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Teacher Preparation Experiences and Early Teaching Effectiveness APPENDICES

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NATIONAL CENTER FOR EDUCATION EVALUATION AND REGIONAL ASSISTANCE

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Appendix A. Teacher Survey Response Rates by District/State

Table A.1: Teacher Survey Response Rates by District/State (n = 30)

District/State	Number of Teachers Notified	Teacher Responses		Eligible Teachers	
		Number of Responses	Response Rate (%)	Number Eligible	Eligibility Rate (%)
1	77	67	87	30	45
2	15	13	87	4	31
3	364	304	84	252	83
4	45	36	80	17	47
5	245	179	73	31	17
6	63	44	70	24	55
7	265	183	69	74	40
8	167	115	69	77	67
9	1,480	942	64	281	30
10	411	251	61	99	39
11	164	97	59	50	52
12	277	158	57	116	73
13	2,421	1,371	57	552	40
14	77	43	56	33	77
15	596	327	55	184	56
16	191	102	53	75	74
17	552	291	53	208	71
18	129	66	51	37	56
19	111	56	50	33	59
20	69	34	49	28	82
21	108	51	47	25	49
22	343	145	42	52	36
23	177	71	40	52	73
24	196	73	37	61	84
25	1,072	345	32	175	51
26	92	28	30	26	93
27	3,734	1,122	30	620	55
28	98	17	17	16	94
29	1,230	186	15	55	30
30	296	12	4	7	58
Overall	15,065	6,729	45	3,294	49

NOTE: For the first 27 districts/states, the study team used data from the district/state to develop a list of potentially eligible teachers and fielded the survey to those teachers. The last three districts/states (27-30) did not want to share teacher contact information with the study team and so opted to send the survey link to teachers on the study's behalf.

TABLE READS: In District/State 1, of the 77 teachers who were notified, 67 (87 percent) responded to the survey. Of the teachers who responded, 30 (45 percent) were eligible.

Table A.2: Distribution of Teachers by Year in Analysis Samples (Full Sample and Subsample)

	First Year Teachers	Second Year Teachers	Third Year Teachers	Total
Full Sample	1,080	1,131	1,083	3,294
Subsample	763	895	875	2,533

TABLE READS: The distribution of teachers in the full sample was 1,080 first-year teachers, 1,131 second-year teachers, and 1,083 third-year teachers.

Appendix B. Comparison of the Subsample Used for Relational Analyses and the Full Sample

This appendix presents the results of analyses that compare the subsample of study teachers used for relational analyses (referred to hereafter as the relational sample) to the full sample of teachers who responded to the survey. Comparisons are presented on the geographic representation of states and preparation providers, the characteristics of districts, and the routes to certification and degree programs of teachers.

Fewer states are represented in the relational sample than in the full sample, but their geographic dispersion is similar.

The relational sample includes 14 states, four fewer than the full sample. The four states not in the relational sample but in the full sample are Alabama, Minnesota, Nevada, and Wisconsin. As in the full sample, the states that teachers taught in were spread across the country but the majority of them were in the southern and western regions of the United States. In both samples, the highest numbers of study teachers are (in descending order) in New York, Florida, Oklahoma, Georgia, Texas, and Illinois.

Both the relational sample and the full sample included a large number of preparation providers in almost all states.

Study teachers in the relational sample were prepared by 469 providers in 44 states (all states except Hawaii, Montana, North Dakota, Vermont, Washington, and Wyoming) and the District of Columbia and Puerto Rico, compared to 566 providers in 46 states (all states except Hawaii, Montana, Vermont, and Wyoming) and the District of Columbia and Puerto Rico in the full sample. The two states represented in the full sample but not in the relational sample are North Dakota and Washington.

