IES Institute of Education Sciences

APPENDIXES
June 2021

Regional Educational Laboratory Northwest
At Education Northwest

Pathways to Teaching: Teacher Diversity, Testing, Certification, and Employment in Washington State

Appendix A. Methodology

Appendix B. Supporting analyses

See https://go.usa.gov/x6T5K for the full report.

Appendix A. Methodology

The study population included all 63,497 teacher candidates who took a Washington state teacher test between 2010 and 2019 (tables A1 and A2). It included candidates who were enrolled in any teacher preparation program that the Washington Professional Educator Standards Board had approved to operate in the state and candidates who were not yet enrolled in a teacher preparation program. The study team chose January 1, 2010, as the starting point because it is the first year that teacher test data were consistently reported and cataloged in the E-Certification database, according to the Washington Office of Superintendent of Public Instruction, the agency that manages the data.

Table A1. Study population and characteristics, 2010–19

Candidate characteristic	Number of teacher candidates	Percent
All candidates	63,497	
Race/ethnicity		
Hispanic candidates	4,281	6.7
Non-Hispanic candidates of color	7,544	11.9
White candidates	49,113	77.3
Missing	2,559	4.0
Gender		
Female	48,184	75.9
Male	14,813	23.3
Missing	500	0.8

Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

Table A2. Study population and characteristics by year, 2010–19

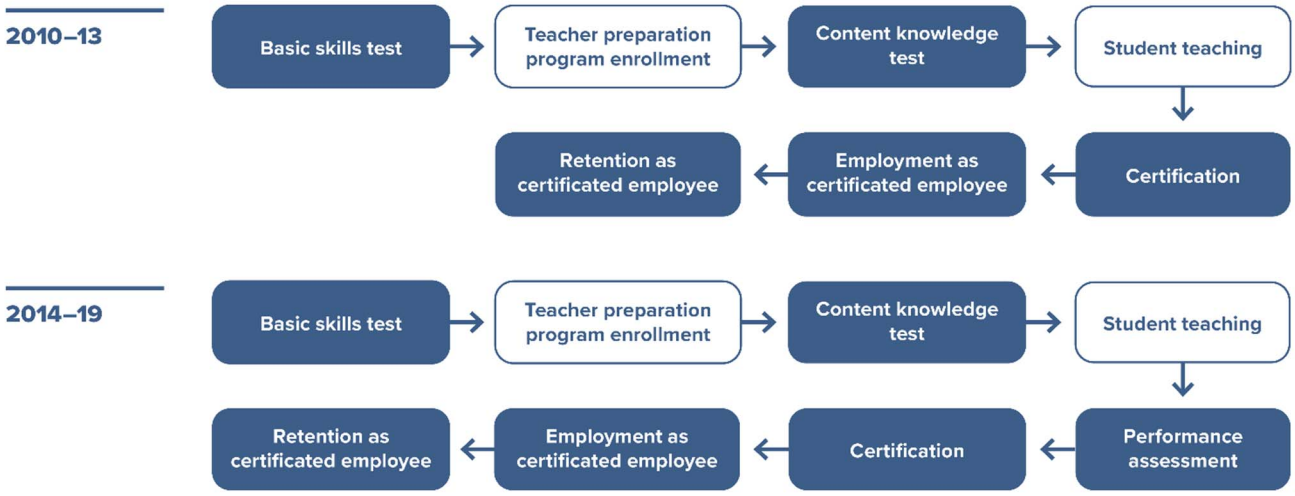
Candidate characteristic	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Number of teacher candidates	10,309	7,424	6,449	5,873	6,541	6,870	6,137	6,106	6,394	1,394
Race/ethnicity (percent)										
Hispanic candidates	6.2	4.6	5.3	6.0	6.4	7.4	8.2	8.2	8.3	9.7
Non-Hispanic candidates of color	10.8	10.9	11.3	11.1	10.5	11.6	13.6	14.2	13.5	13.9
White candidates	79.2	79.5	78.0	77.6	77.8	77.2	76.0	75.4	75.0	73.2
Missing	3.7	5.0	5.5	5.4	5.3	3.8	2.2	2.2	3.2	3.2
Gender (percent)										
Female	75.2	74.4	75.7	76.3	78.1	77.5	75.7	76.1	75.2	72.7
Male	23.9	24.9	23.5	22.9	21.2	21.8	23.7	23.0	23.9	26.5
Missing	0.8	0.8	0.8	0.8	0.8	0.7	0.6	0.9	0.9	0.9

Note: The number of candidates is lower in 2019 than in other years because the 2019 data do not cover all 12 months. Test score data cover January 1, 2019, to March 16, 2019, and certificate data cover January 1, 2019, to April 6, 2019.
Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

The Washington teacher preparation and career pathway

Teacher candidates enrolled in a Washington teacher preparation program during 2014–19 can be observed in statewide data at six points: taking the basic skills test, taking a content knowledge test, taking the performance assessment, obtaining a teaching certification in Washington, being employed as a certificated employee in a Washington K–12 public school, and being retained as a certificated employee (Washington Professional Educator Standards Board, n.d.; figure A1). There have been some changes to this process. Before 2014 the performance assessment was not required for candidates. Also, as of July 2019 candidates are required to take the basic skills test but not to pass it (Washington Professional Educator Standards Board, 2019). In December 2020 the state established a case-by-case exception process for teacher candidates who fail to pass the content knowledge test (Washington Professional Educator Standards Board, 2020). Also, as of April 2021 the state no longer requires candidates to take or pass the performance assessment (2.S.H.B. 1028, Wash. 2021).

Figure A1. Steps in Washington's teacher preparation and career pathway described in state policy, 2010–13 and 2014–19



Note: The teacher preparation and career pathway had five (2010–13) or six (2014–19) steps at which teacher candidates could be observed (shown in the blue rectangles).
Source: Washington Professional Educator Standards Board (n.d.).

Data and data sources

The study used data from three sources: Pearson Education, the Washington E-Certification database, and the Washington S-275 personnel database.

