guidance Counselor
- Occupational Therapist
- School Counselor
- School Counselor (Pre-K–Grade 12)
- School Psychologist
- School Psychology
- School Psychology
- Social Worker

Early Childhood

- Alternate Methodology – Early Childhood Education (Certification Required)
- At-Risk (Pre-K)
- Early Childhood (Age 3–8)
- General Early Childhood Education
- Infant/Toddler (Birth–3 yrs)
- Pre-Kindergarten

Electives

- Business
- Communication (Grades 6–12)
- Communications
- Graphic Design (Grades 6–12)
- Journalism
- Study Skills – Includes Remedial

Category	State Examples
Elementary Education	<ul style="list-style-type: none"> • Elementary – Rural • Elementary Core – Statewide • Elementary School with Subject Matter • Elementary Subject Matter Specialization • General • Kindergarten
English Language Arts	<ul style="list-style-type: none"> • English (Grades 5–9) • English (9–AD) • English (Grade 5–Adult) • English / Language Arts • English / Language Arts (7–12) • English / Language Arts (K–Grade 12) • Language Arts (9–AD) • Language Arts (Middle Schools, County Specific) • Language Arts (Pre-K–6) • Literacy • Middle Childhood (Grades 4–8) – English • Middle Childhood Integrated Language Arts / Social Studies • Reading • Secondary English – Statewide
ESL	<ul style="list-style-type: none"> • Bicultural • Bilingual • Bilingual Arabic • Bilingual Russian • Bilingual Spanish • BLE • English as a New Language (ENL) • English as a Second Language • English Speakers of Other Languages (ESOL) • ESL • ESOL • General ESL / BLE (K–12) • Linguistically Different • TESOL • Transitional Bilingual Education

Category	State Examples
Foreign Language	<ul style="list-style-type: none"> • All grade levels • Arabic Language • French • German • Italian • Latin • Sign Language • Spanish • World Languages (Grades 7–12)
Health and Physical Education	<ul style="list-style-type: none"> • Health Education / PE (9–AD) • Life and Physical Science • Physical Education • Physical Education / Health / Dance
Librarian	<ul style="list-style-type: none"> • Library Media • Library Science • School Librarian / Media • School Library and Media Specialist • School Media Specialist (K–Grade 12) • Teacher Librarian (K–Grade 8, K–Grade 12, and 5–12)
Life Skills	<ul style="list-style-type: none"> • Consumer Home Economics • Driver and Traffic Safety Education • Driver Education (9–AD) • Family Consumer Sciences • Home Economics (Pre-K–Grade 12)
Nurse	<ul style="list-style-type: none"> • Nurse • Health Occupations • Health and Medical Occupations • Sports Medicine / Athletic Trainer • Emergency Medical Technician • Physical Therapist • Health Occupation (Grades 7–12)

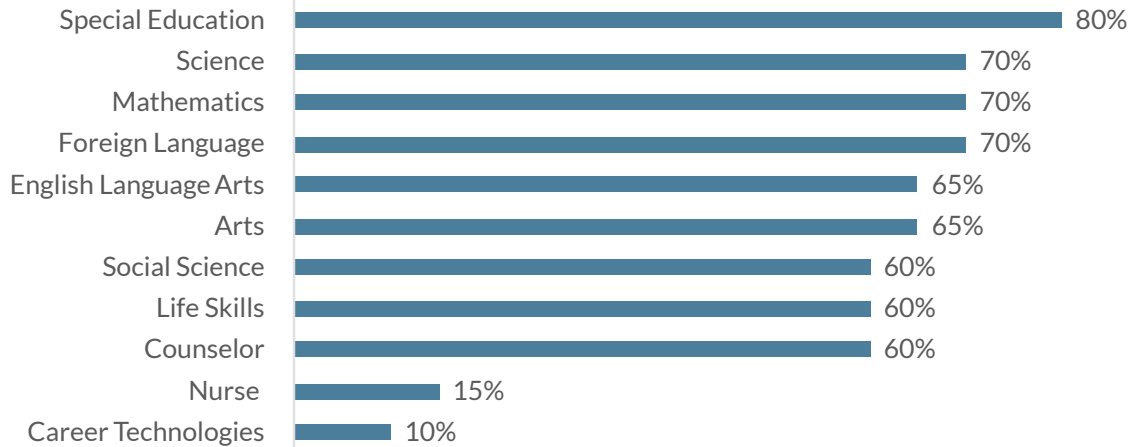
Category	State Examples
Mathematics	<ul style="list-style-type: none"> • Elementary Mathematics Specialist – Statewide • Math (Middle Schools, County Specific) • Middle Grades Mathematics Specialist – Statewide • Middle Childhood (Grades 4–8) – Mathematics • Mathematics (Grades 7–12)
Middle School Education	<ul style="list-style-type: none"> • Middle Grades (4–8)
No subject matter data submitted	<ul style="list-style-type: none"> • No TSA data submitted • No TSA proposal submitted • Only geographic TSA submitted
Reading Specialist	<ul style="list-style-type: none"> • Reading Specialist • Remedial Reading (Grades 1–12)
Science	<ul style="list-style-type: none"> • Agri–Science (Grades 7–12) • Agriculture • Agriculture Science and Technology • Biological Sciences (9–AD) • Biological Sciences (Grade 5–Adult) • Chemistry (Grade 5–Adult) • Earth and Space Science • General Science (5–9) • General Science (Grade 5–Adult) • Middle Childhood (Grades 4–8) – Science • Natural Science • Natural Sciences (Grades 7–12) • Natural Sciences (Kindergarten–Grade 12) • Physical Science • Physics (Grade 5–Adult) • Science – Biology • Science – Chemistry • Science – Physical Science • Science – Physics • Science (Middle Schools, County Specific) • Sciences (K–Grade 6) • Secondary Sciences (Life / Earth and Physical / Earth Sciences)

Category	State Examples
Secondary Education	<ul style="list-style-type: none"> • High school grades
Social Science	<ul style="list-style-type: none"> • Civics Core Content (Grades 9–12) • Economics & Free Enterprise • Economics Core Content (Grades 9–12) • Geography Core Content (Grades 9–12) • Government • History / Social Science (Grades 7–12) • Humanities • Middle Grades Social Studies – Rural • Political Science • Political Science Core Content (Grades 9–12) • Psychology • Secondary History – Statewide • Social Science • Social Studies (Civics / Government) • Social Studies (Middle Schools, County Specific) • Sociology (Grades 6–12)
Special Education	<ul style="list-style-type: none"> • Adaptive Physical Education • Audiology • Autism • Behavior Disorders • Behavior Disorders, Mentally Impaired • Gifted • Hearing Impaired • Hearing Impaired • Learning Disabilities, Mentally Impaired) • Mentally Impaired • Mentally Impaired (Mild–Moderate) • Multi-Categorical • Multi-Categorical (Behavior Disorders) • Multi-Categorical (LD, BD, MI) • Multi-Categorical (Learning Disabilities) • Preschool–Special Needs • Self-Contained Class • Severe Disabilities • Severe / Profoundly Handicapped • Special Learning Disabilities • Specific Learning Disabilities • Speech-Language Pathologist • Speech Pathology • Visually Impaired