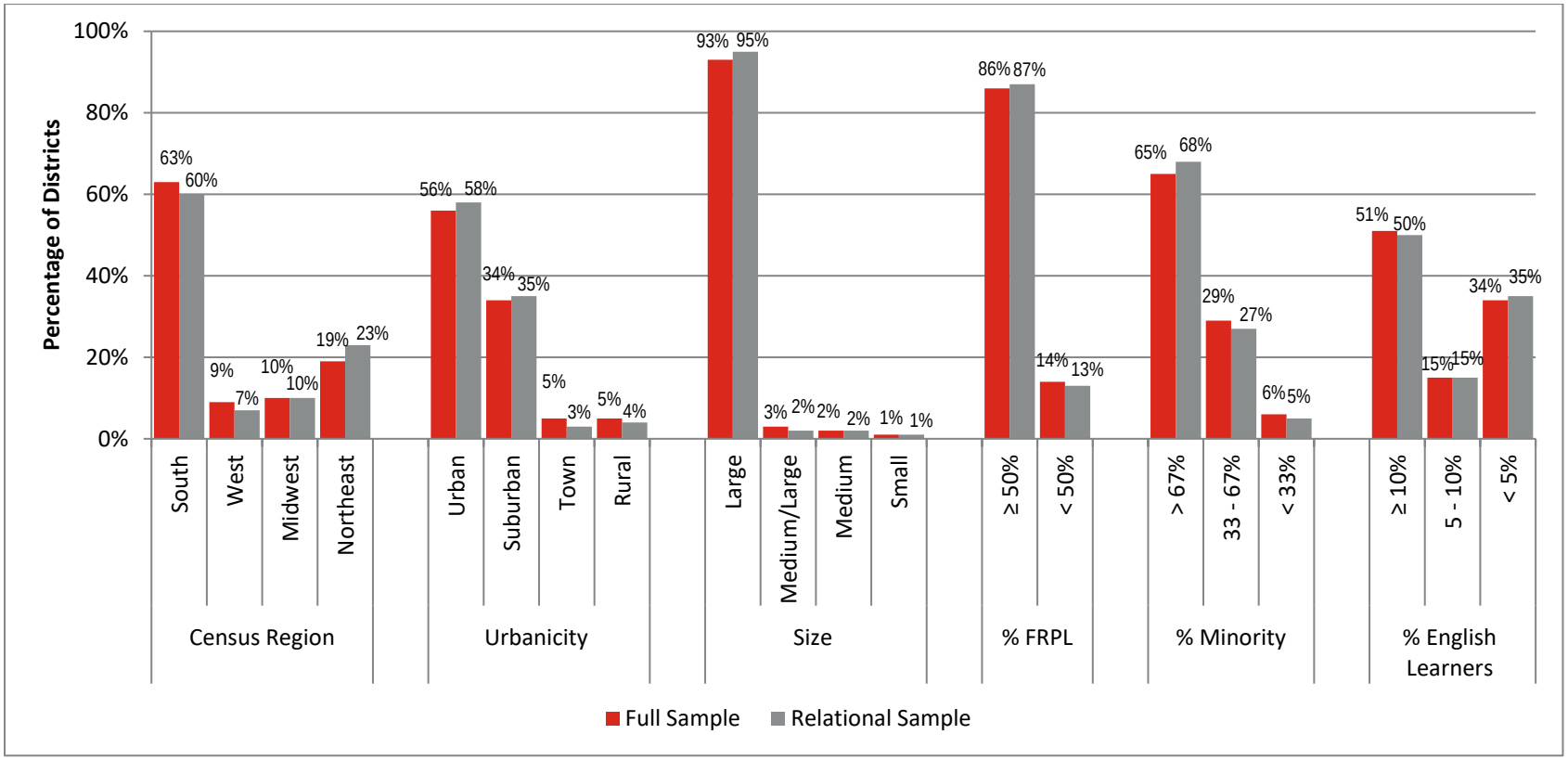
The characteristics of districts in which teacher taught were similar in the relational and the full sample.

Figure B.1 compares the characteristics of districts in the relational sample (n = 169) and those in the full sample (n = 242). District characteristics are weighted by the number of teachers in each district.

More than half of teachers in both the relational and full samples teach in districts that are in the South (63 and 60 percent, respectively) and nearly all serve more than 2,350 students (93 and 95 percent, respectively). Fifty-six and 58 percent of the districts in in which teachers taught in the relational sample and the full sample, respectively, are urban. For the relational sample, over four-fifths of teachers teach in districts where at least 50 percent of students who are eligible for free or reduced-price lunch (FRPL), and two-thirds of teachers teach in districts with 33 to 67 percent minority students. Those same characteristics for the full sample are almost identical. In both samples, about half of teachers teach in districts that have greater than 10 percent English learners.[1]

[1] Although some of these differences are statistically significant, it should be noted that when testing the statistical significance of differences between two large samples, small differences—such as 1 or 2 percentage points—can be statistically significant. The large sample sizes and the small size of the difference lead us to conclude that the characteristics of the districts in which teachers taught are similar for the two samples.

Figure B.1: Percentages of Study Districts by Demographic Characteristics in the Relational and Full Samples, Weighted by Number of Teachers



FRPL is free or reduced-price lunch eligibility, a proxy for low-income status.

NOTE: Characteristics are weighted by the number of study teachers in each district. District size classifications are based on quartiles of the national distribution of districts in the Common Core of Data as follows: "Large" > 2,350 students; "Mid-Size" 800–2,350 students; "Small" 300–799 students; "Very Small" < 300 students. Minority indicates any of the following races based on the CCD: American Indian/Alaska Native, Asian, Hispanic, Black, Two or More Races. Sample size differs across district characteristics in the full sample due to missing data in the CCD. From the full sample of 3,294 teachers in 242 districts, sample size varied from 3,290 to 3,294 teachers in 240 to 242 districts. Sample size is 2,533 in 169 districts in the relational sample. Chi-square tests for the equality of the distribution of census region, urbanicity, size, and percent minority rejected at the 5-percent significance level. Chi-square tests for the equality of the distribution of percent FRPL and percent English learners for the full and relational samples failed to reject at the 5-percent significance level.