- *Pearson Education.* Pearson Education manages all of Washington's teacher tests, including the Washington Educator Skills Test—Basic, the Washington Educator Skills Tests—Endorsements, the National Evaluation Series, and the edTPA. The data used in this study included the test and subtest name, raw scores, and a pass indicator, as well as the name of the test taker, a Pearson-created ID, and self-reported demographic information (including race/ethnicity and gender). Test data included results from January 1, 2010, to March 16, 2019, on all Washington teacher tests from all teacher candidates who took the tests in Washington or in association with a Washington teacher preparation program.
- *Washington E-Certification database.* The Washington Office of Superintendent of Public Instruction manages Washington's E-Certification database, which collects data from all licensed K–12 educators in the state, including their name, certification number, demographic and personal characteristics, teacher test results, certifications, and subject area endorsements. The E-Certification database also includes alternative test results, including those for the ACT or SAT, for anyone who submitted them in lieu of taking a Washington basic skills test. The data used for this study include all records from January 1, 2010–April 6, 2019.
- *Washington S-275 personnel database.* Washington state's S-275 open-access personnel database (http://www.k12.wa.us/safs/db.asp) provides comprehensive individual-level data about Washington educators and school staff members. The data include the names, certification numbers, and employment data of all Washington educators working in K–12 public schools from 2009/10 to 2019/20, as well as the district and school where each educator was employed each year.

The study team linked candidates across the E-Certification database and S-275 personnel database using the teacher certification number. It then used fuzzy matching procedures to link Pearson Education data to the combined E-Certification and S-275 data. Computer algorithms used teacher candidates' first and last name (and probable variants), gender, and date of birth to calculate a similarity score that quantified how alike two records were in the different datasets.

Details about the data elements used to address each research question are in table A3.

Table A3. Data sources and data elements associated with each research question

Research question	Data source	Data elements
1. What sequences of teacher preparation and career pathway steps did Washington teacher candidates follow during 2010–19, what percentage of candidates followed each sequence, and how did this vary by race/ethnicity?	Pearson Education data	• Test taker race/ethnicity and gender • Test and subtest name, score, test attempt date, and passing indicator
	E-Certification database	• Test taker race/ethnicity and gender • Alternative tests submitted • Teacher certification and endorsement records
	S-275 database	• Test taker race/ethnicity and gender • Educator certification and endorsement records • Teacher employment records
2. How many and what percentages of teacher candidates took and passed each of Washington's teacher preparation tests and became certificated during 2010–19? How long did it take candidates from first taking a test to earn certification, and how did results vary by race/ethnicity?	Pearson Education data	• Test taker race/ethnicity and gender • Test and subtest name, score, test attempt date, and passing indicator
	E-Certification database	• Teacher race/ethnicity and gender • Teacher certification and endorsement records
	S-275 database	• Teacher race/ethnicity and gender • Teacher certification and endorsement records
3. How many and what percentages of teachers were employed and retained during 2010–19, and how did this vary by race/ethnicity?	Pearson Education data	• Test taker race/ethnicity and gender • Test attempt date and passing indicator
	E-Certification database	• Teacher race/ethnicity and gender • Teacher certification dates
	S-275 database	• Teacher race/ethnicity and gender • Teacher employment dates

Source: Authors' analysis.

Analysis methods

The study team used descriptive analyses of the number and percentage of teacher candidates who completed each pathway step and were observed in the data at any subsequent step, as well as how long it took candidates to complete each step of the pathway. In addition, the study team used a linear probability regression model to determine the relationship between race/ethnicity and the likelihood of completing each step because such models produce coefficients in the form of percentages, which may be easier for general audiences to understand than probabilities. The analyses are described below (table A4).

Table A4. Analyses associated with each research question

Research question	Associated analysis
1. What sequences of teacher preparation and career pathway steps did Washington teacher candidates follow during 2010–19, what percentage of candidates followed each sequence, and how did this vary by race/ethnicity?	Conduct a descriptive analysis of the specific pathways followed by the study population, which includes all teacher candidates who took a teacher preparation test between 2010 and 2019, disaggregated by race/ethnicity.
2. How many and what percentages of teacher candidates took and passed each of Washington's teacher preparation tests and became certificated during 2010–19? How long did it take from first taking a test to earning certification, and how did results vary by race/ethnicity?	Conduct a descriptive analysis of the study population's teacher preparation pathway outcomes, including: • The percentage and number of teacher candidates who took and passed each of Washington's teacher preparation tests and the percentage and number who were observed at another step. • The percentage and number of candidates who earned certification in Washington. Conduct a linear probability regression analysis to determine the extent to which the demographic characteristics of candidates were associated with passing, as well as passing and continuing at each step. Determine the number of days it took for different groups to complete each of the six steps, the number of attempts at each step, and the extent to which the number of days varied by candidate race/ethnicity.
3. How many and what percentage of teachers were employed and retained during 2010–19, and how did this vary by race/ethnicity?	Conduct a descriptive analysis of the population's employment outcomes, examining the percentage and number of teacher candidates who were employed in a Washington K–12 public school and retained for at least one additional year as a teacher. Conduct a linear probability regression analysis to determine the extent to which the demographic characteristics of candidates were associated with employment and retention.

Source: Authors' analysis plan.

Descriptive analysis. The study team identified and described the analytic sample from the analytic dataset, which included data from Pearson Education, the E-Certification database, and the S-275 Database. The analytic sample was disaggregated by race/ethnicity and gender. Because cell sizes for teacher candidates who identified as American Indian/Alaska Native, Asian, Native Hawaiian/Pacific Islander, or multiracial were sometimes smaller than 10, categories were collapsed into three race/ethnicity categories:

- Hispanic candidates, including individuals who identified as Hispanic or Latino of any race.
- Non-Hispanic candidates of color, including individuals who identified as American Indian/Alaska Native, Asian, Black, Native Hawaiian/Pacific Islander, or multiracial.
- White candidates, including individuals who identified as White or White, not Hispanic.

The percentage and number of teacher candidates from the analytic sample who were observed taking and passing each of the tests were calculated and disaggregated. The study team then calculated the percentage and number of candidates who:

- Completed the step and continued on the pathway by being observed at a subsequent step.
- Completed the step but did not continue on the pathway (for instance, those who passed the basic skills test but did not take a content knowledge test).
- Did not complete the step and did not continue on the pathway (for instance, those who failed the basic skills test and were not eligible to take a content knowledge test).

Since teacher candidates are permitted to retake the tests as many times as they wish, the study team calculated the average number of times each group took each test, as well as the cumulative passing rates by the number of attempts. The percentage and number of candidates were calculated (see appendix B). Results of the basic skills test are shown as an overall passing rate, in addition to passing rates for the math, reading, and writing subtests.

Linear probability regression model. Linear probability regression was used to examine the probability that a teacher candidate would complete each of the six steps in the teacher preparation and career pathway after demographic characteristics of race/ethnicity, gender, age, and year of first record were controlled for.