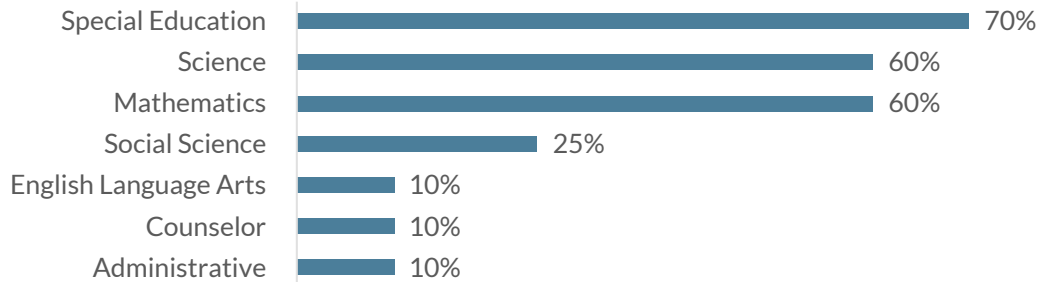
Appendix 2

Percent of Years Shortage Reported by Subject Area, 1998–2018

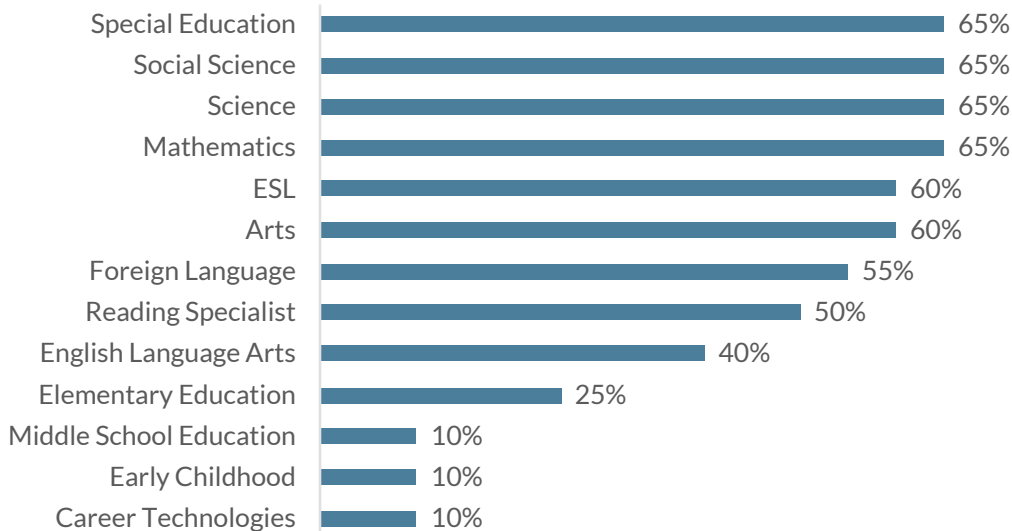
Alabama



Alaska

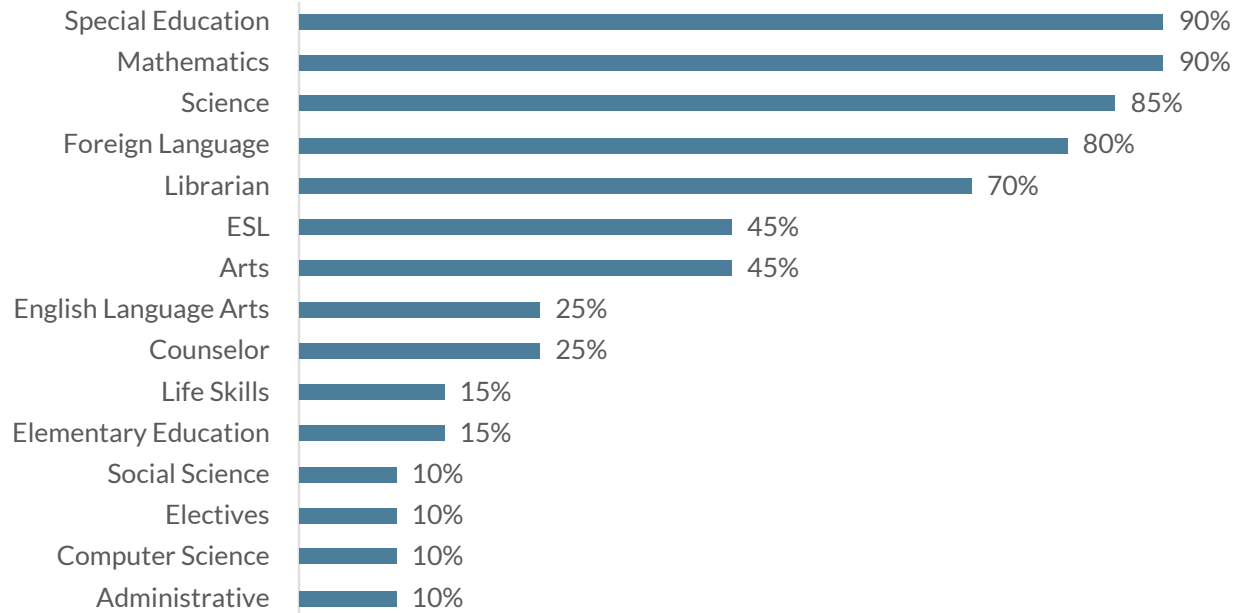


Arizona

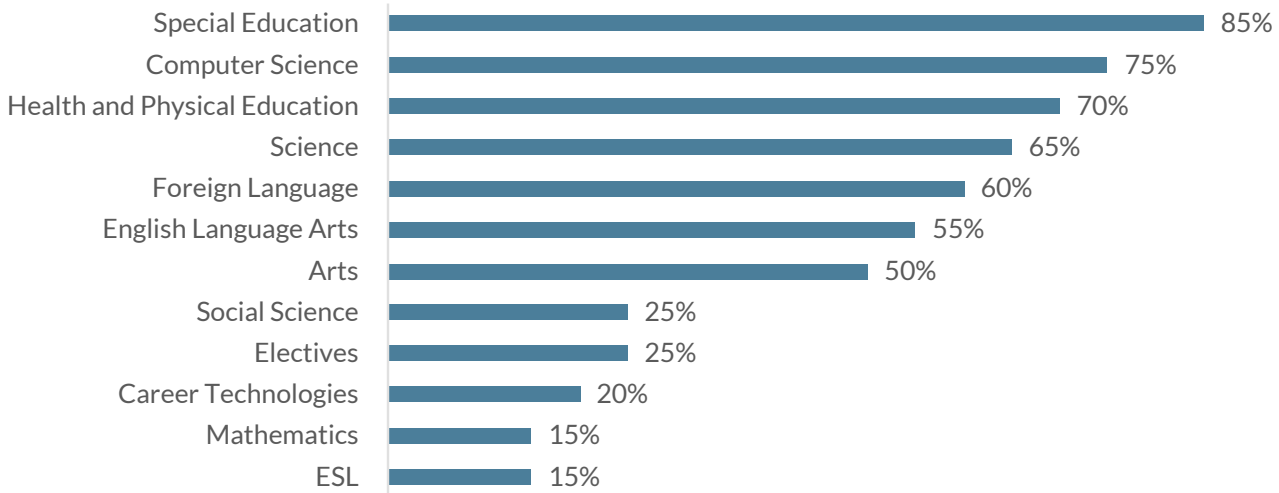


Percent of Years Shortage Reported by Subject Area, 1998–2018

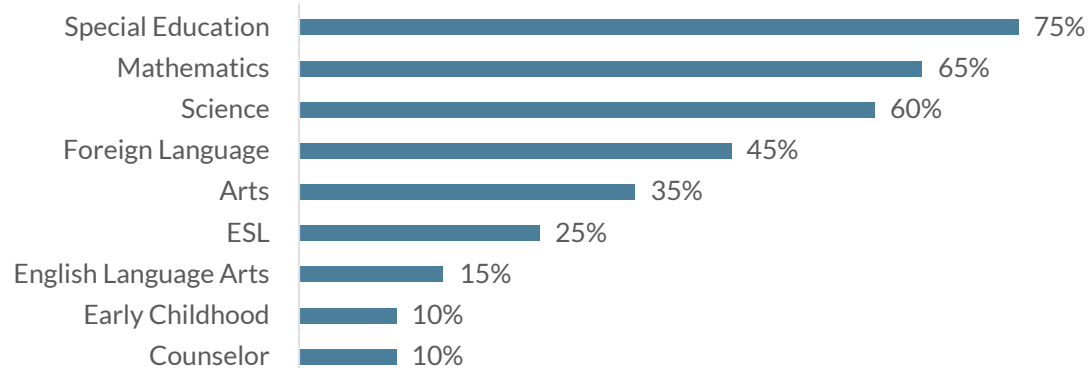
Arkansas



California

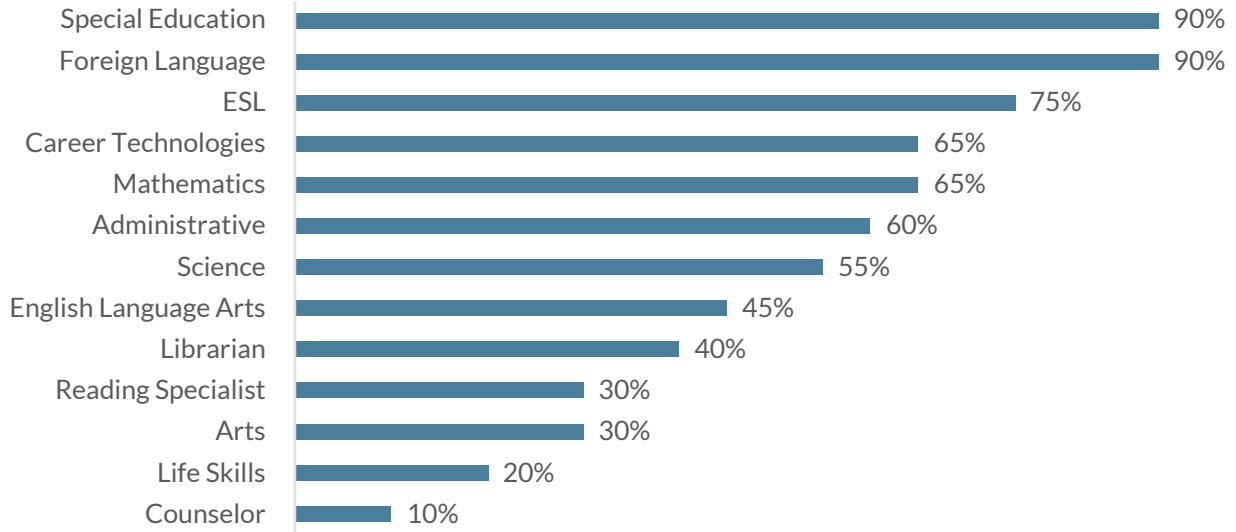


Colorado

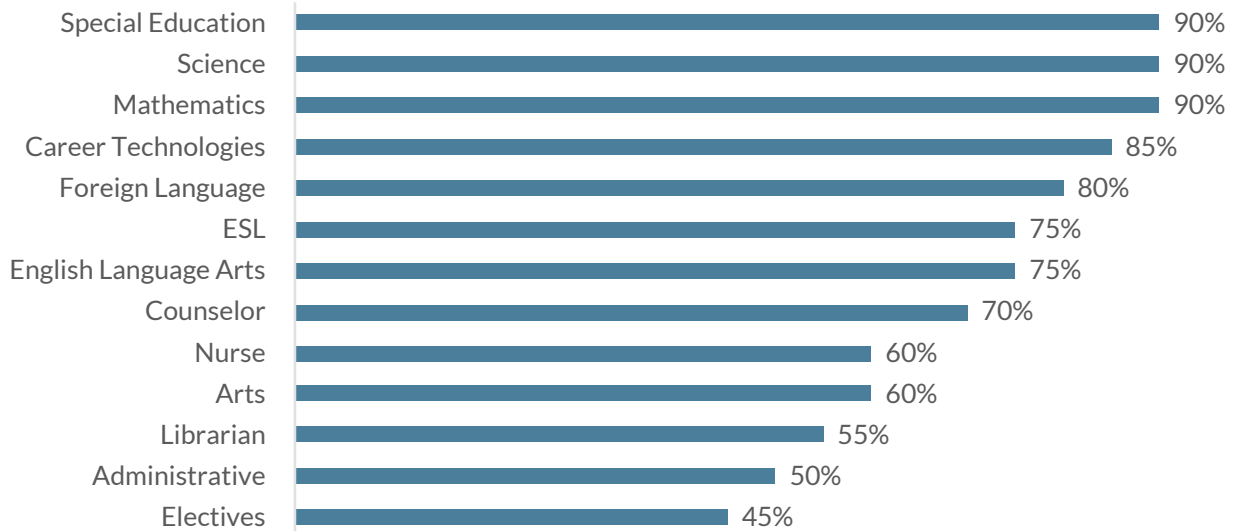


Percent of Years Shortage Reported by Subject Area, 1998–2018

Connecticut

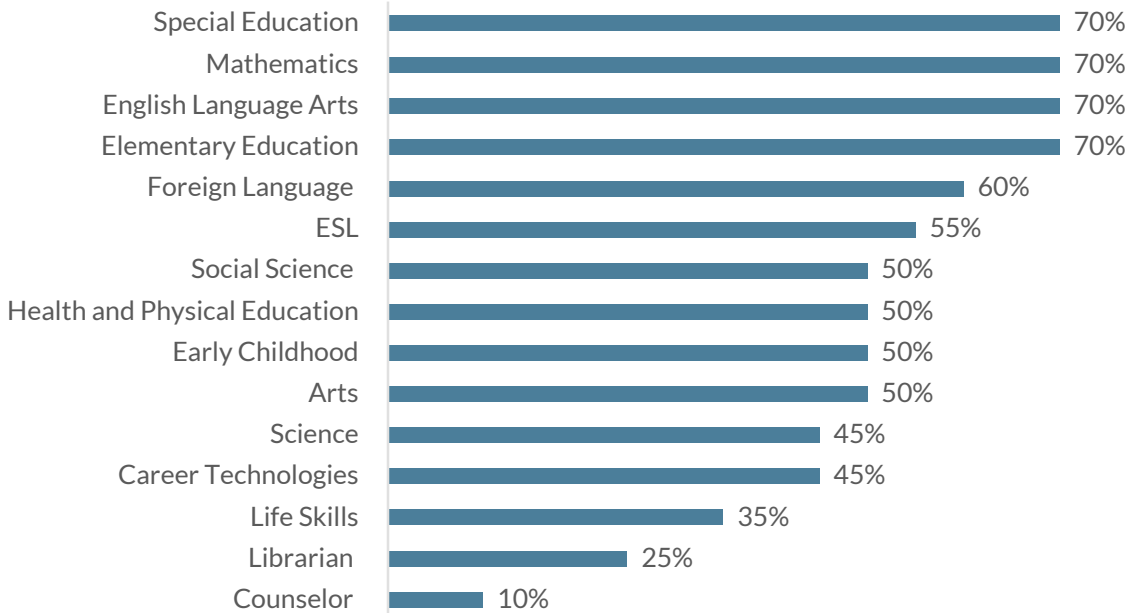


Delaware

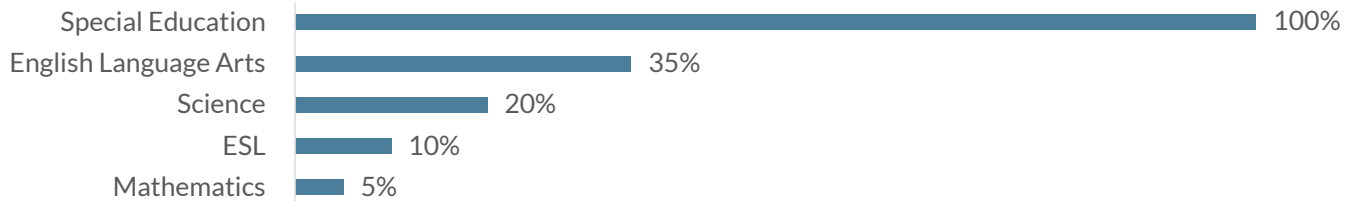


Percent of Years Shortage Reported by Subject Area, 1998–2018

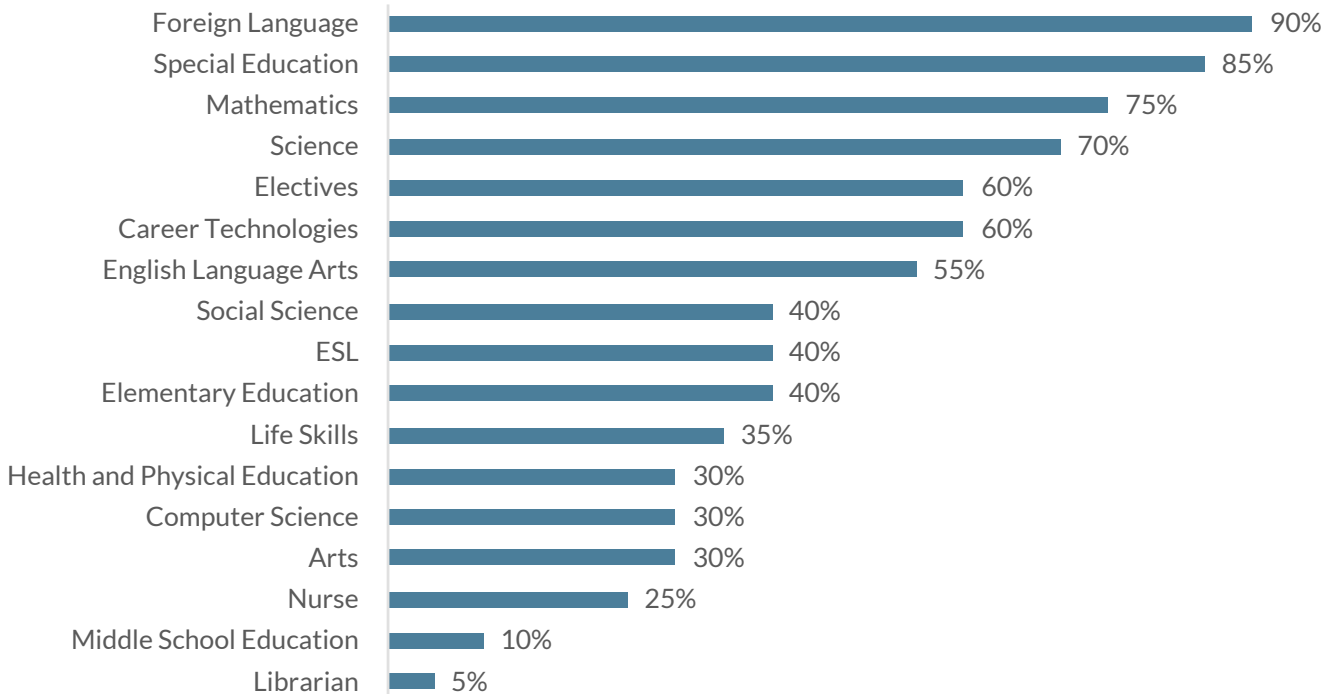
District of Columbia