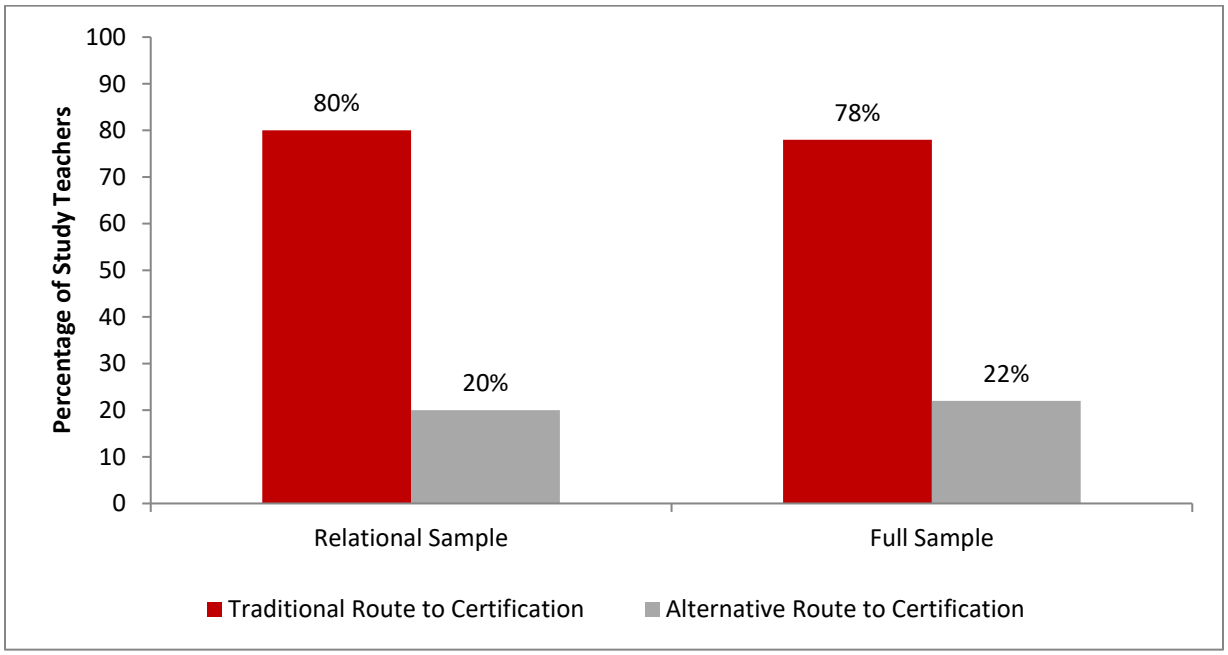
FIGURE READS: In the relational sample, 60 percent of study districts were in the South census region, 7 percent were in the West, 10 percent were in the Midwest, and 23 percent were in the Northeast. In the full sample, 63 percent of study districts were in the South census region, 9 percent were in the West, 10 percent were in the Midwest, and 19 percent were in the Northeast. The distribution of census regions was statistically significantly different for the relational and full samples.

SOURCE: U.S. Census for region. CCD for 2013–14 for urbanicity, size, percentages FRPL, minority, and English learners.

The percentages of teachers entering teaching through traditional and alternative routes to certification were similar for teachers in the relational and full samples.

Eighty (80) percent of teachers in the relational sample entered teaching through a traditional route to certification versus 78 percent in the full sample (figure B.2).[2]

Figure B.2: Percentage of Study Teachers by Certification Route in the Relational and Full Samples



NOTE: Sample size is 2,530 in the relational sample and 3,291 in the full sample. Route to certification information was missing for three study teachers as a result of survey nonresponse. A chi-square test for the equality of the distribution of routes to certification for the relational and full samples was rejected at the 5-percent significance level.
FIGURE READS: Eighty percent of teachers in the relational sample entered teaching through traditional routes to certification and 20 percent entered teaching through alternative routes to certification.
SOURCE: Study's teacher survey data, 2015.

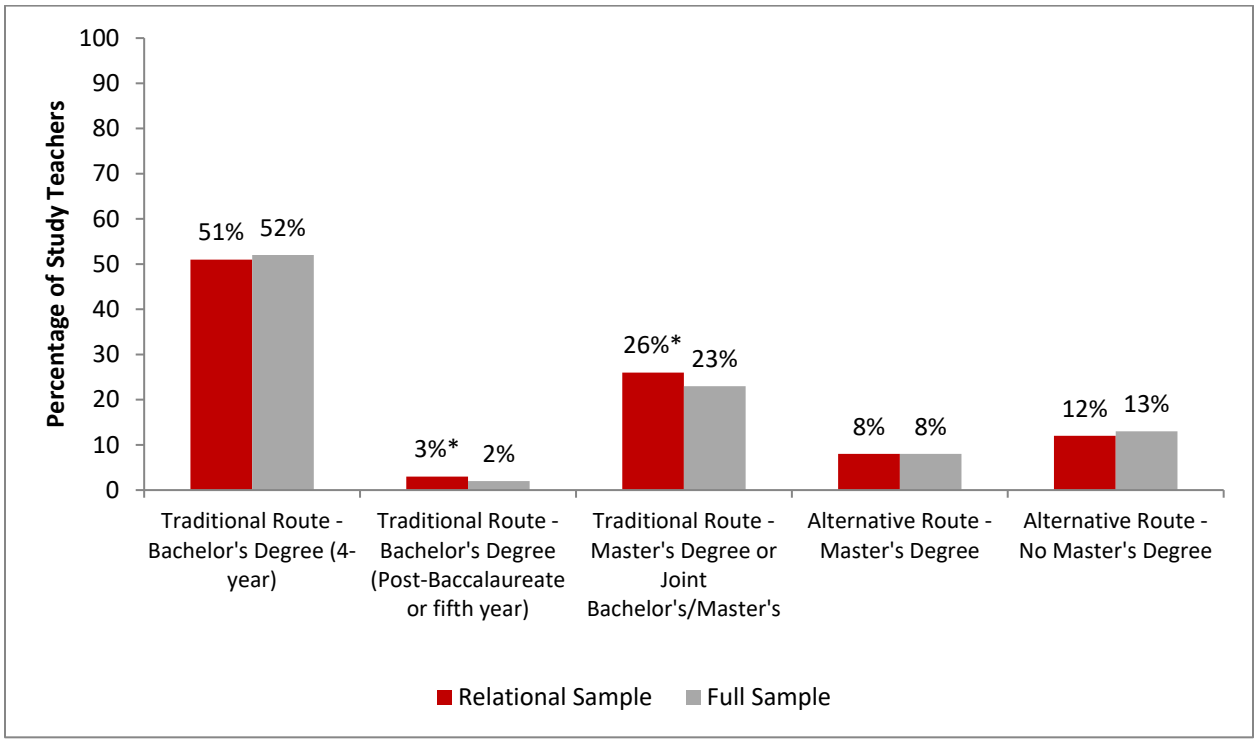
The percentages of teachers entering teaching through different types of degree programs were similar for teachers in the relational and full samples.