A separate linear probability regression analysis using the following model was performed to assess the probability of completing each of the six pathway steps, as well as the probability of completing and continuing on to another step, according to the following model:

$$(p_i) = \alpha_0 + \beta \boldsymbol{X}_{1i} + \delta \boldsymbol{X}_{2i}$$

where p denotes the probability that teacher candidate i achieved the outcome; $\boldsymbol{X}_1$ denotes a vector of individual candidates' characteristics, which include binary indicators for each race/ethnicity, whether the candidate is female, five age categories, and an indicator for missing data; and $\boldsymbol{X}_2$ is the year in which a candidate first appeared in the data (that is, candidate i's cohort).

Table A5 shows the percentage of candidates by pathway step who continued each year. There were large changes (more than 10 percentage points) from 2017 to 2018 in the percentages of candidates who continued after completing the basic skills test, a content knowledge test, certification, and employment. There are other noticeable drops even after 2017. Why this is the case is unknown, but the study team theorized that there was not enough time for the candidates to both pass the step and continue on to the next pathway step.

Table A5. Teacher candidates' continuation on preparation and career pathways, by year, 2010–19

Step	Number of teacher candidates	Total percent who continued	Percent who continued (were observed at another step) each year									
			2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Basic skills test	38,755	58.1	71.8	72.7	73.6	67.7	58.8	56.8	56.5	46.2	28.4	11.7
Content knowledge test	58,297	65.2	66.3	66.0	64.7	62.2	66.4	71.1	77.4	72.9	31.8	47.4
Performance assessment	13,297	78.9	na	na	na	60.1	75.1	76.6	79.6	84.4	81.7	na
Certification	38,755	45.4	51.4	49.0	49.6	50.1	58.3	59.5	52.8	34.7	18.2	10.4
Employment	38,755	36.2	37.8	38.1	39.4	40.5	48.2	48.3	44.1	28.2	14.7	8.1
Retention	38,315	28.0	30.3	31.2	32.8	32.3	36.5	35.5	31.0	20.3	11.3	5.0

na is not applicable.
Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

References

2.S.H.B. 1028, 67th Leg., Reg. Sess. (Wash. 2021). Retrieved April 26, 2021, from http://lawfilesext.leg.wa.gov/biennium/2021-22/Pdf/Bills/House%20Passed%20Legislature/1028-S2.PL.pdf#page=1.

Washington Professional Educator Standards Board. (n.d.). *Becoming an educator*. Retrieved July 14, 2020, from https://www.pesb.wa.gov/pathways/becoming-an-educator/.

Washington Professional Educator Standards Board. (2019). *Governor Inslee signs bill increasing access to teacher preparation programs*. Retrieved December 22, 2020, from https://content.govdelivery.com/accounts/WAOSPI/bulletins/240aeda.

Washington Professional Educator Standards Board. (2020). *Case-by-case exceptions now available for content knowledge assessment.* Retrieved December 22, 2020, from https://content.govdelivery.com/accounts/WAOSPI/bulletins/2ab33cb.

Appendix B. Supporting analyses

This appendix provides data tables for each of the six steps in Washington state's teacher preparation and career pathway, disaggregated by race/ethnicity and gender, including outcomes for teacher candidates missing data on these characteristics.

Pathway outcome tables (tables B1–B5, B12, B15, B19, and B20) include the overall number of teacher candidates who attempted the step and the percentage who:

- Completed the step and continued on the pathway (were observed at a subsequent step).
- Completed the step and did not continue on the pathway (were not observed at a subsequent step).
- Never completed the step (failed).

Regression outcome tables (tables B6, B11, B13, and B16) show results from linear probability regression models estimating the likelihood of ever completing each pathway step and continuing after each pathway step, with demographic and control variables. The tables include demographic characteristics and cohort to show how the likelihood of each step varies by group, after other characteristics and factors are controlled for.

Number of attempts tables (tables B8–B10) show the overall percentages of teacher candidates who passed the step after one, two, and three or more attempts, as well as the percentage of candidates who never passed the step.

Average attempts and days tables (tables B7, B14, B17, and B18) show the average number of attempts to pass the step, as well as the average number of days (from the date of the first attempt to the date of the passing attempt) to pass for teacher candidates who ever passed the step.

Pathway outcomes

Table B1 shows the sequence of pathway steps teacher candidates took between 2010 and 2019 that ended in certification, disaggregated by race/ethnicity.

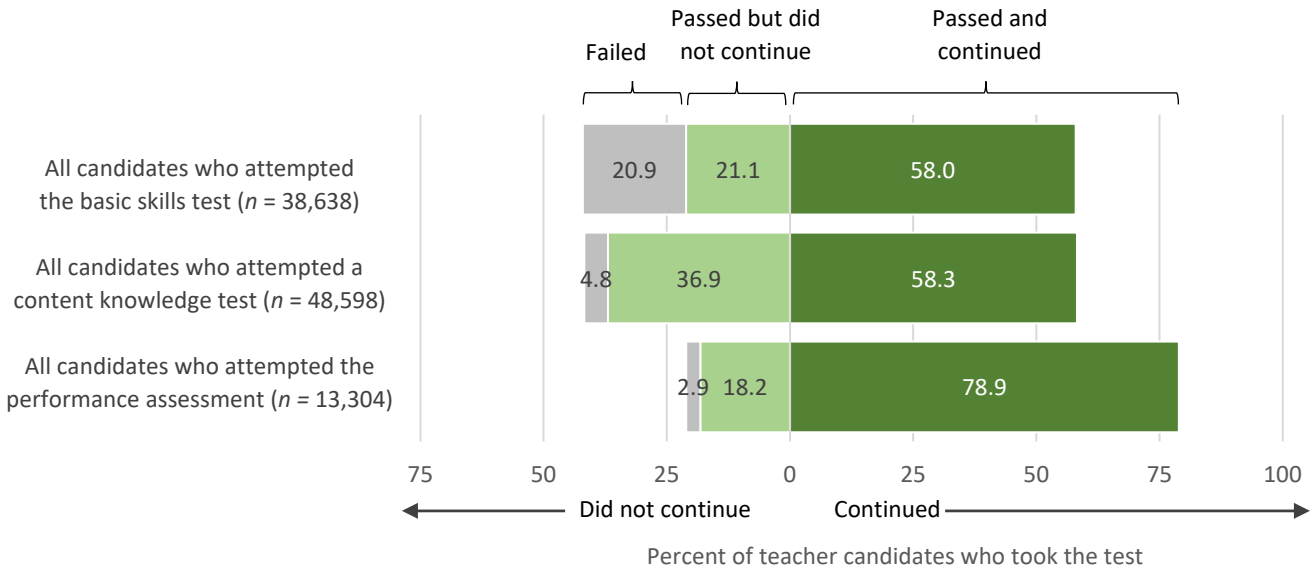
Table B1. Percentage of teacher candidates who followed each sequence of steps, by race/ethnicity, 2010–19