Florida

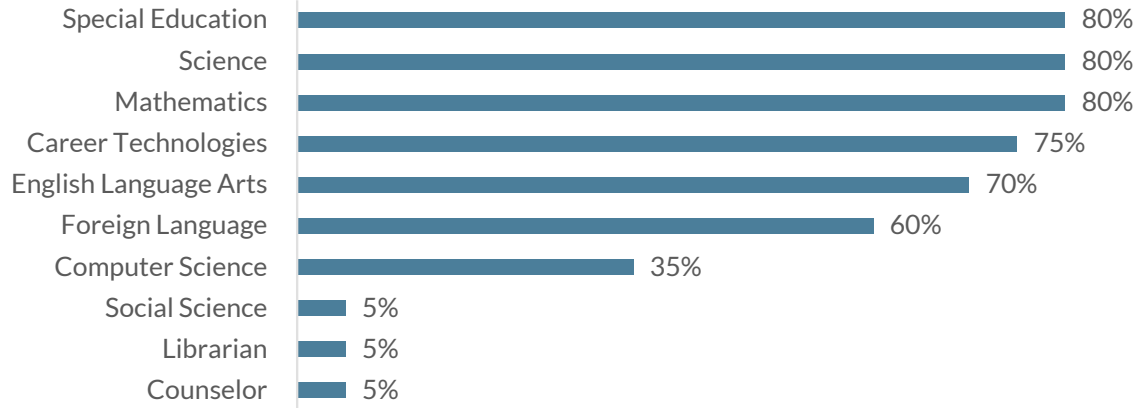


Georgia

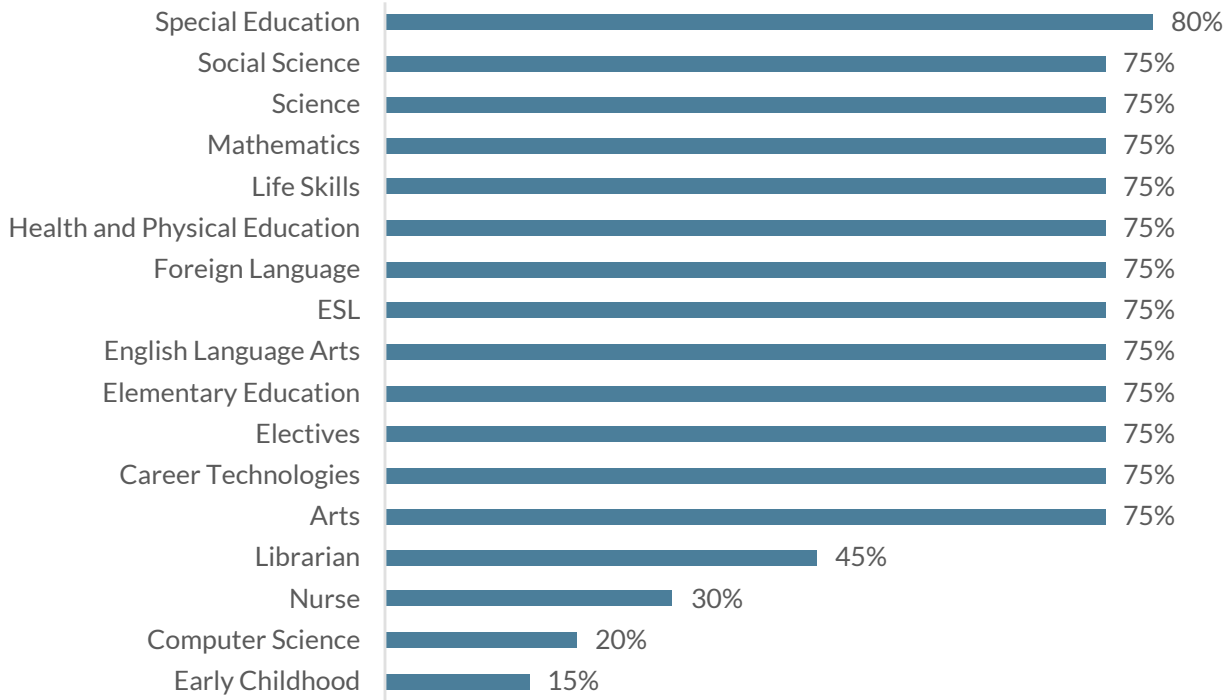


Percent of Years Shortage Reported by Subject Area, 1998–2018

Hawaii

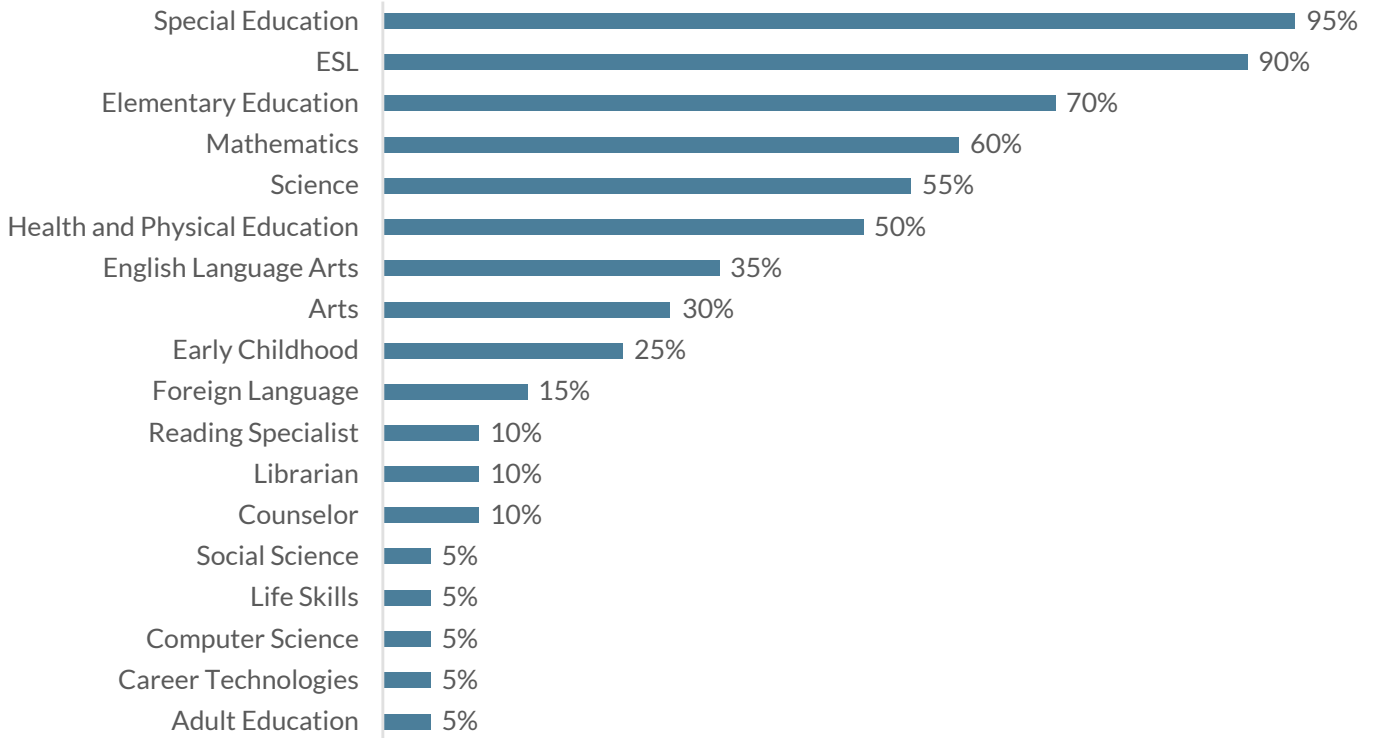


Idaho

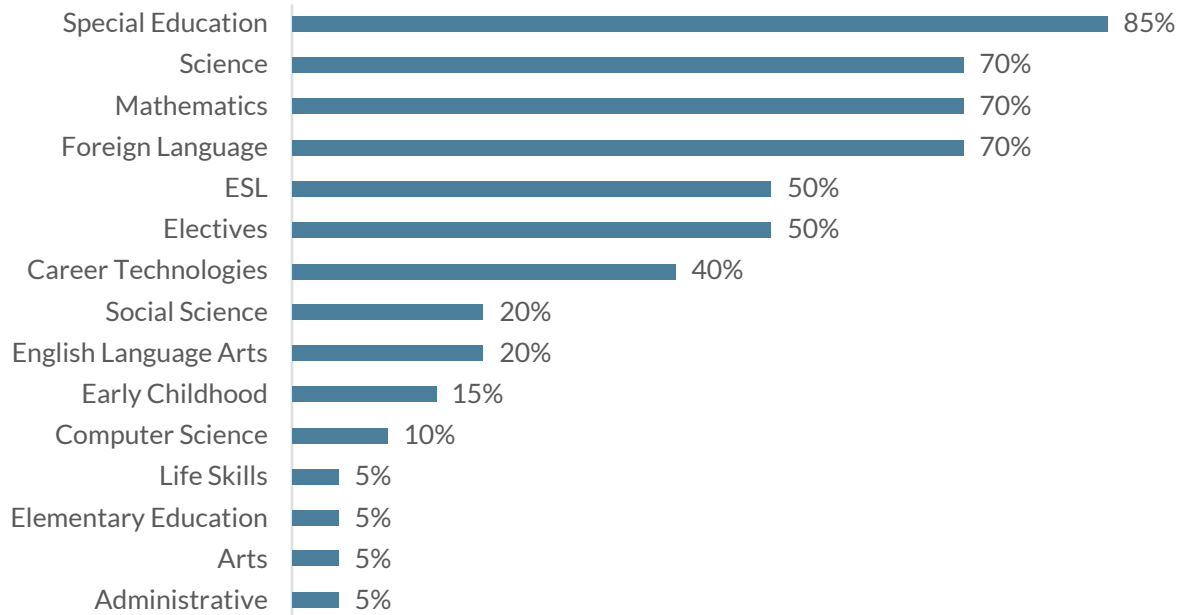


Percent of Years Shortage Reported by Subject Area, 1998–2018

Illinois

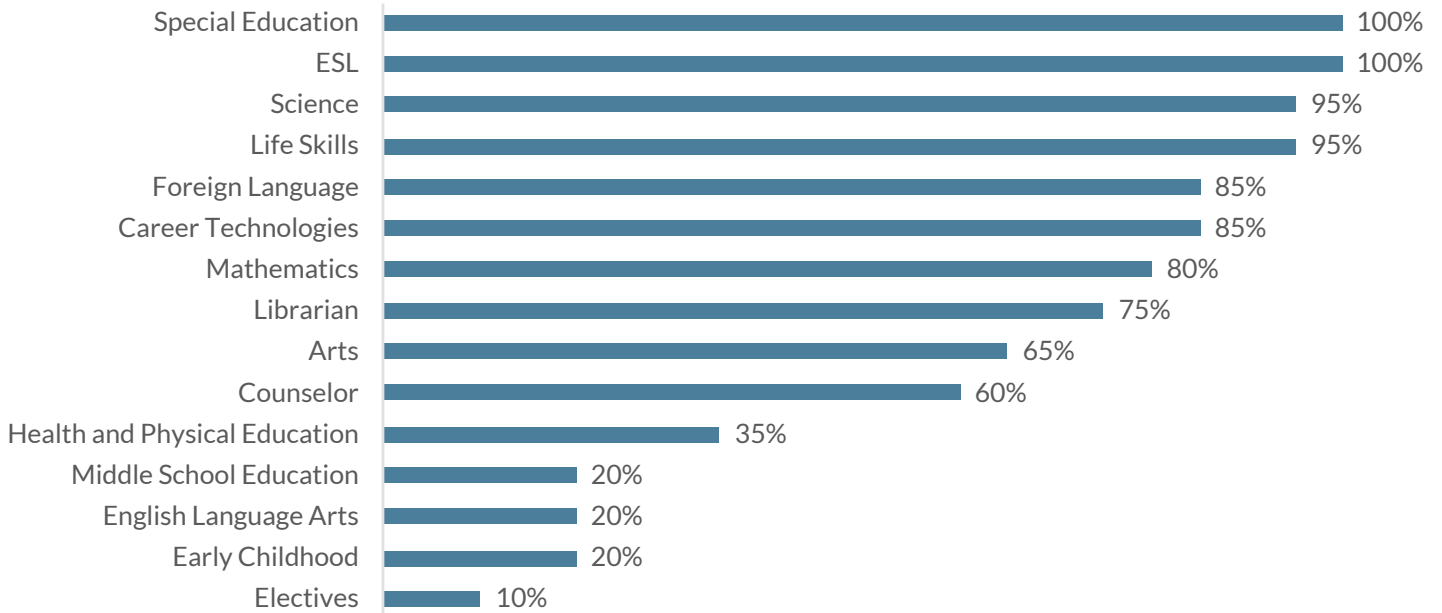


Indiana



Percent of Years Shortage Reported by Subject Area, 1998–2018

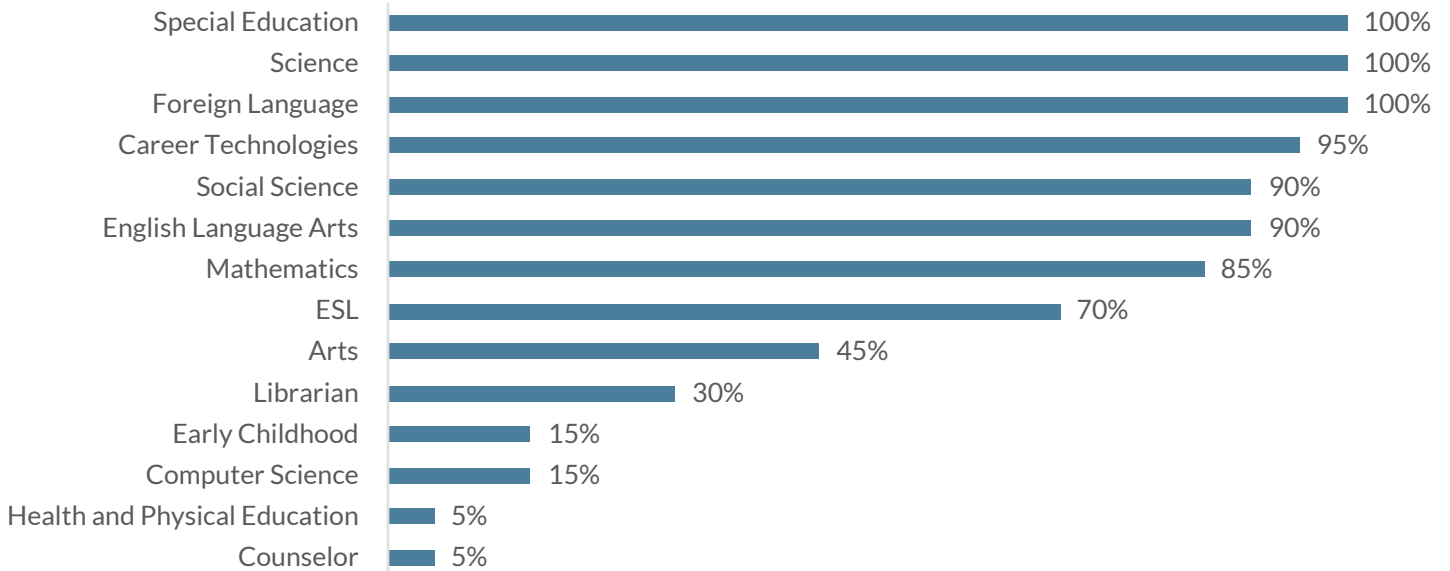
Iowa



Kansas



Kentucky

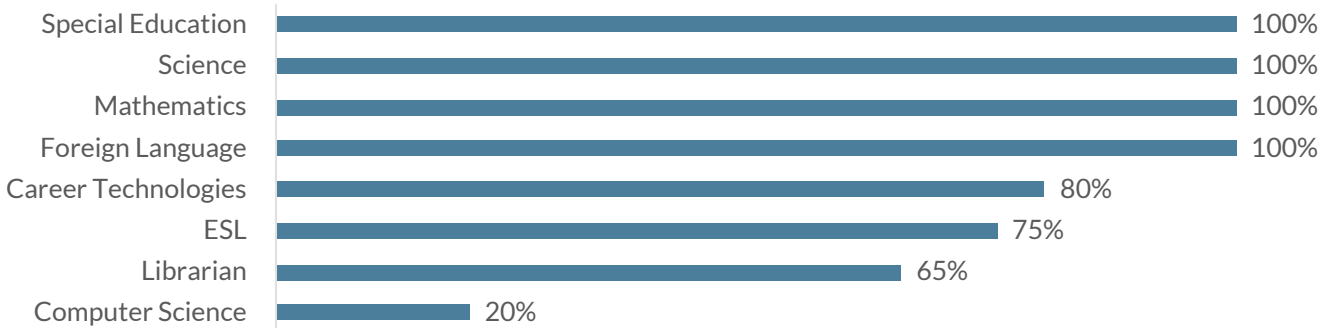


Percent of Years Shortage Reported by Subject Area, 1998–2018

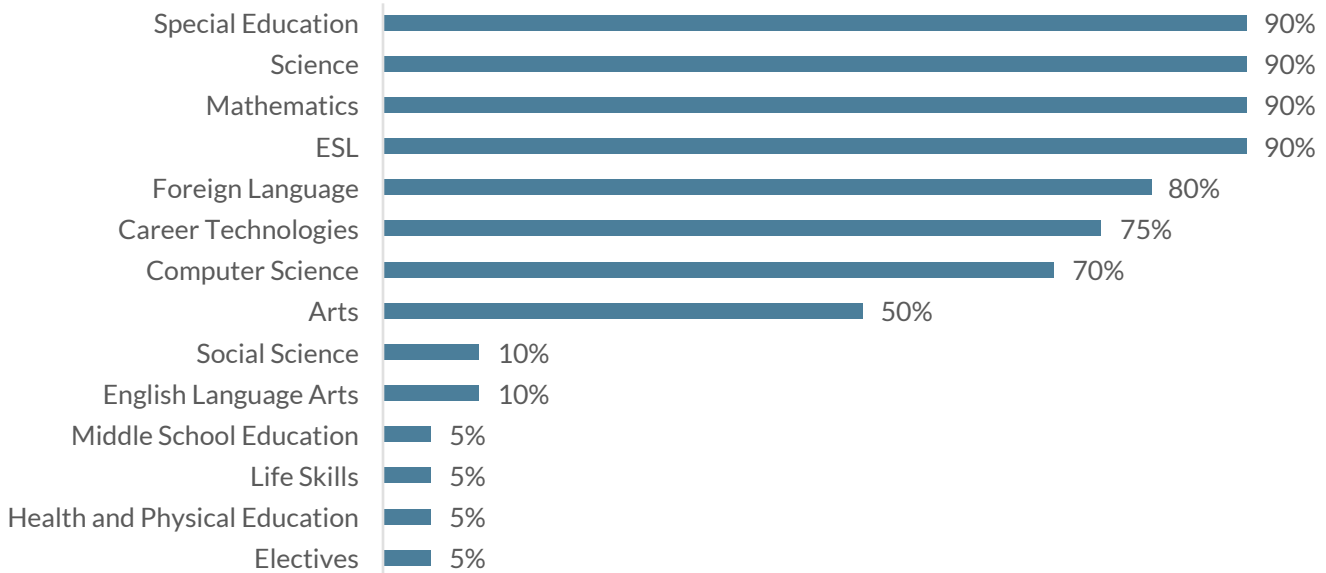
Louisiana



Maine

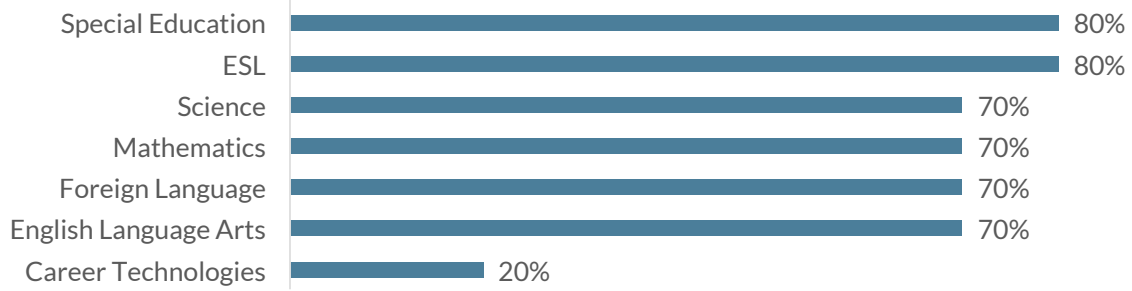


Maryland

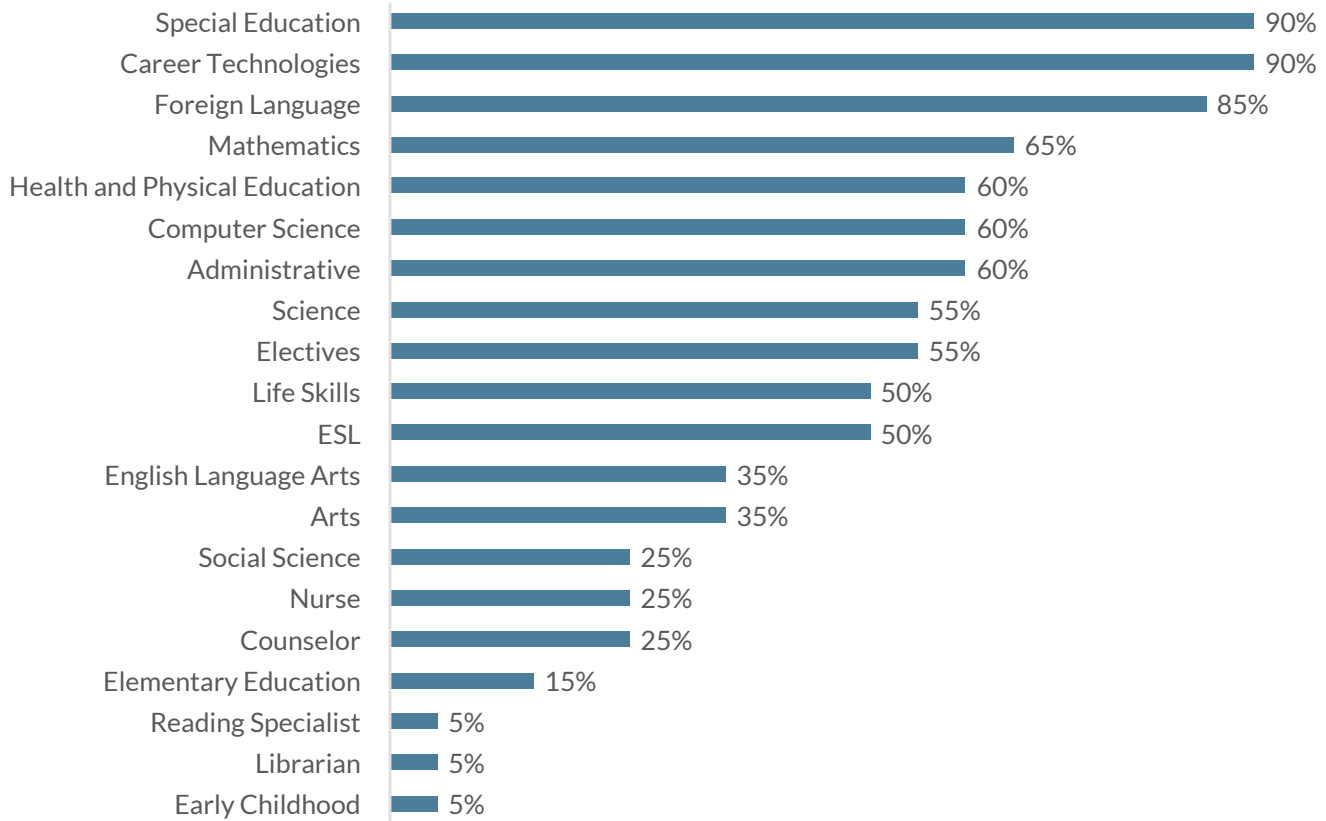