Fifty-one (51) percent of study teachers in the relational sample entered teaching through a traditional undergraduate program culminating in a four-year bachelor's degree, whereas the percentage was 52 in the full sample (figure B.3). Three (3) percent of teachers in the relational sample and 2 percent in the full sample entered teaching through a traditional post-baccalaureate or fifth-year program. Twenty-six (26) percent of teachers in the relational sample versus 23 percent in the full sample entered teaching through a traditional master's degree or a joint bachelor's/master's degree program. The remaining study teachers in the relational sample indicated that they entered teaching though an alternative route to certification, with

[2] Although this difference is statistically significant, it should be noted that when testing the statistical significance of differences between two large samples, small differences—such as 1 or 2 percentage points—can be statistically significant. The large sample sizes and the small size of the difference lead us to conclude that the routes to certification by which teachers entered teaching are similar for the two samples.

8 percent of the relational sample receiving a master's degree and 12 percent not receiving a master's degree. The percentages in the full sample were 8 and 13, respectively.[3]

Figure B.3: Percentage of Study Teachers by Degree Program in the Relational and Full Samples



* indicates a t-test rejects the null hypothesis of equivalence between the mean for teachers in the relational and full samples at the 5-percent significance level.
NOTE: Sample size is 2,530 in the relational sample and 3,291 in the full sample. Degree program information was missing for three study teachers as a result of survey nonresponse. Totals do not add to 100 percent due to rounding. Totals in this figure also do not match those in figure B.2 due to rounding.
FIGURE READS: Fifty-one percent of teachers in the relational sample and 52 percent in the full sample entered teaching through traditional routes to certification and obtained a bachelor's degree.
SOURCE: Study's teacher survey data, 2015.

[3] Although some of the differences described above were statistically significant, it should be noted that when testing the statistical significance of differences between two large samples, small differences—such as 1 or 2 percentage points—can be statistically significant. The large sample sizes and the small sizes of the differences lead us to conclude that the degree programs by which teachers entered teaching are similar for the two samples.

Appendix C. Development of the Teacher Survey

This appendix includes figures that are relevant to the development of the teacher survey and references in chapter 2 as well as a description of the cognitive testing that we conducted to ensure that the survey items would be understandable to teachers and that the survey format would be easy to navigate.