Pathways ending in certification	All candidates (*n* = 22,113)	Hispanic candidates (*n* = 1,236)	Non-Hispanic candidates of color (*n* = 2,088)	White candidates (*n* = 17,950)	Missing race/ethnicity (*n* = 839)
Basic skills test–content knowledge test–certification	40.6	30.7	37.4	41.2	49.7
Basic skills test–content knowledge test–performance assessment–certification	35.3	44.7	37.5	34.8	26.3
Content knowledge test–basic skills test–certification	11.7	10.6	9.4	12.0	11.7
Content knowledge test–performance assessment–certification	8.4	7.7	11.3	8.1	8.5
Content knowledge test–basic skills test–performance assessment–certification	2.4	1.9	2.6	2.4	2.3
Basic skills test–performance assessment–content knowledge test–certification	1.3	4.0	1.4	1.1	1.0
Performance assessment–content knowledge test–certification	0.2	0.1	0.2	0.2	0.1
Content knowledge test–performance assessment–basic skills test–certification	0.1	0.5	0.0	0.1	0.1
Four other pathways ending in certification	0.1	0.0	0.1	0.1	0.4

Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

Figure B1 shows the outcomes for each of the three teacher preparation tests, including the percentages of candidates who failed the test, who passed the test but did not continue on the pathway, and who passed the test and continued on the pathway.

Figure B1. Although most teacher candidates who took each test passed and continued on the teacher preparation and career pathway, 18–37 percent of candidates passed a test but left the pathway, 2010–19



Note: The candidates who took each test are not necessarily the same. For example, a larger number of candidates took a content knowledge test than took the basic skills test or took the performance assessment. This is because all Washington candidates had to take at least one content knowledge test, but they could submit an alternative test for the basic skills test and might not have been required to take the performance assessment. This figure summarizes data from tables B3–B5. Percentages might not sum to 100 percent because of rounding.
Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

Basic skills test outcomes

Table B2 shows the characteristics of teacher candidates who provided ACT/SAT scores as an alternative to the basic skills test.

Table B2. Characteristics of teacher candidates who submitted ACT/SAT scores as an alternative to the basic skills test, by race/ethnicity and gender, 2010–19

	Teacher candidates who submitted an alternative test score for		
Candidate characteristic	Math basic skills subtest	Reading basic skills subtest	Writing basic skills subtest
All candidates (number)	448	491	381
Race/ethnicity (percent)			
Hispanic candidates	3.1	2.6	3.7
Non-Hispanic candidates of color	11.6	10.8	12.3
White candidates	82.4	82.9	80.1
Missing	2.9	3.7	3.9
Gender (percent)			
Female	77.2	79.8	82.7
Male	22.8	20.2	17.3
Missing	0	0	0

Source: Authors' analysis based on Washington E-Certification data for 2010–19.

Table B3 shows passing and pathway outcomes for the basic skills test. A total of 38,638 teacher candidates took the basic skills test during 2010–19. Overall, 58.0 percent of candidates passed the basic skills test and continued on the pathway, 21.1 percent passed the test but did not continue on the pathway, and 20.9 percent failed the test (never passed). No candidate who failed the basic skills test was certificated.

Table B3. Basic skills test pathway outcomes, by race/ethnicity and gender, 2010–19

		Percentage of candidates who		
Candidate characteristic	Number of teacher candidates	Passed the basic skills test and continued on pathway	Passed the basic skills test but did not continue on pathway	Never passed the basic skills test
All candidates	38,638	58.0	21.1	20.9
Race/ethnicity				
Hispanic candidates	3,095	48.9	19.6	31.6
Non-Hispanic candidates of color	5,115	51.8	19.0	29.2
White candidates	29,029	60.9	20.7	18.4
Missing race/ethnicity	1,399	39.5	40.0	20.5
Gender				
Female	29,121	57.8	20.7	21.5
Male	9,245	59.3	21.8	18.9
Missing gender	272	32.0	40.8	27.2

Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

Content knowledge test outcomes

Table B4 shows passing and pathway outcomes for content knowledge tests. A total of 48,598 teacher candidates took at least one content knowledge test during 2010–19. Overall, 58.3 percent of candidates passed a content knowledge test and continued on the pathway, 36.9 percent passed a test but did not continue on the pathway, and 4.8 percent failed (never passed). No candidate who failed a content knowledge test was certificated.

Table B4. Content knowledge test pathway outcomes, by race/ethnicity and gender, 2010–19

Candidate characteristic	Number of teacher candidates	Percentage of candidates who: Passed a content knowledge test and continued on pathway	Percentage of candidates who: Passed a content knowledge test but did not continue on pathway	Percentage of candidates who: Never passed a content knowledge test
All candidates	48,598	58.3	36.9	4.8
Race/ethnicity				
Hispanic candidates	2,844	59.2	29.0	11.7
Non-Hispanic candidates of color	5,426	57.7	34.2	8.2
White candidates	38,633	59.7	36.6	3.7
Missing	1,695	26.7	66.0	7.3
Gender				
Female	36,840	57.5	37.8	4.7
Male	11,438	62.1	33.0	5.0
Missing	320	7.5	84.1	8.4

Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

Performance assessment outcomes

Table B5 shows passing and pathway outcomes for the performance assessment. A total of 13,304 teacher candidates took the performance assessment during 2014–19. Overall, 78.9 percent of candidates passed the assessment and continued on the pathway, 18.2 percent passed the assessment but did not continue on the pathway, and 2.9 percent failed (never passed). No candidate who failed the performance assessment was certificated.

Table B5. Performance assessment pathway outcomes, by race/ethnicity and gender, 2014–19

Candidate characteristic	Number of teacher candidates	Percentage of candidates who: Passed the performance assessment and continued on pathway	Percentage of candidates who: Passed the performance assessment but did not continue on pathway	Percentage of candidates who: Never passed the performance assessment
All candidates	13,304	78.9	18.2	2.9
Race/ethnicity				
Hispanic candidates	995	73.4	21.0	5.6
Non-Hispanic candidates of color	1,528	85.0	11.6	3.3
White candidates	10,524	79.6	17.9	2.5
Missing	257	39.3	57.2	3.5
Gender				
Female	10,289	77.2	20.6	2.2
Male	2,973	86.2	8.8	5.0
Missing	42	0.0	90.5	9.5

Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2014–19.