Percent of Years Shortage Reported by Subject Area, 1998–2018

Massachusetts

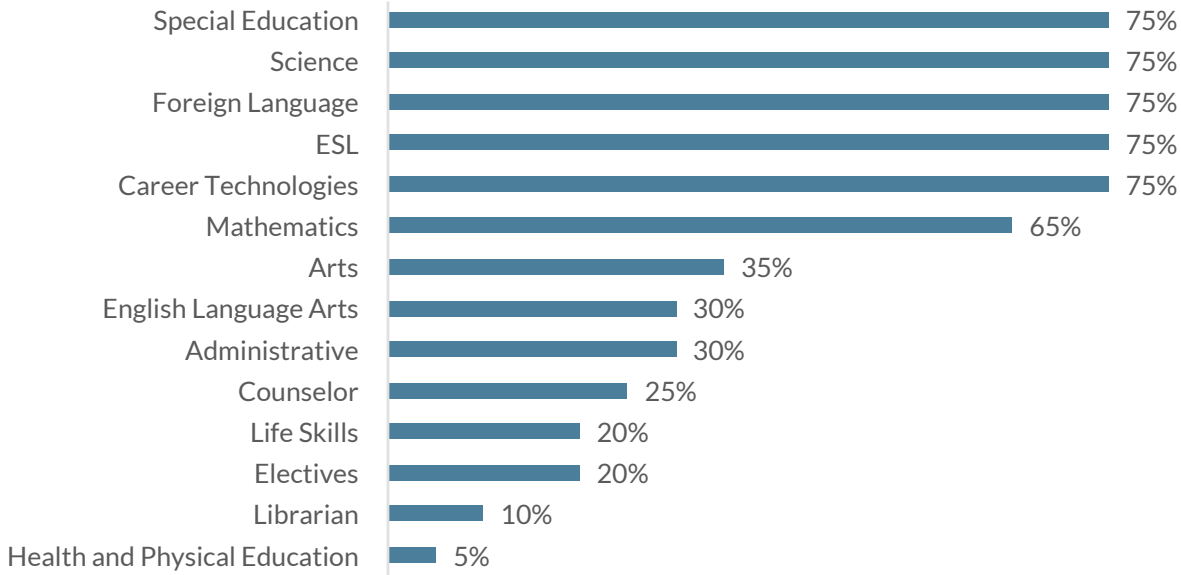


Michigan



Percent of Years Shortage Reported by Subject Area, 1998–2018

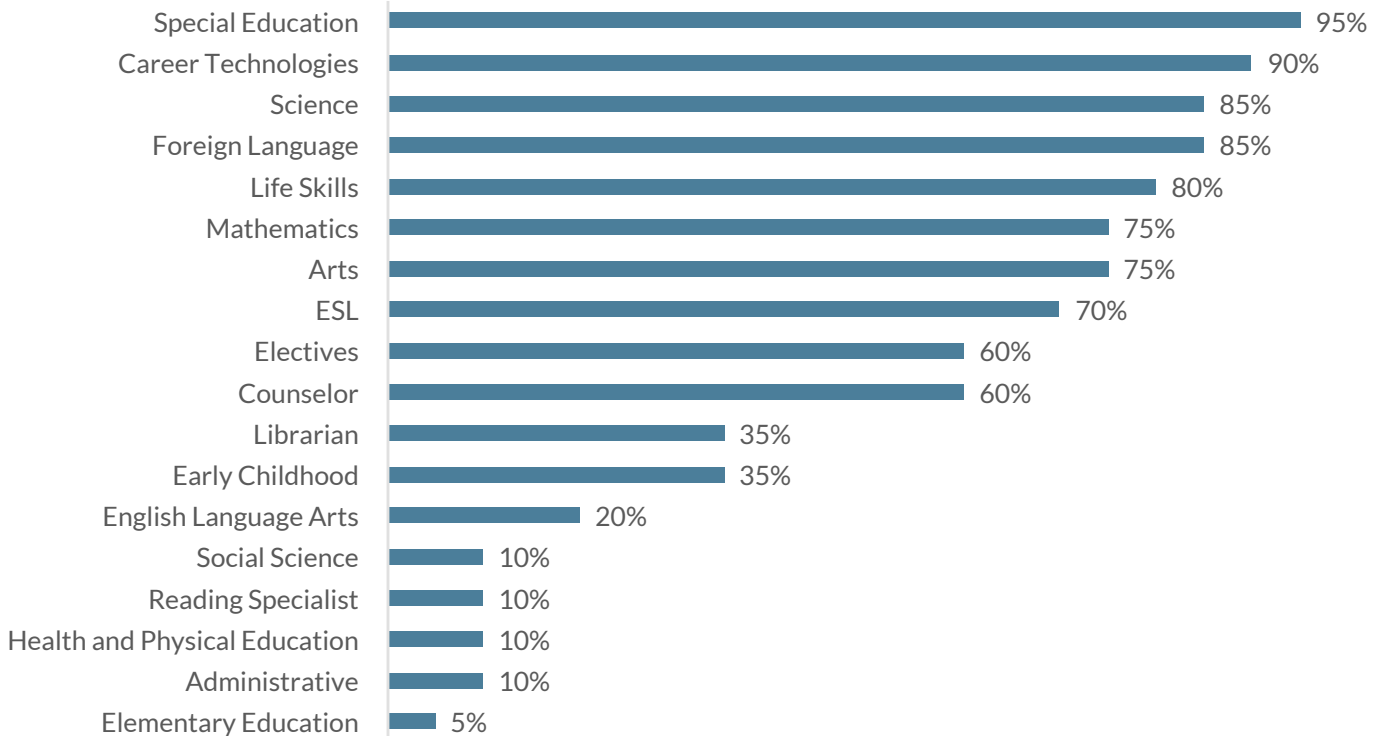
Minnesota



Mississippi

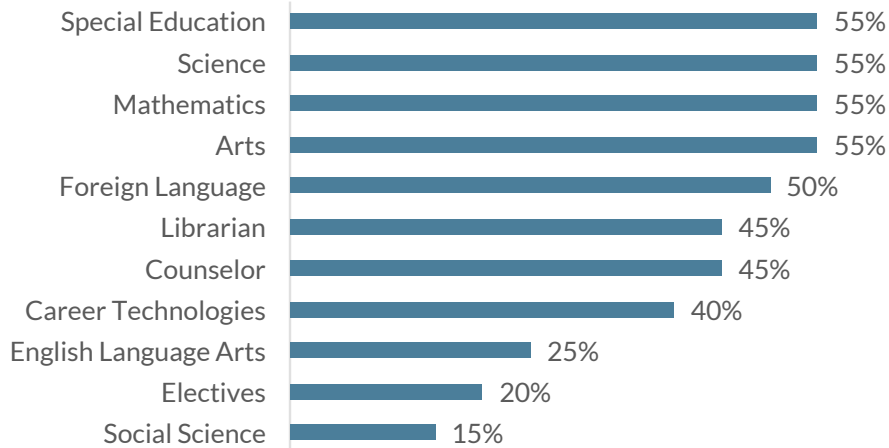


Missouri

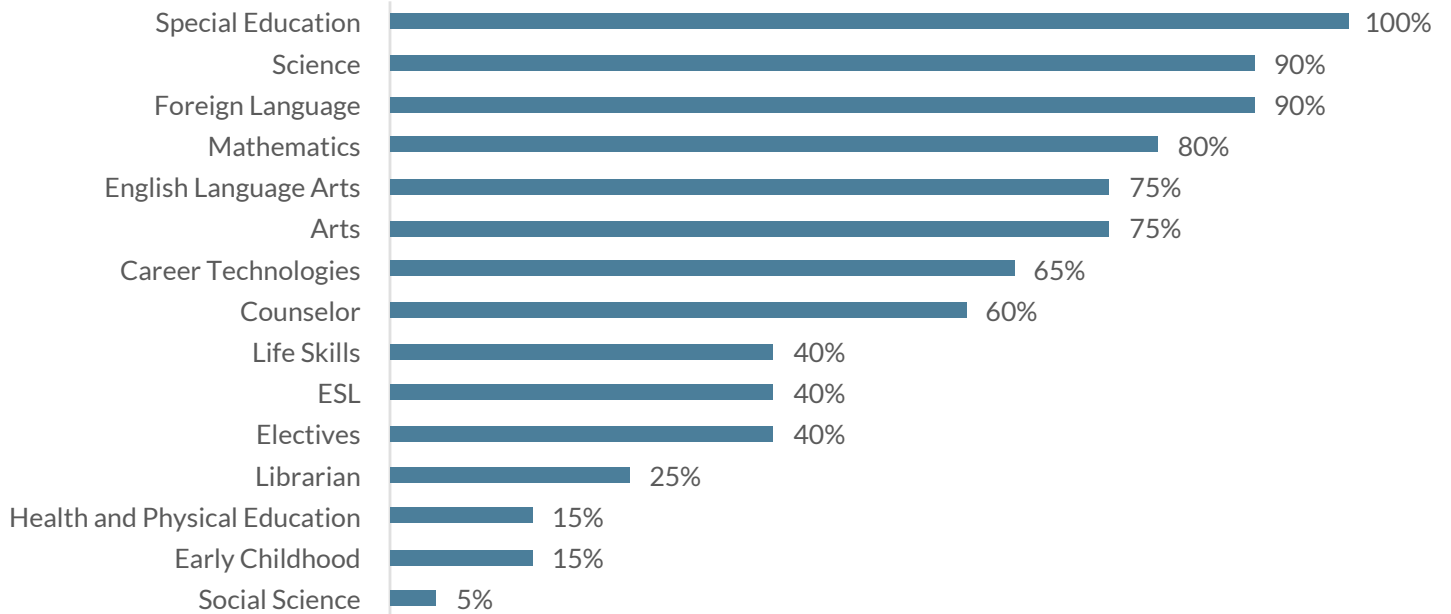


Percent of Years Shortage Reported by Subject Area, 1998–2018

Montana

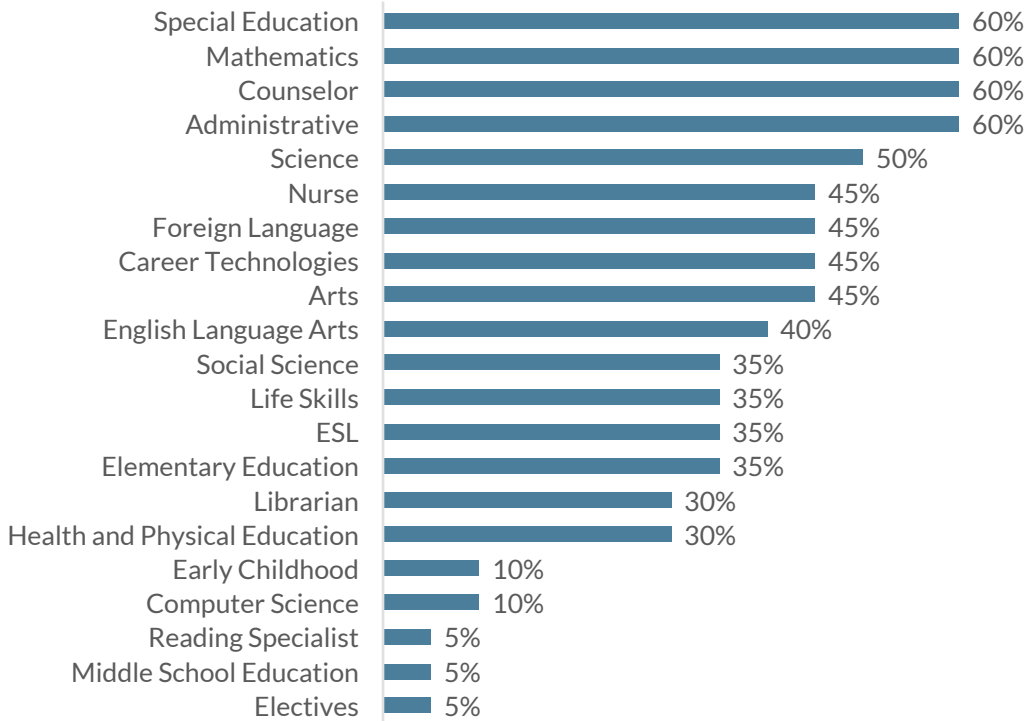


Nebraska

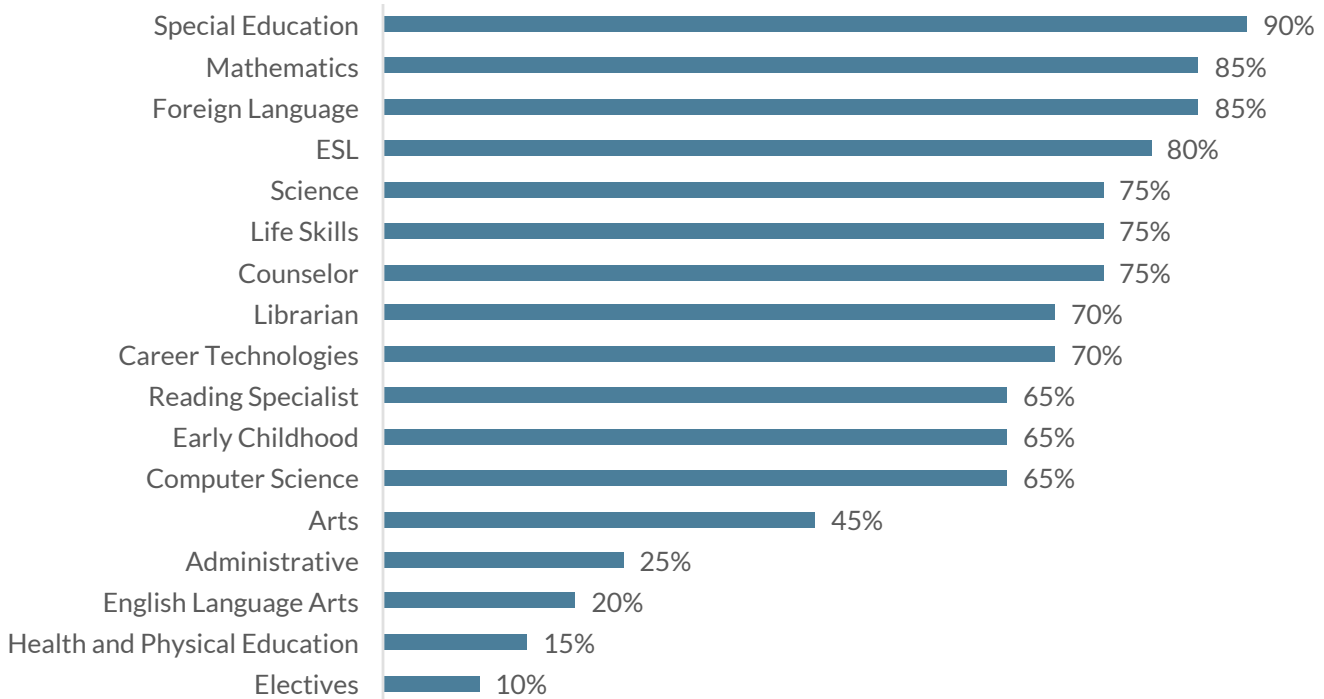


Percent of Years Shortage Reported by Subject Area, 1998–2018

Nevada

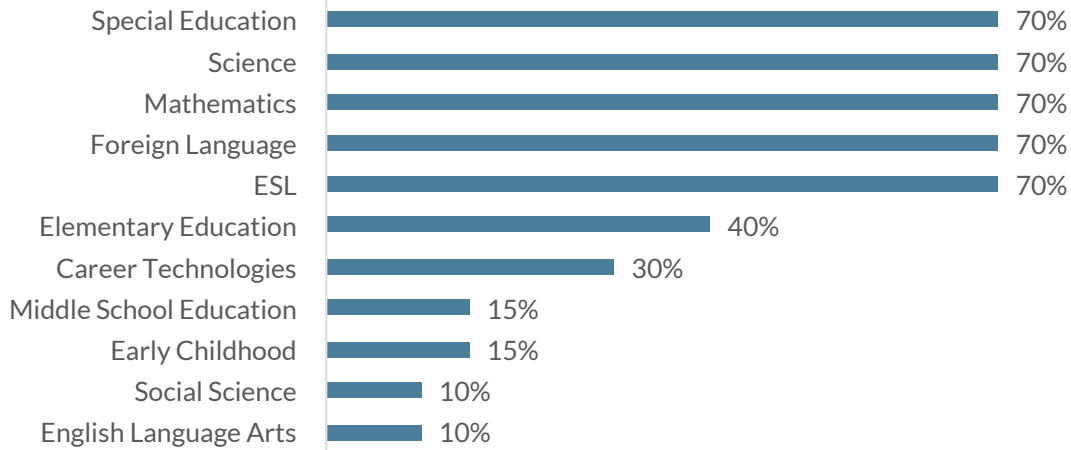


New Hampshire

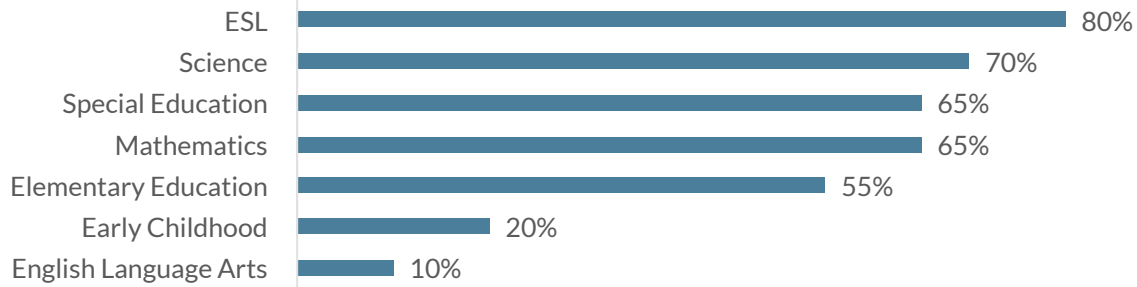


Percent of Years Shortage Reported by Subject Area, 1998–2018

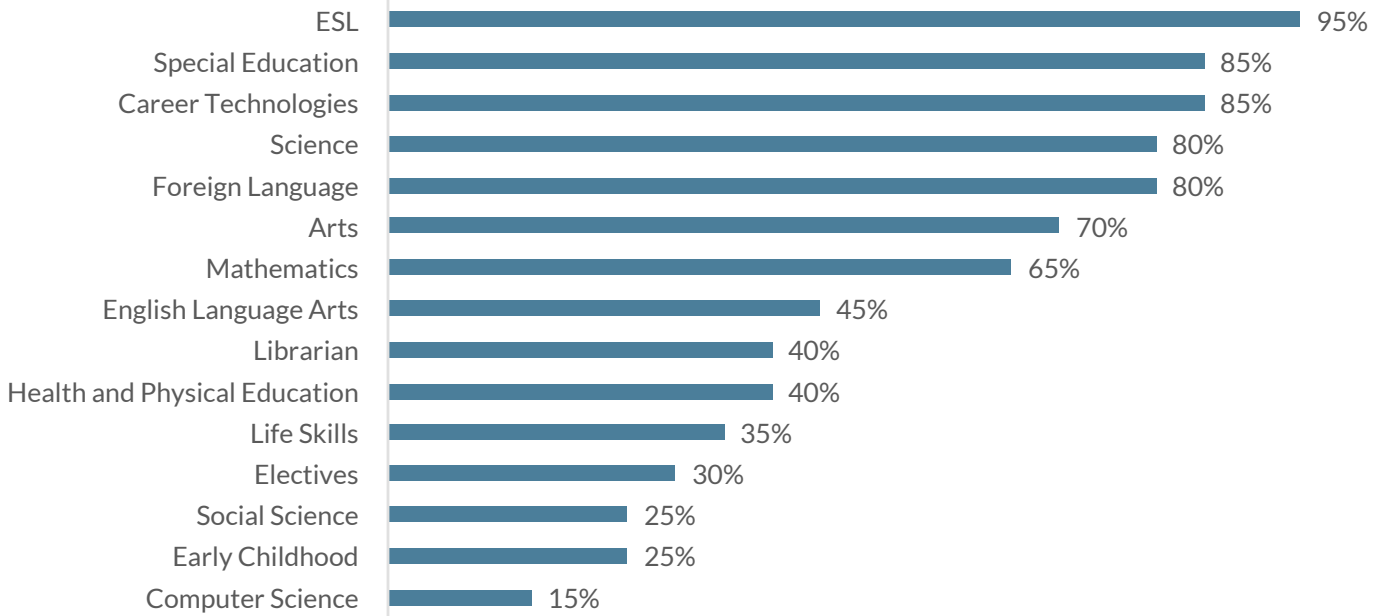