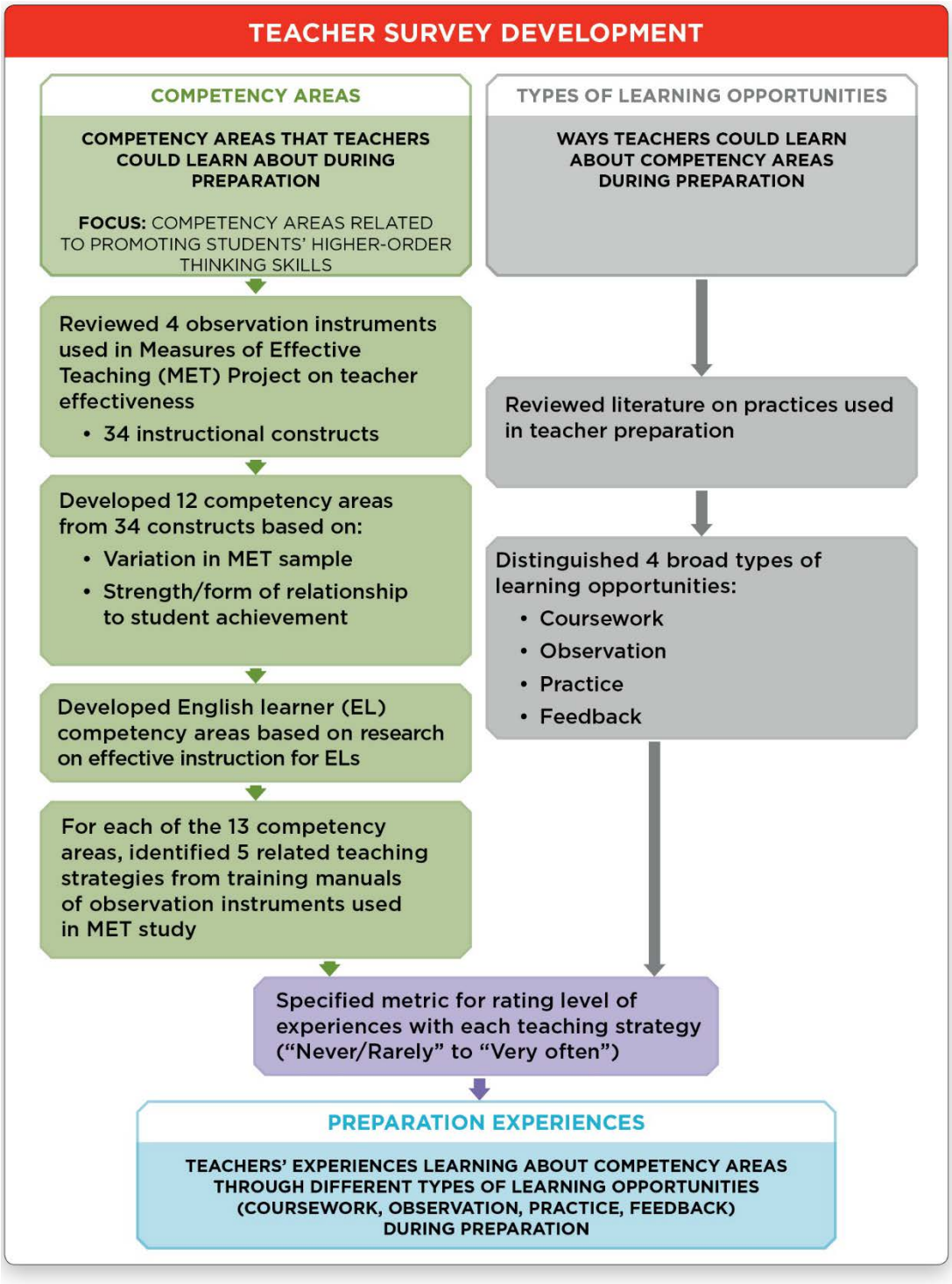
Table C.1 lists the constructs from the classroom observation instruments that were used in the Measures of Effective Teaching (MET) Project and on which we based the instructional strategies for each competency area in the survey.

Table C.1: Constructs in Classroom Observation Instruments Used in the MET Project

Framework for Teaching (FFT) *(Scale: 1 = Unsatisfactory, 2 = Basic, 3 = Proficient, 4 = Distinguished)*	Classroom Assessment Scoring System, K–3 (CLASS) *(Scale: 1/2 = Low, 3/4/5 = Medium, 6/7 = High)*
Domain 2 = Classroom Environment • Creating an environment of respect and rapport • Managing student behavior • Managing classroom procedures • Organizing physical space *Domain 3 = Instruction* • Establishing a culture for learning • Using assessment in instruction • Demonstrating flexibility and responsiveness • Engaging students in learning • Using questions and discussion techniques • Communicating with students	*Domain 1 = Emotional Support* • Positive climate • Teacher sensitivity • Regard for student perspectives *Domain 2 = Classroom Organization* • Behavior management • Productivity • Negative climate *Domain 3 = Instructional Support* • Instructional learning formats • Analysis and inquiry • Quality of feedback • Instructional dialogue • Content understanding
Protocol for Language Arts Teaching Observation–Prime (PLATO Prime) *(Scale: No evidence, Limited evidence, Evidence with some weaknesses, Consistently strong evidence)*	**Mathematical Quality Instruction Lite (MQI Lite)** *(Scale: Low, Medium, High)*
• Behavior management • Time management • Intellectual challenge • Classroom discourse • Strategy use and instruction • Modeling	• Classroom work connected to math • Absence of errors and imprecision • Explicitness and thoroughness • Working with students on mathematics • Richness of math content • Student participation in meaning-making and reasoning • Lesson-based guess at mathematical knowledge for teaching

Figure C.1 shows the steps that we used to construct the survey questions with competency areas and types of learning opportunities.

Figure C.1: Steps in Constructing the Survey Questions on Teacher Preparation Experiences



Cognitive Testing

We did two rounds of cognitive testing. The first round focused on teachers' understanding of the wording and content of the items in the grids. This round of cognitive testing was also used to obtain teacher feedback on the five-point frequency scale and whether they found it challenging to use a scale that only had labels at the endpoints. The second round focused on teachers' ability to navigate through the survey sections and to complete the multiple items within the survey grids.