Basic skills test regression and subtest outcomes

Table B6 shows regression outcomes from a linear probability model that estimates the likelihood of ever passing the basic skills test (all three subtests) and continuing on the teacher preparation pathway. The table has two outcomes: the likelihood of passing all three basic skills subtests and the likelihood of passing and continuing on the preparation pathway, as indicated by appearing in the data at the next pathway step. These two outcomes might have different policy implications for testing outcomes and preparation pathways.

Table B6. Regression results for basic skills test, likelihood of passing and likelihood of passing and continuing, 2010–19

Variable	Likelihood of passing	Likelihood of passing and continuing
Demographic characteristic (White candidates are the reference group)		
Hispanic candidate	−9.775***	−7.721***
Non-Hispanic candidate of color	−9.505***	−7.578***
Missing race/ethnicity	−5.760***	−24.83***
Female	−1.480***	0.33
Missing gender	−5.409+	−11.57***
Earliest record in the data (2010 is the reference group)		
2011	4.554***	3.010***
2012	6.776***	5.459***
2013	2.874***	−0.288
2014	−11.37***	−9.964***
2015	−14.48***	−11.66***
2016	−16.98***	−11.85***
2017	−20.11***	−22.27***
2018	−25.64***	−39.67***
2019	−36.15***	−56.33***
Age category (30 and under is the reference group)		
31–40	7.455***	13.57***
41–50	9.990***	18.35***
51–60	6.843***	14.81***
Older than 60	4.345***	11.19***
Missing age	−15.89	−43.01***
Constant	86.05***	61.72***
Number of candidates	38,638	38,638
Adjusted R-squared	0.12	0.147

+ significant at $p < .1$; *** significant at $p < .001$.
Note: The analysis was limited to teacher candidates who took all three basic skills subtests. Passing is defined as passing all three subtests. All coefficient estimates in this table were converted to percentages.
Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

Table B7 shows the average number of attempts to pass the basic skills test, as well as the average number of days it took teacher candidates to pass the test. On average, candidates took the basic skills test 1.23 times and took 45 days to pass the test.

Table B7. Average number of attempts and days to pass basic skills test, by race/ethnicity and gender, 2010–19

Candidate characteristic	Number of teacher candidates	Average number of attempts	Average number of days to pass
All candidates	38,638	1.23	45
Race/ethnicity			
Hispanic candidates	3,095	1.73	139
Non-Hispanic candidates of color	5,115	1.39	75
White candidates	29,029	1.15	30
Missing	1,399	1.17	35
Gender			
Female	29,121	1.24	48
Male	9,245	1.18	37
Missing	1,582	1.07	11

Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

Table B8 shows the passing rate on the basic skills math subtest by the number of attempts teacher candidates made. Overall, 86.9 percent of candidates passed on their first attempt, 5.5 percent more passed on their second attempt, 3.0 percent more passed on their third or later attempt, and 4.6 percent never passed.

Table B8. Passing rate for the basic skills math subtest, by race/ethnicity and gender

Candidate characteristic	Number of teacher candidates	Passing rates for candidates who made			Percentage of candidates who never passed the basic skills math subtest
		One attempt at the basic skills math subtest	Two attempts at the basic skills math subtest	Three or more attempts at the basic skills math subtest	
All candidates	37,786	86.9	5.5	3.0	4.6
Race/ethnicity					
Hispanic candidates	3,445	67.9	11.3	8.7	12.1
Non-Hispanic candidates of color	5,143	79.6	5.9	5.0	9.5
White candidates	27,836	90.6	4.8	2.0	2.7
Missing	1,362	88.5	4.1	1.1	6.3
Gender					
Female	28,815	85.6	6.1	3.4	5.0
Male	8,721	91.3	3.6	1.7	3.3
Missing	250	90.0	2.4	1.2	6.4

Note: Percentages might not sum to 100 because of rounding.
Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

Table B9 shows the passing rate of the basic skills reading subtest by the number of attempts teacher candidates made. Overall, 88.6 percent of candidates passed on their first attempt, 5.3 percent passed on their second attempt, 2.7 percent passed on their third or later attempt, and 3.4 percent never passed.

Table B9. Passing rate for the basic skills reading subtest, by race/ethnicity and gender

Candidate characteristic	Number of teacher candidates	Passing rates for candidates who made			Percentage of candidates who never passed the basic skills reading subtest
		One attempt at the basic skills reading subtest	Two attempts at the basic skills reading subtest	Three or more attempts at the basic skills reading subtest	
All candidates	36,597	88.6	5.3	2.7	3.4
Race/ethnicity					
Hispanic candidates	3,353	70.3	11.8	7.7	10.2
Non-Hispanic candidates of color	5,106	78.5	8.5	4.6	8.4
White candidates	26,789	92.7	4.1	1.7	1.5
Missing	1,349	90.9	2.2	2.1	4.8
Gender					
Female	27,663	87.5	5.9	3.0	3.6
Male	8,682	92.0	3.7	1.6	2.8
Missing	252	89.7	1.6	4.0	4.8

Note: Percentages might not sum to 100 because of rounding.
Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

Table B10 shows the passing rate of the basic skills writing subtest by the number of attempts teacher candidates made. Overall, 72.0 percent of candidates passed on their first attempt, 11.4 percent passed on their second attempt, 7.6 percent passed on their or later third attempt, and 9 percent never passed.

Table B10. Passing rate for the basic skills writing subtest, by race/ethnicity and gender

Candidate characteristic	Number of teacher candidates	Passing rates for candidates who made			Percentage of candidates who never passed the basic skills writing subtest
		One attempt at the basic skills writing subtest	Two attempts at the basic skills writing subtest	Three or more attempts at the basic skills writing subtest	
All candidates	42,831	72.0	11.4	7.6	9.0
Race/ethnicity					
Hispanic candidates	4,777	35.6	16.8	22.1	25.5
Non-Hispanic candidates of color	6,230	55.5	15.4	10.6	18.4
White candidates	30,318	80.9	9.9	4.9	4.3
Missing	1,506	77.0	7.8	3.2	12.0
Gender					
Female	32,264	71.0	11.7	8.2	9.2
Male	10,282	75.1	10.7	5.7	8.5
Missing	285	78.6	4.9	5.6	10.9

Note: Percentages might not sum to 100 because of rounding.
Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

Content knowledge test regression and content area outcomes

Table B11 shows regression outcomes from a linear probability model that estimates the likelihood of ever passing any content knowledge test and continuing on the teacher preparation pathway. The table has two outcomes: the likelihood of passing and the likelihood of passing and continuing on the pathway, as indicated by appearing in the data at the next pathway step. These two outcomes might have different policy implications for testing outcomes and preparation pathways.