New Jersey



New Mexico



New York

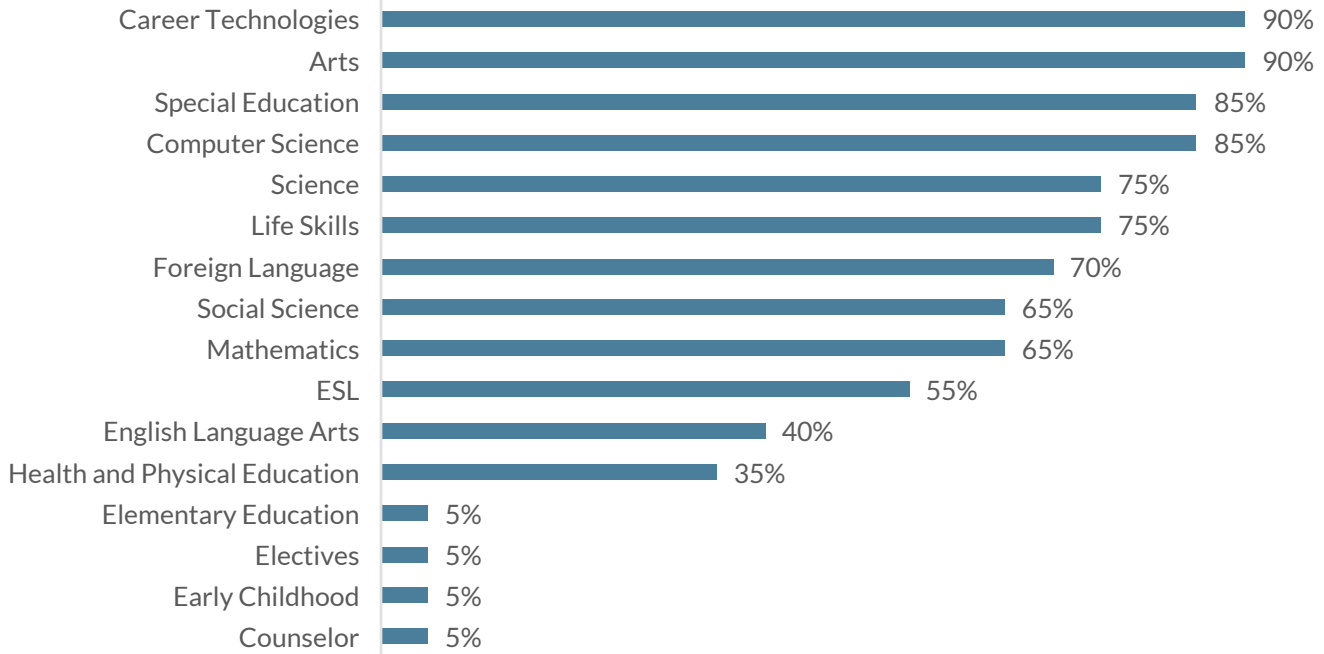


Percent of Years Shortage Reported by Subject Area, 1998–2018

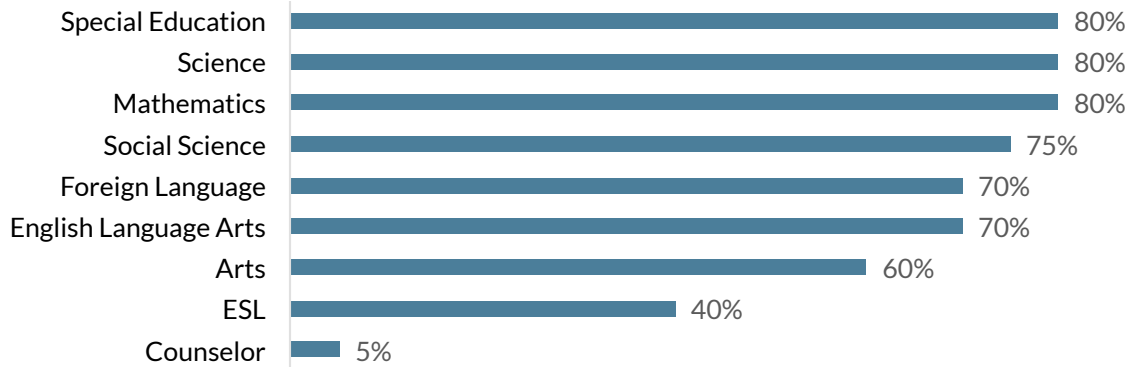
North Carolina



North Dakota

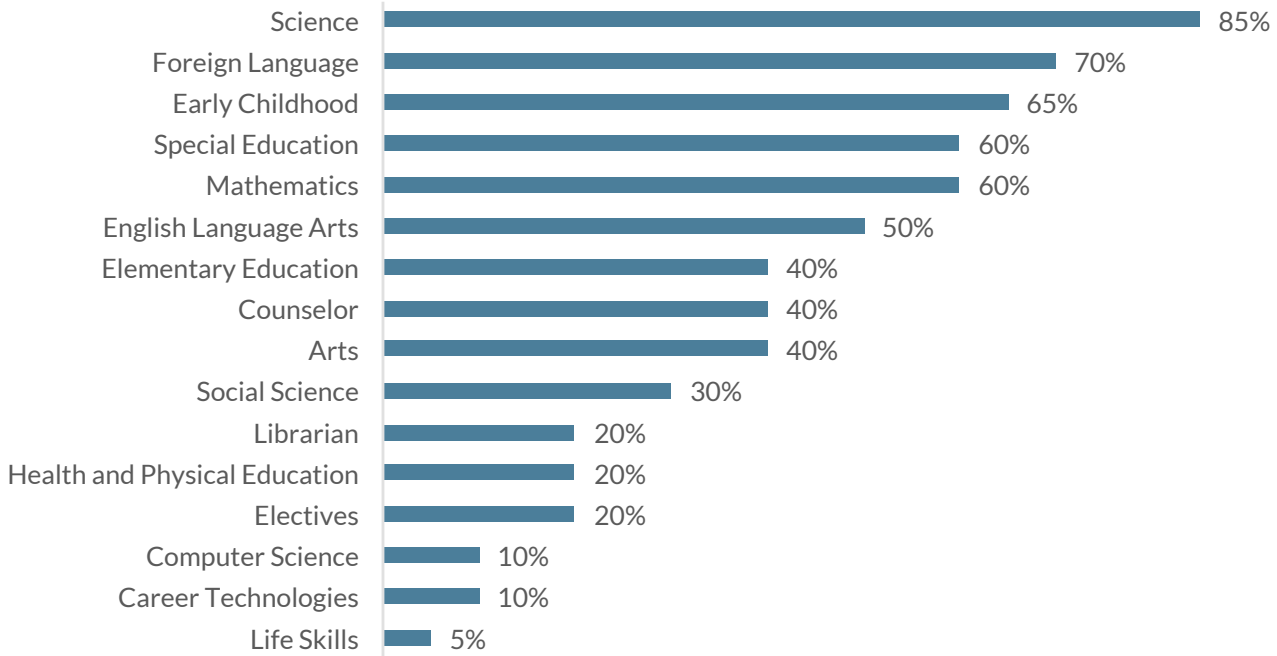


Ohio

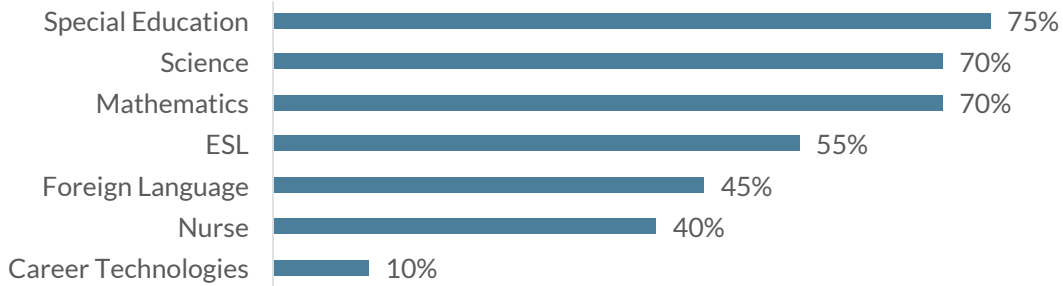


Percent of Years Shortage Reported by Subject Area, 1998–2018

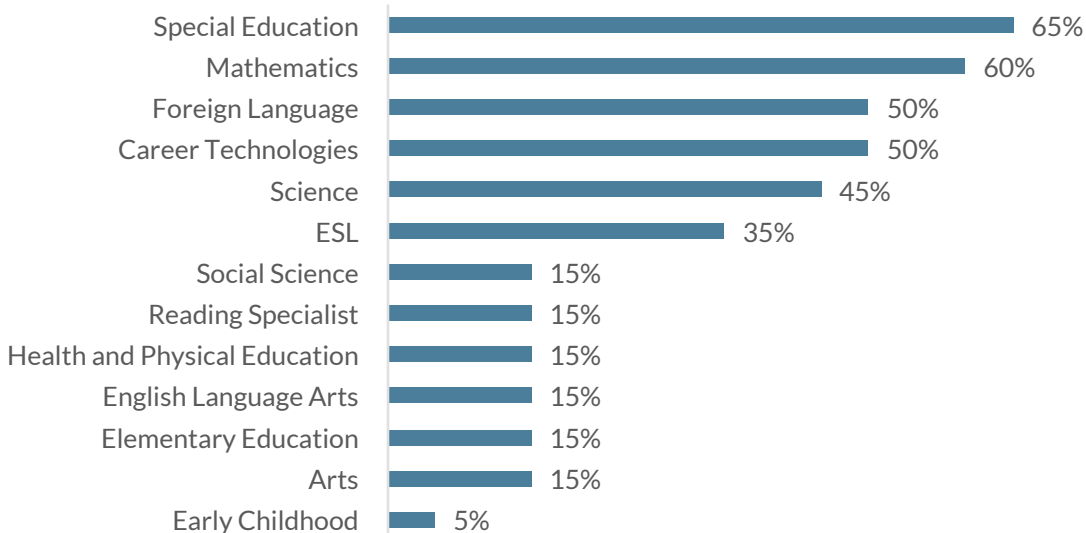
Oklahoma



Oregon

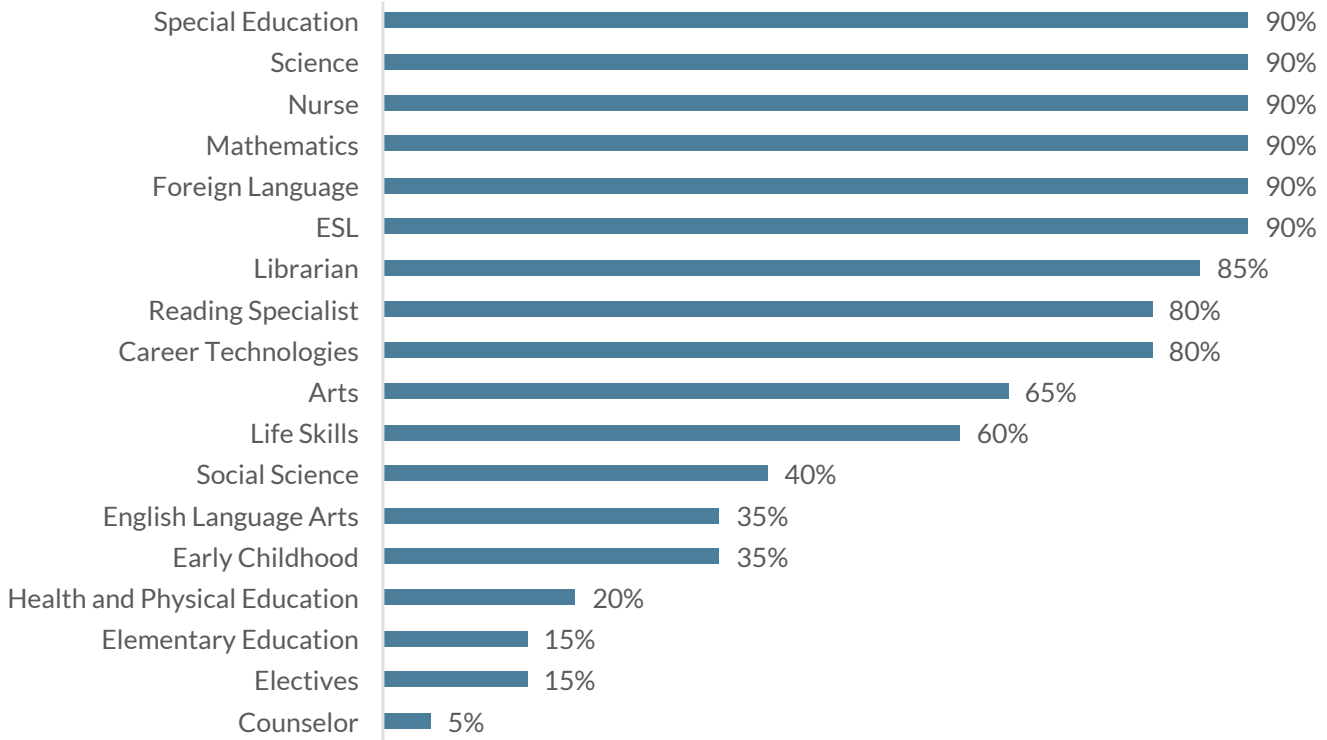


Pennsylvania

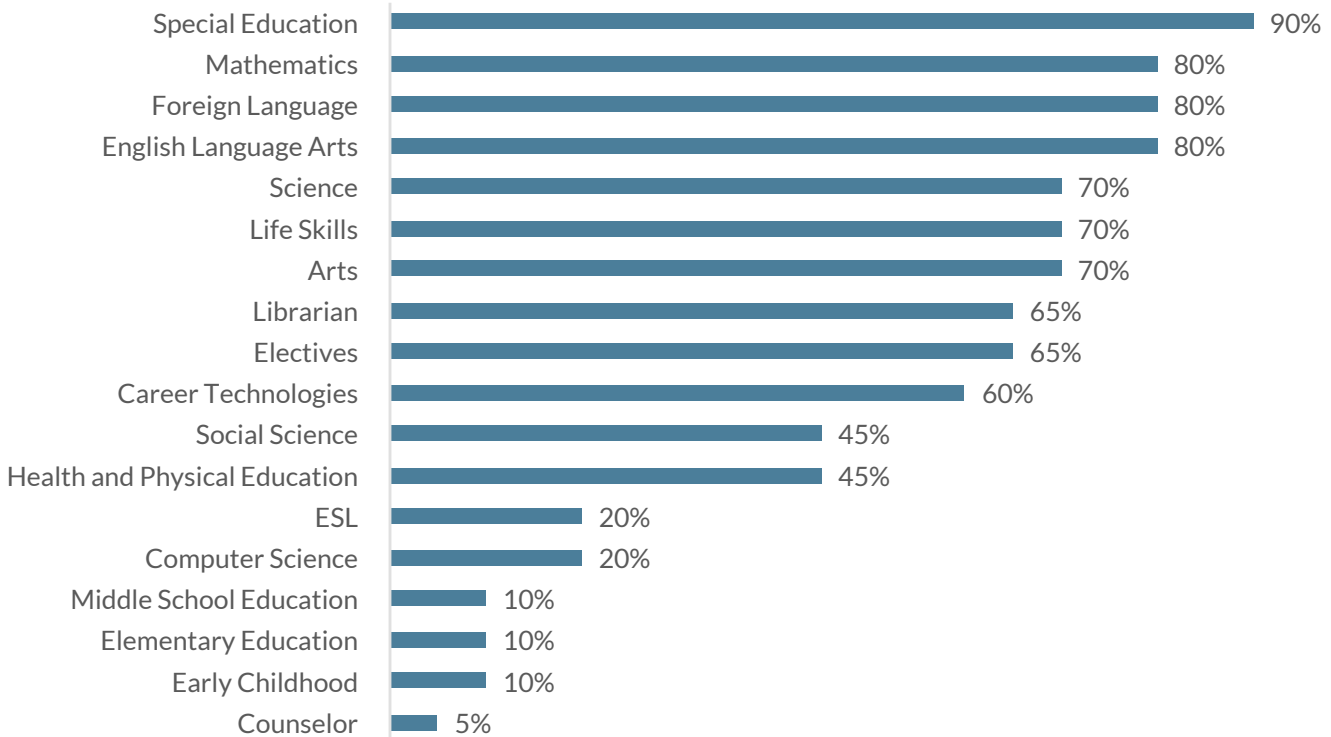


Percent of Years Shortage Reported by Subject Area, 1998–2018

Rhode Island

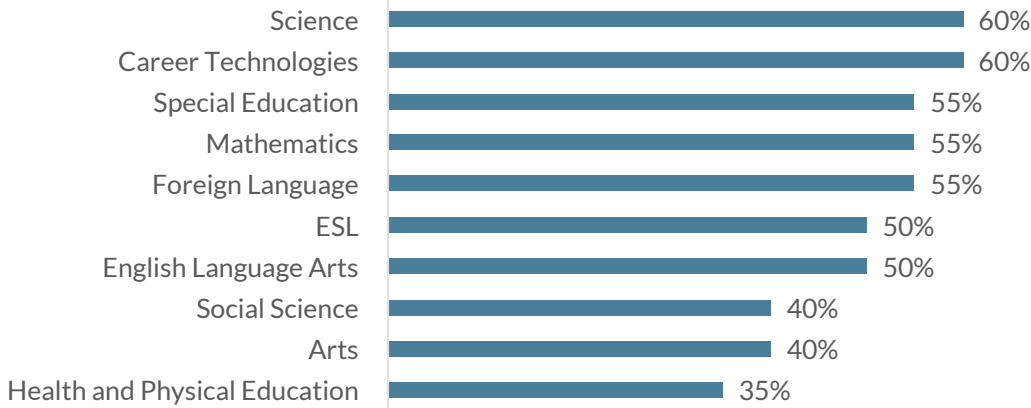


South Carolina

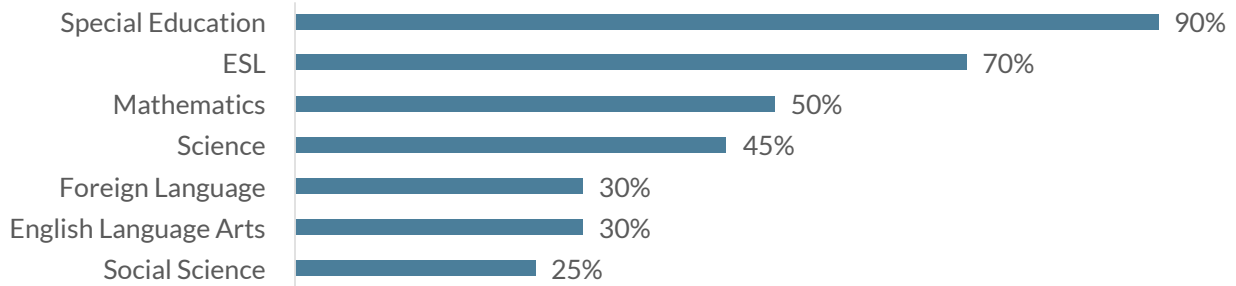


Percent of Years Shortage Reported by Subject Area, 1998–2018

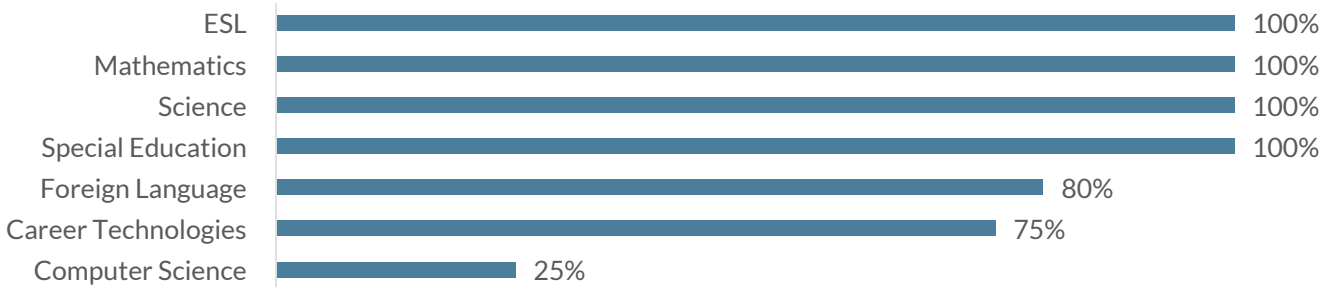