Round 1

We conducted cognitive testing of the survey with six teachers in grades 4–6 who were in their first three years of teaching. We instructed the teachers to complete paper versions of the survey items on the competency areas (one survey grid for each) during a phone interview. Each survey question required the teacher to provide a frequency rating for each of five instructional strategies for each of four types of learning opportunities. After the teacher completed a survey question, we discussed the teacher's understanding of the meaning of the instructional strategies and of the distinctions among the learning opportunities, using a set of common probes. We also asked teachers about their perceptions of the five-point frequency scale, including whether they were comfortable selecting a point of the scale that described the frequency of their experiences and if they could distinguish different frequency levels across strategies and types of learning opportunities. Figure C.2 below provides the probes used about respondent understanding of the descriptions of the strategies in the grid for *productive use of classroom time*.

Figure C.2: Round 1 Cognitive Testing Probes for *Productive Use of Classroom Time*

1) The first instructional strategy is: Providing clear options/directions for students if they finish a task or in-class assignment early (e.g., students know which work centers to go to after they finish their work).
   - What does this look like to you in the classroom?
   - What teaching or instructional behaviors do you think about when you read this strategy? (Record teacher's description in the interviewer reporting form)
2) If the teacher describes student, rather than teacher behaviors, probe:
   - What would teacher behaviors look like? What might the teacher do? How might the teacher act?
3) If the teacher's description matches that of the developer, move on to the next strategy.
4) If the teacher's description is different from that of the developer, probe:
   - The developers of this strategy described it this way (read developer definition from interviewer reporting form).
   - What words in the strategy led you to think of the behaviors as you did?
   - What words might we have used to help you think about the strategy in a more similar way to what the developer intended? (Record suggested language in interviewer reporting form)
5) Move on to the next strategy.

The results of this round of cognitive testing showed that teachers in general recognized and felt that they understood the descriptions of the instructional strategies and were comfortable rating the frequency of preparation experiences that they received on these strategies separately for the different types of learning opportunities. Teachers did not report being confused or distracted by the vocabulary or concepts in the items. The fact that we pulled these items from commonly used instruments that teachers are familiar with to rate/describe instruction increased our confidence that teachers would find the language acceptable and understandable. We did make minor revisions to wording based on teachers' recommendations.

Round 2

We conducted a second round of testing using of the online version of the survey. This round of testing focused on teachers' understanding of how to complete the survey, using the instructions embedded in the online version. We were interested in whether the features of the online version, which we had introduced to reduce confusion and burden of the grid questions, did in fact make completing the survey reasonable for teachers. These features included visual cues, such as color-coding each grid as well as rows within grids; drop-down menus for each cell so that teachers could easily select their ratings; different options for moving through the items—tabs or arrow keys; and having the shading of a cell change color when it was completed to help teachers know which of the multiple cells in each grid had been answered.

We tested the online survey with five teachers in grades 4–6 who were in their first three years of teaching. Each of the five teachers completed the survey within 30 - 45 minutes. All teachers found it easy to navigate through the survey as well as within the grids, and found the grid instructions clear. The teachers made suggestions for reducing burden and adding encouragement within the grids, such as adding a meter that indicated the percentage of survey completion, highlighting certain sections of the grids, and adding hotlinks back to the instructions. We made these revisions before launching the survey to study teachers.

Appendix D. Teacher Survey Questions on Preparation Experiences

Study of Teacher Preparation Experiences and Early Teaching Effectiveness

Teacher Survey

Section 2: Teacher Preparation Experiences

*The next questions ask about your experiences while attending your teacher preparation program for your **initial certification**. Please consider all of your preparation experiences in the program you attended for initial certification, but **do not include experiences after you received your initial certification** such as experiences in a master's program or a program to obtain additional certifications. **These questions are the heart of the survey. This is the first time teachers are being asked about their preparation experiences in this way. We hope you find it interesting and value your responses to each question!***

Instructions**:* There are 13 questions in this section covering 13 competency areas. The rows on each question list teaching strategies specific to the competency area. The columns describe four types of learning opportunities. Use the drop-down menu to select a response category that best describes, for each instructional strategy, ***how often as part of your preparation program for **your initial certification** you had experience with the instructional strategy through each of the four types of learning opportunities. In the fifth column, for each instructional strategy, select the response category that describes ***how useful*** your preparation experiences have been for your classroom instruction.

Section 2: Teacher Preparation Experiences

(Question 1 of 13: Facilitating Extended Classroom Discussions)

	As part of your preparation program for *initial certification*, how often did you:																				How useful have your preparation experiences been for your classroom instruction?				
	Read about, hear about or see a role play of this strategy (such as during coursework)?					**Observe** a teacher using this strategy in a K-12 classroom (include videos and direct observations during your fieldwork or student teaching)?					**Practice** this strategy in a K-12 classroom prior to becoming a full-time teacher?					**Receive feedback** on your use of this strategy from program staff or a cooperating teacher that included information about what you did well/how you could improve?									
Teaching Strategies for *"Facilitating Extended Classroom Discussions"*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Have not used*	*Not useful*	*Somewhat useful*	*Useful*	*Very useful*
Holding extended classroom discussions about lesson content where students are asked to explain and defend their thinking, compare their ideas to others, brainstorm about new ideas, and formulate hypotheses.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Asking students to explain and clarify their ideas about academic content by using methods such as open-ended questions, repetition, or extension.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Using questioning and discussion techniques to challenge students to build logical arguments, challenge their premises, and critique the arguments of others.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Modeling "active listening" during classroom discussions, i.e., using non-verbal cues such as making eye contact, leaning forward, nodding.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Using methods such as open-ended questioning, repetition and extension to encourage students to use complex language to explain and clarify their ideas about academic content.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