Table B11. Regression results for content knowledge test, likelihood of passing and likelihood of passing and continuing, 2010–19

Variable	Likelihood of passing	Likelihood of passing and continuing
Demographic characteristic (White candidates are the reference group)		
Hispanic candidate	−8.203***	−1.831*
Non-Hispanic candidate of color	−4.559***	−2.414***
Missing race/ethnicity	−3.097***	−27.98***
Female	0.0153	−6.006***
Missing gender	−1.824	−35.34***
Earliest record in the data (2010 is the reference group)		
2011	0.212	−0.515
2012	0.237	0.361
2013	0.143	2.945***
2014	−0.454	6.182***
2015	−1.436***	5.322***
2016	−1.107**	5.924***
2017	−0.805*	−7.749***
2018	−1.993***	−36.67***
2019	−1.239	−35.91***
Age category (30 and under is the reference group)		
31–40	−1.010***	−5.319***
41–50	−2.680***	−11.06***
51–60	−3.753***	−16.07***
Older than 60	−6.243***	−26.33***
Missing age	−8.473	−60.92***
Constant	98.34***	73.03***
Number of candidates	48,598	48,598
Adjusted R-squared	0.017	0.084

* significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$.
Note: The analysis was limited to teacher candidates who took a content knowledge test.
Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

Table B12 provides pathway outcomes for specific content knowledge tests. Because of small cell sizes, these outcomes have not been disaggregated by demographic characteristics.

Table B12. Content knowledge test pathway outcomes, by content area, 2010–19

Content knowledge area	Number of teacher candidates	Percent of candidates who		
		Passed content area test and continued on pathway	Passed content area test but did not continue on pathway	Never passed content area test
Any	48,598	58.3	36.9	4.8
Agriculture	100	64.0	35.0	1.0
Bilingual	286	62.2	31.8	11.9
Biology	1,682	64.3	28.8	8.4
Business	182	58.2	35.7	6.6
Chemistry	618	65.0	30.3	6.5
Choral	714	74.4	24.9	0.7
Counselor	20	35.0	65.0	0.0
Dance	63	46.0	54.0	0.0
Deaf education	44	70.5	27.3	2.3
Drama	174	100.0	0.0	0.0
Early childhood education	1,990	69.8	27.5	3.8
Early childhood special education	498	68.7	29.1	3.4
Earth science	290	68.3	27.9	5.9
Elementary subtest 1[a]	22,789	67.6	29.7	4.4
Elementary subtest 2[a]	22,570	67.9	29.7	4.2
English language arts	5,124	69.1	29.7	1.7
English as a second language	4,966	61.6	36.7	2.7
Family and consumer science	187	51.9	48.1	0.0
Health and physical education	2,023	54.6	44.3	1.3
History	1,358	63.8	32.4	4.9
Instrumental	887	74.5	24.9	0.8
Library	852	25.7	73.4	1.3
Math	2,828	63.2	28.4	13.1
Middle level English language arts	42	11.9	83.3	7.1
Middle level humanities	2,342	57.2	29.7	21.2
Middle level math	2,999	59.3	33.4	12.1
Middle level science	1,258	61.4	31.0	18.0
Middle level social studies	23	13.0	82.6	8.7
Music	1,037	73.5	24.5	3.2
Physics	338	69.8	26.3	5.6
Reading	2,552	63.8	34.7	4.2
Special education	7,270	62.4	35.4	2.8
Science	1,380	71.0	24.3	9.6
Social studies	3,506	64.0	31.4	6.8
Technology	67	70.1	28.4	1.5
Theatre	317	56.5	40.7	4.4
Traffic	23	30.4	69.6	0.0
Visual arts	827	64.7	32.4	3.6
World languages	1,470	64.0	33.9	2.5

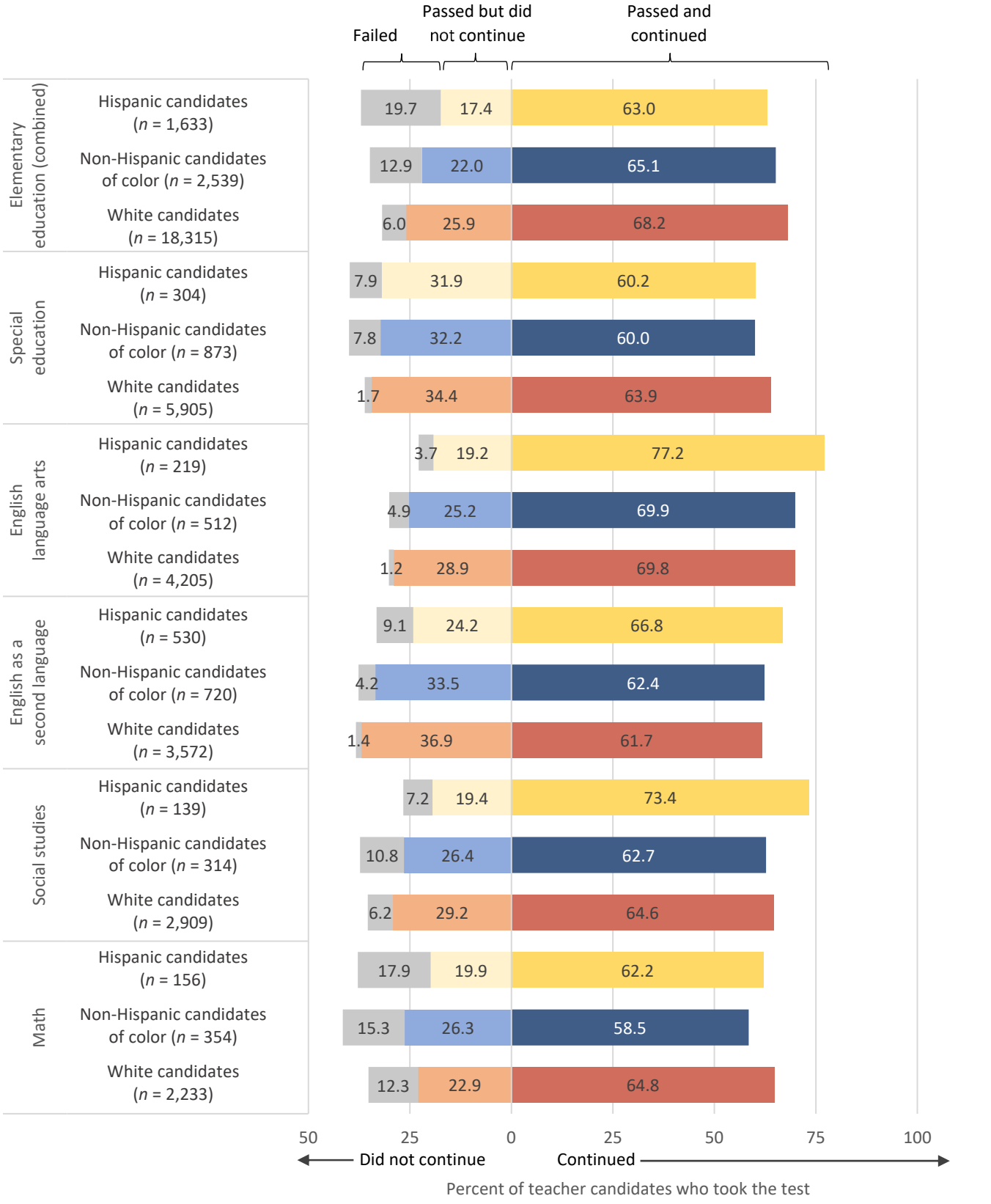
Note: This table reflects outcomes for 48,598 teacher candidates, some of whom took tests in more than one area. Tests in four subjects—computer science, gifted and talented education, psychology, and speech language pathology—had fewer than 10 test takers, and the outcomes are not displayed to protect candidate anonymity. Percentages might not sum to 100 because of rounding.

