

APPENDICES

Appendix Table 1

Descriptive Statistics

Variables	Full Analytic Sample Mean	Analytic Sample Mean with Student and Subject Fixed Effects
Student		
Female	0.50	0.50
White	0.57	0.60
Black	0.09	0.08
Hispanic	0.16	0.14
Asian	0.08	0.08
Other race/ethnicity	0.10	0.10
Family SES	0.07	0.15
Math Achievement (Grade 9)	0.02	0.14
Math Teacher		
Alternative certificate	0.19	0.18
All students can be successful	3.34	3.35
Mistakes are okay	3.21	3.22
Make the subject interesting	2.75	2.76
Make the subject easy	2.92	2.92
Science Teacher		
Alternative certificate	0.29	0.28
All students can be successful	3.29	3.31
Mistakes are okay	3.12	3.13
Make the subject interesting	2.90	2.90
Make the subject easy	2.85	2.85

Source. High School Longitudinal Study of 2009 (HSLs:09).

Note. The data include data from ninth graders in HSLs:09. SES = socioeconomic status.

Appendix Table 2*Student Characteristics and Teachers with Alternative Certifications with Sampling Weights*

Student Characteristics	Math Teachers				Science Teachers			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Black	0.127*** (0.029)			0.114*** (0.030)	0.054 (0.044)			0.049 (0.041)
Hispanic	0.139*** (0.022)			0.128*** (0.023)	0.068* (0.026)			0.064* (0.026)
Asian	0.061 (0.031)			0.067* (0.032)	0.012 (0.026)			0.018 (0.026)
Other race/ethnicity	0.029 (0.024)			0.022 (0.023)	0.002 (0.023)			-0.001 (0.023)
SES (bottom tercile)		0.082*** (0.017)		0.023 (0.017)		0.037 (0.021)		0.008 (0.019)
SES (middle tercile)		0.044** (0.015)		0.023 (0.013)		0.026 (0.017)		0.015 (0.018)
Achievement (bottom tercile)			0.068** (0.022)	0.035 (0.023)			0.035 (0.030)	0.020 (0.028)
Achievement (middle tercile)			0.022 (0.015)	0.006 (0.015)			0.031 (0.017)	0.023 (0.016)
N (unique student)	21370	21370	21370	21370	21230	21230	21230	21230

Source. High School Longitudinal Study of 2009 (HSLs:09) * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Note. Standard errors in parentheses at the school level. The observation numbers have been rounded to the nearest 10 to meet disclosure risk requirements. Achievement = Math Achievement in 9th grade. SES = socioeconomic status. ATC = alternative teacher certificate. STEM = science, technology, engineering, and mathematics. FE = fixed effects.

Appendix Table 3*Association Between Alternative Teacher Certification and Classroom Learning Environments across Teacher Characteristics Using Multiple Imputations*

Variables	Classroom Learning Environments							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ATC (ref. Traditional)	-0.000 (0.044)	0.016 (0.066)	-0.010 (0.047)	0.056 (0.065)	0.056 (0.079)	-0.001 (0.060)	-0.054 (0.065)	0.104 (0.119)
ATC * Female teacher		-0.029 (0.080)						
ATC * Teacher of color			0.065 (0.116)					
ATC * Graduate degree				-0.110 (0.080)				
ATC * STEM					-0.088 (0.089)			
ATC * Experience						0.000 (0.005)		
ATC * Math							0.094 (0.077)	
ATC * Math Course (Regular) (ref. Remedial)								-0.107 (0.122)
ATC * Math Course (Advanced)								-0.116 (0.133)
Student FE	X	X	X	X	X	X	X	X
Subject FE	X	X	X	X	X	X	X	X
Teacher Controls	X	X	X	X	X	X	X	X
N (student-subject)	36590	36590	36590	36590	36590	36590	36590	36590

Source. High School Longitudinal Study of 2009 (HSLs:09)

Note. Standard errors in parentheses at the school level. The observation numbers have been rounded to the nearest 10 to meet disclosure risk requirements. The outcome is a composite measure based on four items: (1) teachers believe all students can be successful, (2) teachers view mistakes as acceptable as long as students learn from them, (3) teachers make the subject interesting, and (4) teachers make the subject easy to understand. Teacher-level controls include gender, race/ethnicity, graduate degree, STEM degree, and teaching experience.