Section 2: Teacher Preparation Experiences

(Question 2 of 13: Maintaining a Positive Classroom Climate)

	As part of your preparation program for *initial certification*, how often did you:																				How useful have your preparation experiences been for your classroom instruction?				
	Read about, hear about or see a role play of this strategy (such as during coursework)?					**Observe** a teacher using this strategy in a K-12 classroom (include videos and direct observations during your fieldwork or student teaching)?					**Practice** this strategy in a K-12 classroom prior to becoming a full-time teacher?					**Receive feedback** on your use of this strategy from program staff or a cooperating teacher that included information about what you did well/how you could improve?									
Teaching Strategies for *"Maintaining a Positive Classroom Climate"*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Have not used*	*Not useful*	*Somewhat useful*	*Useful*	*Very useful*
Communicating respect and warmth both in words and non-verbally (making eye contact, being in physical proximity) when interacting with individual students and the class as a whole.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Demonstrating knowledge of and interest in students' lives inside and outside of school.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Listening closely and with genuine interest when students talk and encouraging students to listen to each other.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Encouraging cooperation among students, such as working together and sharing materials.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Responding to students' efforts and participation with positive comments (e.g., "What a great idea!," "You guys are working together really well on that project.").	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

Section 2: Teacher Preparation Experiences

(Question 3 of 13: Productive Use of Classroom Time)

	As part of your preparation program for *initial certification*, how often did you:																				How useful have your preparation experiences been for your classroom instruction?				
	Read about, hear about or see a role play of this strategy (such as during coursework)?					**Observe** a teacher using this strategy in a K-12 classroom (include videos and direct observations during your fieldwork or student teaching)?					**Practice** this strategy in a K-12 classroom prior to becoming a full-time teacher?					**Receive feedback** on your use of this strategy from program staff or a cooperating teacher that included information about what you did well/how you could improve?									
Teaching Strategies for *"Productive Use of Classroom Time"*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Have not used*	*Not useful*	*Somewhat useful*	*Useful*	*Very useful*
Providing clear options/directions for students who finish class activities early (e.g., students have other activities to do when they finish their work).	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Providing clear guidance to students about what is expected during transitions between activities and different groupings to avoid losing instructional time to address student behavior.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Establishing procedures for students during whole-class discussions or activities to avoid losing instructional time to address student behavior (e.g., raising hands to talk in turn, listening actively to other students).	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Conveying what students are expected to do during a lesson when they are working independently or with peers without direct teacher supervision.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Teaching students to implement classroom routines such as distribution and collection of materials with minimum disruption to the flow of instruction.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

Section 2: Teacher Preparation Experiences

(Question 4 of 13: Demonstrating Sensitivity to Student Needs)

	As part of your preparation program for *initial certification*, how often did you:																				How useful have your preparation experiences been for your classroom instruction?				
	Read about, hear about or see a role play of this strategy (such as during coursework)?					**Observe** a teacher using this strategy in a K-12 classroom (include videos and direct observations during your fieldwork or student teaching)?					**Practice** this strategy in a K-12 classroom prior to becoming a full-time teacher?					**Receive feedback** on your use of this strategy from program staff or a cooperating teacher that included information about what you did well/how you could improve?									
Teaching Strategies for *"Demonstrating Sensitivity to Student Needs"*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Have not used*	*Not useful*	*Somewhat useful*	*Useful*	*Very useful*
Recognizing the signs that students may need extra support or assistance.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Checking in with students who are having difficulties with classroom activities or who are not engaged in the activities.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Providing individualized support to both students struggling with understanding content and students who need extra challenge.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Adjusting pacing and wait time during instruction if students need more time to understand a concept, process information, or complete an assignment.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Follow-up with students who have experienced difficulty to ensure that the additional assistance offered has met their needs.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

Section 2: Teacher Preparation Experiences

(Question 5 of 13: Conveying the Importance of Learning)

	As part of your preparation program for *initial certification*, how often did you:																				How useful have your preparation experiences been for your classroom instruction?				
	Read about, hear about or see a role play of this strategy (such as during coursework)?					**Observe** a teacher using this strategy in a K-12 classroom (include videos and direct observations during your fieldwork or student teaching)?					**Practice** this strategy in a K-12 classroom prior to becoming a full-time teacher?					**Receive feedback** on your use of this strategy from program staff or a cooperating teacher that included information about what you did well/how you could improve?									
Teaching Strategies for *"Conveying the Importance of Learning"*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Have not used*	*Not useful*	*Somewhat useful*	*Useful*	*Very useful*
Conveying to students the importance and value of the concepts and skills they are learning.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Conveying to students that their job in the classroom is to work hard and engage in learning.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Conveying high expectations for student participation and engagement in classroom tasks and activities.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Conveying the belief that all students are capable of learning challenging material if they work hard.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Conveying that students should take responsibility for the quality of their own work by initiating improvements, making revisions, or adding detail based on feedback from the teacher.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