a. The elementary test is divided into two subtests and counts as only one content area.

Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

Figure B2 shows the outcomes of the six most commonly taken content knowledge tests. At least 2,500 teacher candidates took these tests during 2010–19. Overall, a lower percentage of Hispanic candidates than of White candidates passed the math and English as a second language test, and a lower percentage of Hispanic candidates and non-Hispanic candidates of color than White candidates passed the elementary education (combined) and special education tests.

Figure B2. A lower percentage of Hispanic teacher candidates and of non-Hispanic candidates of color than of White candidates passed content knowledge tests, 2010–19



Note: Each subject corresponds to the test of the same name in table B12, except for elementary education, which shows the combined outcomes of both subtests. This figure does not include outcomes for candidates with missing race/ethnicity data, so the number of total candidates may differ from that in table B12. Percentages might not sum to 100 because of rounding.

Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

Performance assessment regression outcomes

Table B13 shows regression outcomes from a linear probability model that estimates the likelihood of ever passing the performance assessment and continuing on the teacher preparation and career pathway. The table has two outcomes: the likelihood of passing and the likelihood of passing and continuing on the preparation pathway, as indicated by appearing in the data at the next pathway step. These two outcomes might have different policy implications for performance assessment outcomes and preparation pathways.

Table B13. Regression results for performance assessment, likelihood of passing and likelihood of passing and continuing, 2014–19

Variable	Likelihood of passing	Likelihood of passing and continuing
Demographic characteristic (White candidates are the reference group)		
Hispanic candidate	−2.948***	−4.546**
Non-Hispanic candidate of color	−0.714	6.123***
Missing race/ethnicity	−0.954	−34.50***
Female	2.785***	−7.321***
Missing gender	−3.618	−72.15***
Earliest record in the data (2010 is the reference group)		
2011	−1.369	−1.098
2012	2.083*	2.301*
2013	1.472	−4.963***
2014	1.625+	−27.73***
2015	0.957	−25.67***
2016	−1.877+	−21.88***
2017	−2.214*	−18.34***
2018	−8.541***	−37.39***
2019	2.853*	1.819
Age category (30 and under is the reference group)		
31–40	−0.0719	0.955
41–50	−0.182	8.467***
51–60	−0.542	10.55***
Older than 60	0.0107	11.38***
Missing age	na	na
Constant	95.35***	100.2***
Number of candidates	13,304	13,304
Adjusted R-squared	0.022	0.126

+ significant at $p < .1$; * significant at $p < .05$; *** significant at $p < .001$. na is not applicable.
Note: This analysis is limited to teacher candidates who took the performance assessment. All coefficient estimates in this table were converted to percentages.
Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

Certification and employment outcomes

Table B14 shows the average number of days it took teacher candidates who took a basic skills test to earn certification from the day of their first teacher preparation test. The sample for this analysis includes only candidates who took a basic skills test and were certificated during 2010–19. On average, the candidates took 912 days to become certificated.

Table B14. Average number of days to certification, by race/ethnicity and gender, 2010–19

Candidate characteristic	Number of teacher candidates	Average number of days to certification
All candidates	17,485	912
Race/ethnicity		
Hispanic candidates	1,108	1,018
Non-Hispanic candidates of color	1,959	945
White candidates	14,198	900
Missing	220	841
Gender		
Female	13,018	911
Male	4,467	915
Missing	0	na

na is not applicable.
Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

Table B15 shows passing and pathway outcomes for certification and employment outcomes for the sample of 45,619 teacher candidates who ever took at least one of the teacher pathway steps during 2010–16. This sample represents about 72 percent of the full study population covered by table A1 in appendix A. Overall, 50.2 percent of candidates obtained a full teaching certificate and were employed as a teacher; 15.2 percent obtained a full teaching certificate but were not employed as a teacher; and 34.2 percent did not complete the pathway, did not obtain a teaching certificate, and were not employed as a teacher.

Table B15. Certification and employment pathway outcomes for teacher candidates whose first record was during 2010–16, by race/ethnicity and gender, 2010–19

		Percentage of candidates who			
Candidate characteristic	Number of teacher candidates	Obtained a teaching certificate and were employed as a certificated employee	Did not obtain a teaching certificate and were employed as a certificated employee	Obtained a teaching certificate but were not employed as a certificated employee	Did not obtain a teaching certificate and were not employed as a certificated employee
All candidates	45,619	50.2	< 0.1	15.2	34.2
Race/ethnicity					
Hispanic candidates	2,132	52.5	< 0.1	8.5	38.6
Non-Hispanic candidates of color	4,504	51.7	< 0.1	11.6	36.1
White candidates	36,181	53.8	< 0.1	12.5	33.3
Missing	2,802	0.8	< 0.1	60.6	38.5
Gender					
Female	35,457	49.6	< 0.1	15.0	34.9
Male	9,889	53.8	< 0.1	16.0	30.0
Missing	273	0.0	0.0	12.5	87.5

Note: The teacher candidates who did not obtain a teaching certificate and were employed might have received a limited teaching certificate, but the dataset used for this analysis did not include an indicator for that license. Percentages might not sum to 100 because of rounding.
Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

Certification, employment, and retention regression outcomes

Table B16 shows regression outcomes from a linear probability model that estimated the likelihood of being certificated, employed, or retained for one year. The sample for this analysis included only teacher candidates whose first record was in 2010–16. The sample examining the likelihood of retention is further restricted to candidates who were hired by 2017.