Appendix Table 4

Association between Alternative Teacher Certification and Classroom Learning Environments Using Propensity Score Matching with Inverse Probability Weights across Teacher Characteristics and Math Tracks

Teacher Subgroups	Coefficients
All teachers	-0.021 (0.017)
Female teachers	-0.017 (0.024)
Male teachers	-0.019 (0.026)
Teachers of color	0.040 (0.047)
White teachers	-0.028 (0.019)
Teachers with graduate degree	-0.008 (0.024)
Teachers without graduate degree	0.037 (0.025)
Teachers with STEM major	-0.039 (0.021)
Teachers without STEM major	0.022 (0.030)
Math teachers	-0.099** (0.027)
Science teachers	0.028 (0.023)
Remedial math course	0.057 (0.088)
Regular math course	0.002 (0.023)
Advanced math course	-0.056 (0.030)

Source. High School Longitudinal Study of 2009 (HSL:09) ** $p < 0.01$

Note. Standard errors in parentheses at the school level. We applied inverse probability weighting to estimate the association between alternative teacher certification and classroom learning environments. The outcome is a composite measure based on four items: (1) teachers believe all students can be successful, (2) teachers view mistakes as acceptable as long as students learn from them, (3) teachers make the subject interesting, and (4) teachers make the subject easy to understand. Teacher-level controls include gender, race/ethnicity, graduate degree, STEM degree, and teaching experience.

Appendix Table 5

Associations Between Alternative Teacher Certification and Classroom Learning Environments across Teacher Characteristics

Variables	All Students can be Successful							Mistakes are Okay as Long as Students Learn						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
ATC	0.025	-0.013	0.036	0.018	-0.042	0.022		0.022	0.014	0.060	0.032	0.001	0.053*	-0.009
(ref. traditional)	(0.031)	(0.022)	(0.030)	(0.035)	(0.027)	(0.026)		(0.033)	(0.023)	(0.031)	(0.036)	(0.030)	(0.027)	(0.056)
ATC * Female teacher	-0.046							0.013						
	(0.040)							(0.042)						
ATC * Teacher of color		0.084							0.111*					
		(0.049)							(0.051)					
ATC * Graduate degree			-0.071							-0.060				
			(0.037)							(0.040)				
ATC * STEM				-0.027							-0.002			
				(0.043)							(0.045)			
ATC * Experience					0.005							0.003		
					(0.003)							(0.003)		
ATC * Math (ref. science)						-0.053							-0.056	
						(0.034)							(0.038)	
ATC * Math Course (regular) (ref. remedial)							-0.019							0.062
							(0.049)							(0.060)
ATC * Math Course (advanced)							-0.016							0.010
							(0.051)							(0.064)
Student FE	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Subject FE	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Teacher Controls	X	X	X	X	X	X	X	X	X	X	X	X	X	X
N (student-subject)	19930	19930	19930	19930	19930	19930	19930	20000	20000	20000	20000	20000	20000	20000

Source. High School Longitudinal Study of 2009 (HSL:09). * $p < 0.05$

Note. Standard errors in parentheses at the school level. The observation numbers have been rounded to the nearest 10 to meet disclosure risk requirements.

Achievement = math achievement in 9th grade. SES = socioeconomic status. ATC = alternative teacher certificate. STEM = science, technology, engineering, and mathematics. FE = fixed effects.

Appendix Table 6

Associations Between Alternative Teacher Certification and Classroom Learning Environments across Teacher Characteristics

Variables	Teachers Make Subject Interesting							Techers Make Subject Easy to Understand						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
ATC	0.015	-0.021	0.030	0.035	-0.008	0.059	0.106	-0.004	-0.039	0.024	0.023	-0.018	0.054	0.062
(ref. Traditional)	(0.058)	(0.042)	(0.055)	(0.066)	(0.052)	(0.048)	(0.082)	(0.052)	(0.035)	(0.047)	(0.054)	(0.046)	(0.042)	(0.068)
ATC * Female teacher	-0.052							-0.027						
	(0.071)							(0.063)						
ATC * Teacher of color		0.058							0.144					
		(0.103)							(0.091)					
ATC * Graduate degree			-0.083							-0.083				
			(0.066)							(0.060)				
ATC * STEM				-0.071							-0.063			
				(0.075)							(0.064)			
ATC * Experience					-0.000							-0.000		
					(0.005)							(0.004)		
ATC* Math						-0.169**							-0.175**	
(ref. science)						(0.061)							(0.054)	
ATC * Math Course														-0.091
(Regular)														
								-0.112						
(ref. remedial)								(0.086)						(0.072)
ATC * Math Course								-0.159						-0.082
(Advanced)														
								(0.094)						0.081
Student FE	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Subject FE	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Teacher Controls	X	X	X	X	X	X	X	X	X	X	X	X	X	X
N (student-subject)	20040	20040	20040	20040	20040	20040	20040	20070	20070	20070	20070	20070	20070	20070

Source. High School Longitudinal Study of 2009 (HSLS:09). * $p < 0.05$ ** $p < 0.01$

Note. Standard errors in parentheses at the school level. The observation numbers have been rounded to the nearest 10 to meet disclosure risk requirements.

Achievement = math achievement in 9th grade. SES = socioeconomic status. ATC = alternative teacher certificate. STEM = science, technology, engineering, and mathematics. FE = fixed effects.