South Dakota



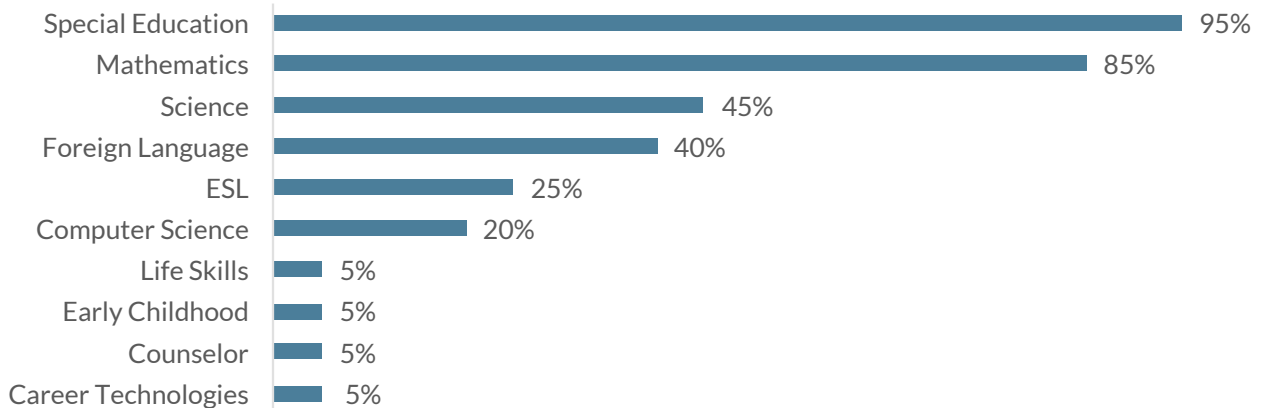
Tennessee



Texas

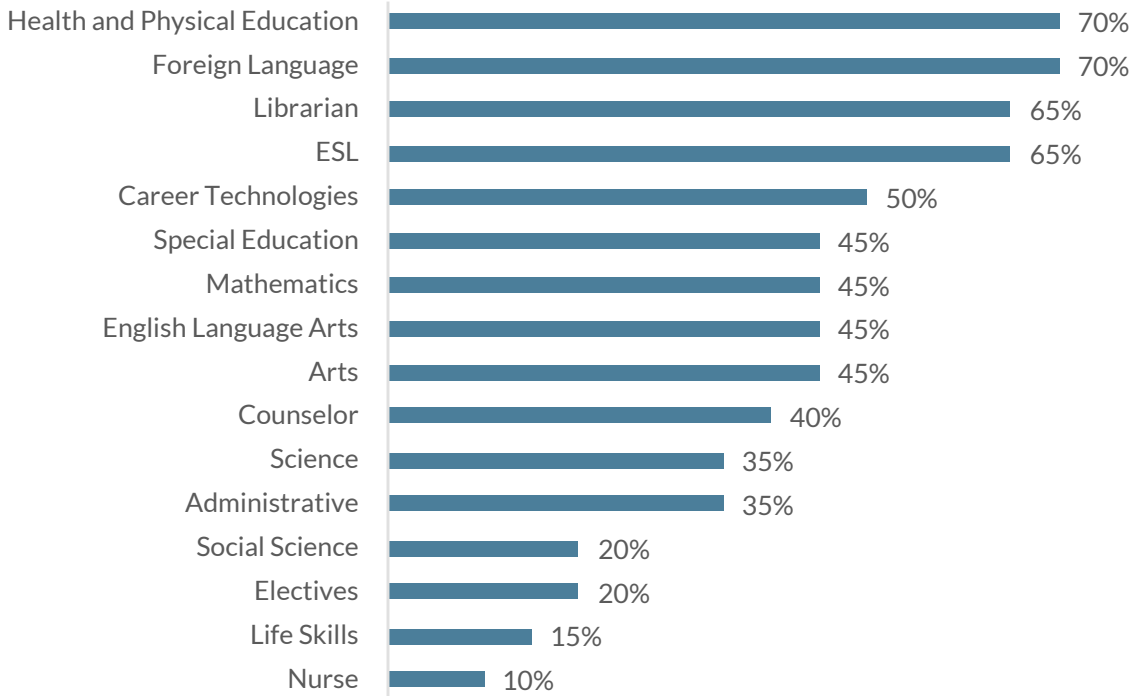


Utah

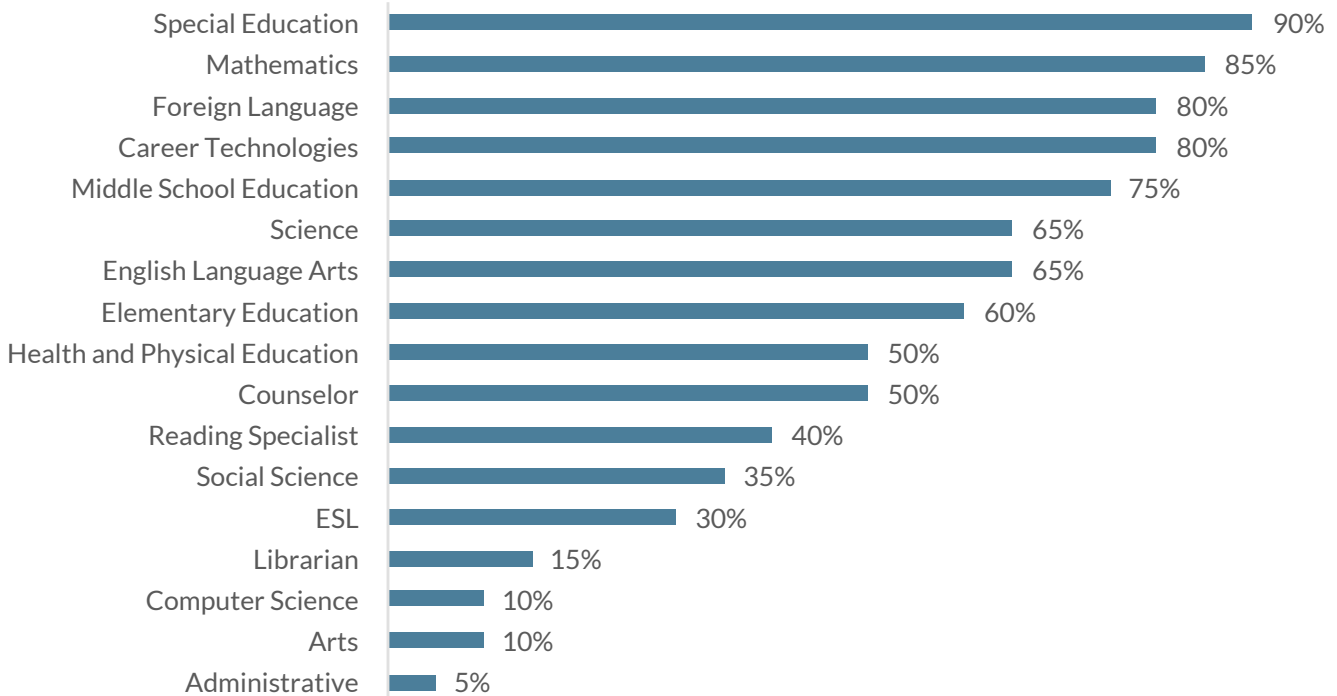


Percent of Years Shortage Reported by Subject Area, 1998–2018

Vermont

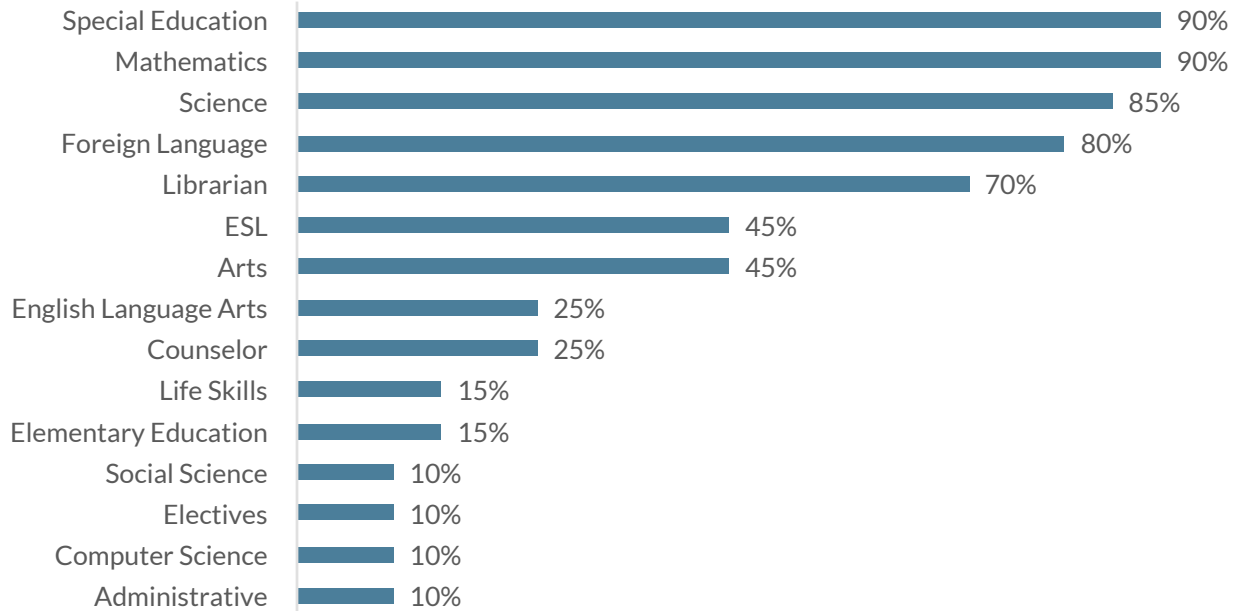


Virginia

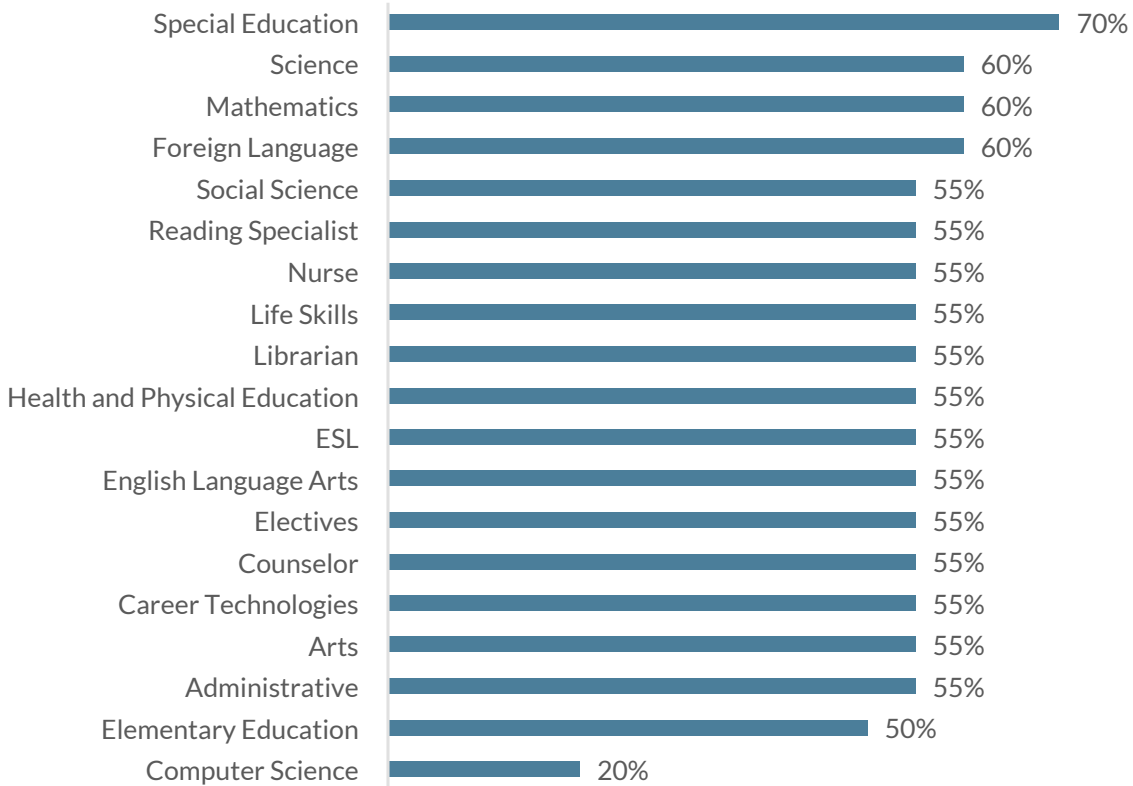


Percent of Years Shortage Reported by Subject Area, 1998–2018

Washington

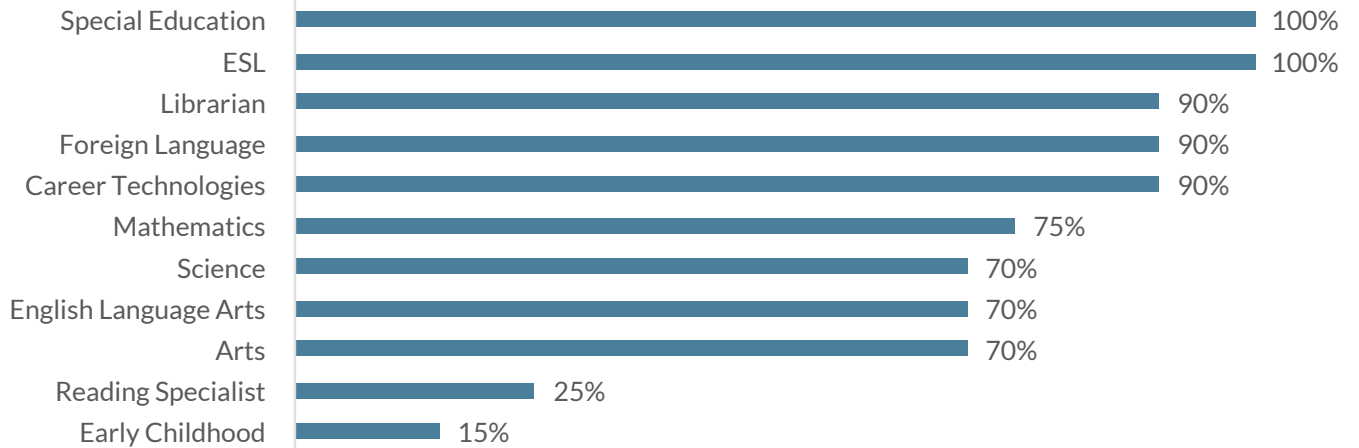


West Virginia

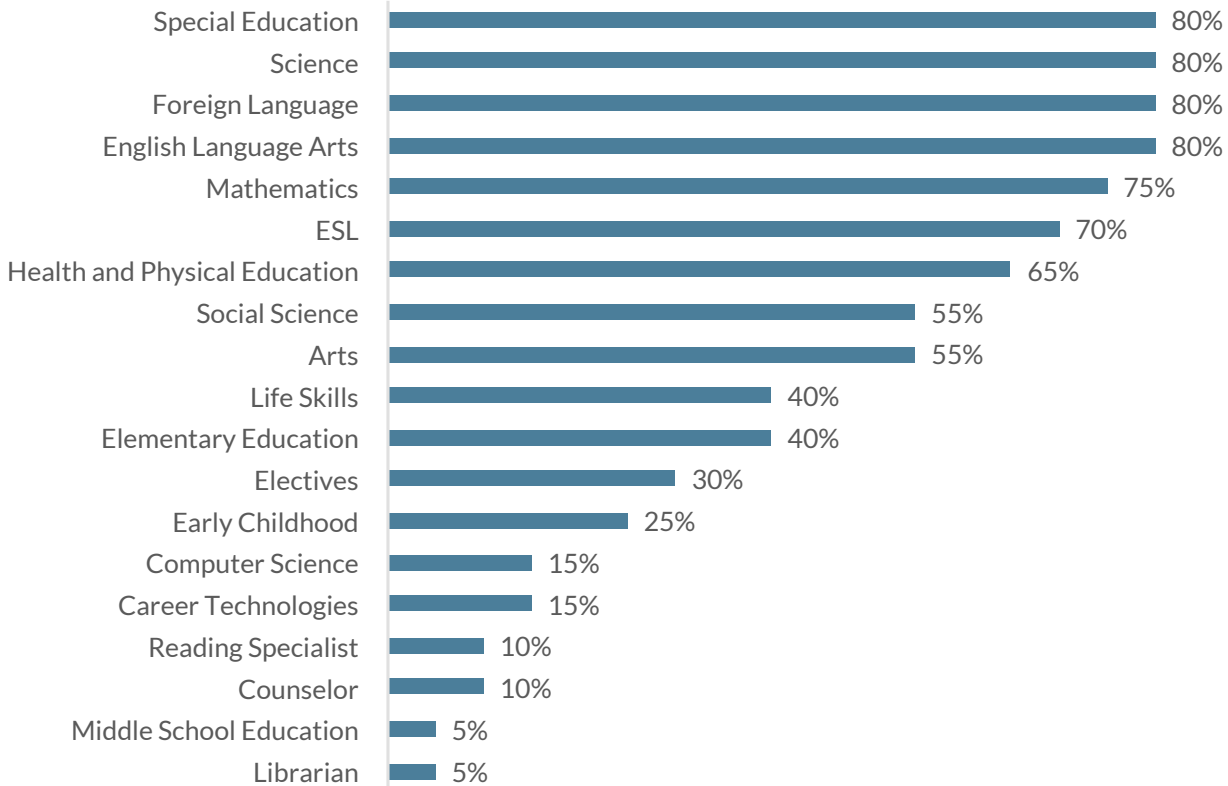


Percent of Years Shortage Reported by Subject Area, 1998–2018

Wisconsin



Wyoming

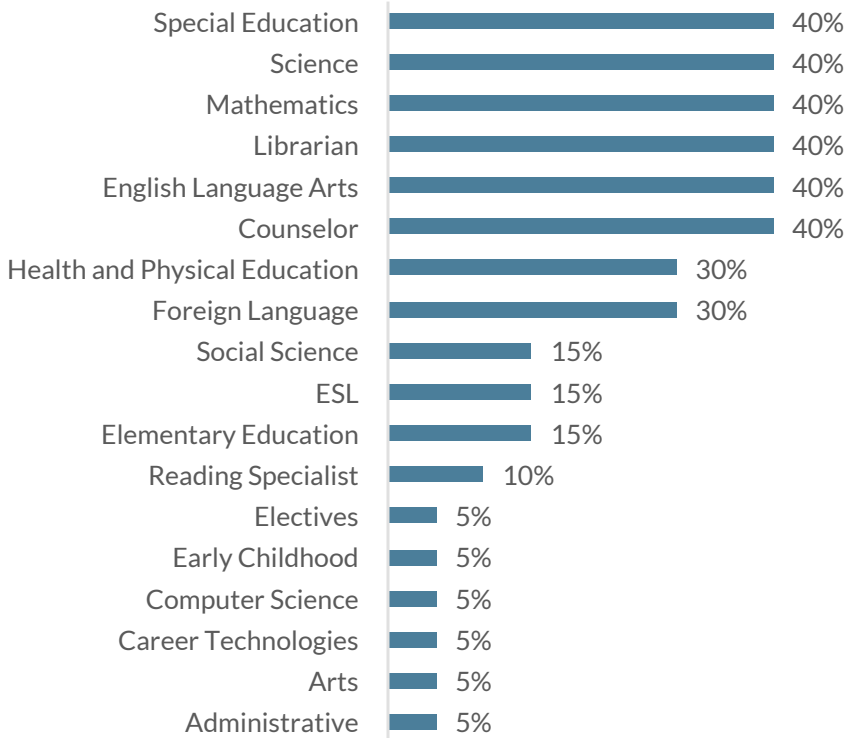


American Samoa

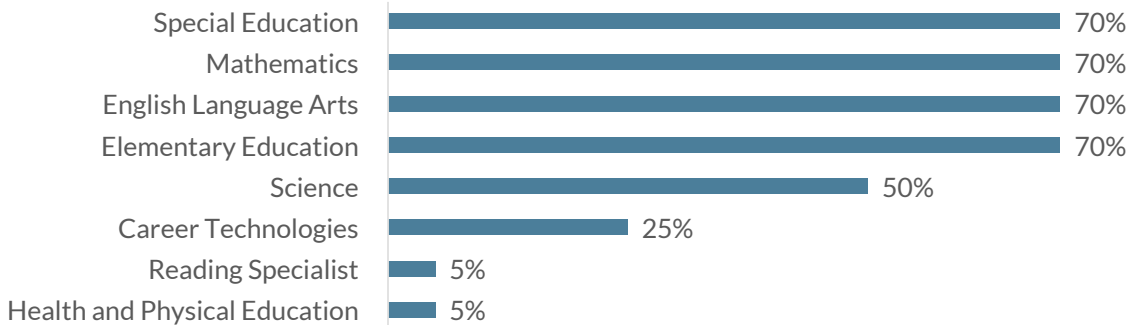


Percent of Years Shortage Reported by Subject Area, 1998–2018

Guam