Table B16. Regression results for likelihood of certification, employment, and retention for teacher candidates whose first record was during 2010–16, by race/ethnicity and gender, 2010–19

Variable	Likelihood of certification	Likelihood of employment	Likelihood of retention[a]
Demographic characteristic (White candidates are the reference group)			
Hispanic candidate	−6.383***	−1.428	1.278
Non-Hispanic candidate of color	−3.981***	−2.005**	−1.464+
Missing race/ethnicity	−30.39***	−37.59***	−29.27*
Female	−7.134***	−7.202***	−0.541
Missing gender	−32.97***	−15.87***	na
Earliest record in the data (2010 is the reference group)			
2011	−0.819	0.654	1.243
2012	0.0534	2.422**	1.920*
2013	−1.095	3.074***	1.054
2014	−2.153**	3.480***	0.804
2015	−3.562***	1.761*	1.810*
2016	−1.723*	3.129***	1.733*
Age category (30 and under is the reference group)			
31–40	5.471***	3.690***	−0.950+
41–50	4.259***	4.482***	−2.204**
51–60	−1.094	−0.9	−2.585**
Older than 60	−9.849***	−12.61***	−7.592***
Missing age	−38.54***	−28.56***	na
Constant	55.75***	41.54***	91.44***
Number of candidates	49,467	49,467	16,659
Adjusted R-squared	0.032	0.037	0.003

+ significant at $p < .1$, * significant at $p < .05$, ** significant at $p < .01$, *** significant at $p < .001$. na is not applicable.
Note: All coefficient estimates were converted to percentages.
a. The sample is restricted to teacher candidates who were hired by 2017.
Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

Table B17 shows the average number of attempts to pass a content knowledge test and the average number of days it took teacher candidates to pass a content knowledge test. On average, candidates took a content knowledge test 1.1 times and took 13 days to pass the test.

Table B17. Content knowledge test average number of attempts and days to pass, by race/ethnicity and gender, 2010–19

Candidate characteristic	Number of teacher candidates	Average number of attempts	Average number of days to pass
All candidates	48,598	1.1	13
Race/ethnicity			
Hispanic candidates	2,844	1.3	43
Non-Hispanic candidates of color	5,426	1.2	20
White candidates	38,633	1.1	9
Missing	1,695	1.1	13
Gender			
Female	36,840	1.1	13
Male	11,438	1.1	12
Missing	320	1.1	3

Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

Table B18 shows the average number of attempts to pass the performance assessment and the average number of days it took teacher candidates to pass the performance assessment. On average, candidates took the performance assessment 1.1 times and took six days to pass the assessment.

Table B18. Performance assessment average number of attempts and days to pass, by race/ethnicity and gender

Candidate characteristic	Number of teacher candidates	Average number of attempts	Average number of days to pass
All candidates	13,304	1.1	6
Race/ethnicity			
Hispanic candidates	995	1.1	13
Non-Hispanic candidates of color	1,528	1.1	8
White candidates	10,524	1.0	5
Missing	257	1.1	8
Gender			
Female	10,289	1.0	5
Male	2,973	1.1	8
Missing	42	1.0	0

Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 personnel data for 2010–19.

Retention outcomes

Table B19 shows the number and percentage of teachers who were retained in their position for one year and two years. The sample includes all teacher candidates who were hired by or before 2017. The sample for this analysis includes only teacher candidates who took the basic skills test during 2010–16.

Table B19. Retention pathway outcomes for teacher candidates who took the basic skills test during 2010–16, by race/ethnicity and gender, 2010–19

Candidate characteristic	Number of teacher candidates	Percentage of candidates who	
		Were employed for two years	Were employed for three or more years
All candidates	17,998	90.8	82.9
Race/ethnicity			
Hispanic candidates	1,114	92.0	85.0
Non-Hispanic candidates of color	2,044	89.3	81.1
White candidates	14,827	90.9	83.0
Missing	13	61.5	53.8
Gender			
Female	13,145	90.7	82.4
Male	4,853	91.1	84.0
Missing	0	na	na

na is not applicable.
Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 Personnel data for 2010–19.

Pathway outcomes for teacher candidates whose first record was during 2010–16

Table B20 shows the overall teacher preparation and career pathway outcomes for teacher candidates whose first record was during 2010–16 and who followed either the pre-2014 or the 2014–19 teacher preparation and career pathway described in Washington state policy.

Table B20. Percentages of teacher candidates who took the basic skills test, whose first record was during 2010–16, and who followed the pathway described in state policy, by pathway step outcome and race/ethnicity, 2010–19

Pathway step	All candidates (*n* = 26,163)	Hispanic candidates (*n* = 1,989)	Non-Hispanic candidates of color (*n* = 3,373)	White candidates (*n* = 19,705)
Basic skills test				
Passed the basic skills test and continued	68.1	59.8	62.4	71.4
Passed the basic skills test and stopped	20.5	18.0	17.7	20.0
Failed the basic skills test	11.4	22.2	19.8	8.6
Content knowledge test				
Did not attempt a content knowledge test	30.1	36.5	33.6	27.3
Passed a content knowledge test and continued	48.7	42.7	43.8	52.1
Passed a content knowledge test and stopped	18.8	14.9	18.1	18.9
Failed a content knowledge test	2.4	5.9	4.5	1.7
Certification and employment				
Not certificated	50.2	56.7	55.3	46.8
Certificated and employed	38.9	37.0	36.1	41.7
Certificated and not employed	10.9	6.3	8.6	11.5
Retention				
Not employed	61.1	63.0	63.9	58.3
Employed for only one year	1.2	1.6	0.7	1.2
Retained for one year	34.5	33.0	31.8	37.1
Not retained for one year	3.2	2.4	3.6	3.4

Note: Percentages might not sum to 100 because of rounding. Data for all candidates includes data for the 1,906 candidates for whom race/ethnicity information were missing.
Source: Authors' analysis based on Pearson Education, Washington E-Certification, and Washington S-275 Personnel data for 2010–19.