Northern Mariana Islands

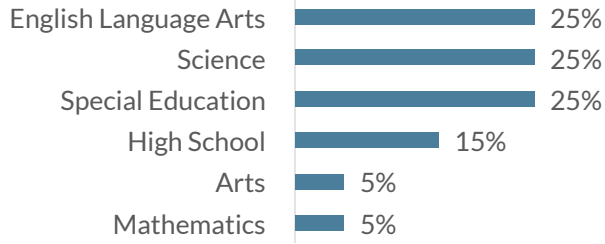


Palau

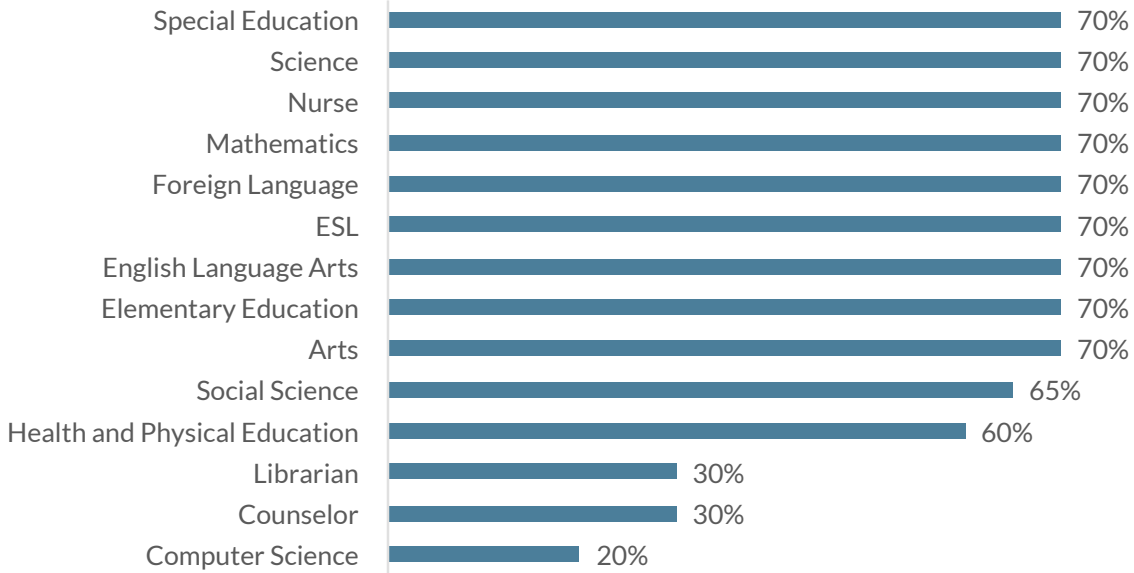


Percent of Years Shortage Reported by Subject Area, 1998–2018

Puerto Rico



U.S. Virgin Islands



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Acknowledgments

Bellwether Education Partners would like to express gratitude for the generous support from the Charles and Lynn Schusterman Family Foundation. The authors would like to thank Bellwether colleagues Tanya Skubiak, Sherri Geng, and Jennifer Schiess for their contributions to this report; and to Chad Aldeman and Andy Rotherham for sharing their insight. We would also like to thank Lisa Dieker at the University of Central Florida who provided advice and thoughtful feedback on this project. The views and opinions expressed in this report, however, are the responsibility of the authors alone and should not be interpreted to reflect the views of others.

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About Bellwether Education Partners

Bellwether Education Partners is a national nonprofit focused on dramatically changing education and life outcomes for underserved children. We do this by helping education organizations accelerate their impact and by working to improve policy and practice.

Bellwether envisions a world in which race, ethnicity, and income no longer predict opportunities for students, and the American education system affords all individuals the ability to determine their own path and lead a productive and fulfilling life.

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