Section 2: Teacher Preparation Experiences

(Question 6 of 13: Managing Student Behavior to Maximize Learning Time)

	As part of your preparation program for *initial certification*, how often did you:																				How useful have your preparation experiences been for your classroom instruction?				
	Read about, hear about or see a role play of this strategy (such as during coursework)?					**Observe** a teacher using this strategy in a K-12 classroom (include videos and direct observations during your fieldwork or student teaching)?					**Practice** this strategy in a K-12 classroom prior to becoming a full-time teacher?					**Receive feedback** on your use of this strategy from program staff or a cooperating teacher that included information about what you did well/how you could improve?									
Teaching Strategies for *"Managing Student Behavior to Maximize Learning Time"*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Have not used*	*Not useful*	*Somewhat useful*	*Useful*	*Very useful*
Providing consequences for misbehavior that are enforced in a consistent and predictable way, when and if necessary.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Redirecting misbehavior using nonverbal cues such as eye contact, gestures, or physical proximity to students.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Monitoring students to anticipate and redirect problem behavior to minimize loss of instructional time.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Encouraging students to monitor themselves, i.e., to be responsible for their own behavior.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Providing students with expectations for behavior that are clear, consistent and understood by everyone in the class.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

Section 2: Teacher Preparation Experiences

(Question 7 of 13: Building Comprehension of Academic Concepts)

	As part of your preparation program for *initial certification*, how often did you:																				How useful have your preparation experiences been for your classroom instruction?				
	Read about, hear about or see a role play of this strategy (such as during coursework)?					**Observe** a teacher using this strategy in a K-12 classroom (include videos and direct observations during your fieldwork or student teaching)?					**Practice** this strategy in a K-12 classroom prior to becoming a full-time teacher?					**Receive feedback** on your use of this strategy from program staff or a cooperating teacher that included information about what you did well/how you could improve?									
Teaching Strategies for *"Building Comprehension of Academic Concepts"*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Have not used*	*Not useful*	*Somewhat useful*	*Useful*	*Very useful*
Helping students understand and explain multiple perspectives about academic concepts, such as different views on immigration or global warming, and to support their position.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Anticipating areas where student misconceptions about content are likely and providing explanations that address the misconceptions.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Modeling the use of precise academic vocabulary and explaining its meaning.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Providing opportunities for students to practice using new strategies and processes in context and monitoring their understanding and appropriate use.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Requiring students to analyze and explain their ideas or answers about what they have read and written, for example, asking students to summarize and defend a position they have taken, using citations or other evidence.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

Section 2: Teacher Preparation Experiences

(Question 8 of 13: Providing Feedback that Helps Student Learning)

	As part of your preparation program for *initial certification*, how often did you:																				How useful have your preparation experiences been for your classroom instruction?				
	Read about, hear about or see a role play of this strategy (such as during coursework)?					**Observe** a teacher using this strategy in a K-12 classroom (include videos and direct observations during your fieldwork or student teaching)?					**Practice** this strategy in a K-12 classroom prior to becoming a full-time teacher?					**Receive feedback** on your use of this strategy from program staff or a cooperating teacher that included information about what you did well/how you could improve?									
Teaching Strategies for *"Providing Feedback that Helps Student Learning"*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Have not used*	*Not useful*	*Somewhat useful*	*Useful*	*Very useful*
Using questions, prompts and assessments to regularly monitor student understanding and diagnose misconceptions or errors in thinking.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Providing students with strategies and opportunities for monitoring their own understanding of academic concepts and learning progress.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Teaching students how to provide constructive review and criticism of each other's work.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Providing assistance, hints, or prompts that help students deepen their understanding of concepts or procedures and perform at a higher level.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Providing feedback that builds on learning by expanding on and clarifying student ideas, providing new information, and correcting any misstatements or misconceptions.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

Section 2: Teacher Preparation Experiences

(Question 9 of 13: Building Students' Higher-Order Thinking Skills)

	As part of your preparation program for *initial certification*, how often did you:																				How useful have your preparation experiences been for your classroom instruction?				
	Read about, hear about or see a role play of this strategy (such as during coursework)?					**Observe** a teacher using this strategy in a K-12 classroom (include videos and direct observations during your fieldwork or student teaching)?					**Practice** this strategy in a K-12 classroom prior to becoming a full-time teacher?					**Receive feedback** on your use of this strategy from program staff or a cooperating teacher that included information about what you did well/how you could improve?									
Instructional Strategies for *"Building Students' Higher-Order Thinking Skills"*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Have not used*	*Not useful*	*Somewhat useful*	*Useful*	*Very useful*
Presenting students with open-ended problems and tasks where there is not one correct answer or approach.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Modeling the problem-solving process for students by "thinking out loud" to bring students' attention to the steps they are expected to go through to derive a solution.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Asking students to explain or show their thinking—how they approached a given problem or task and how they arrived at their answer (e.g., doing a math problem at the board, arguing an interpretation of a poem or story).	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Providing assignments that engage students in content that is cognitively challenging, i.e., that requires them to make predictions, formulate hypotheses, or brainstorm.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Providing materials and resources that promote deeper learning, such as primary source materials in social studies, or articles or published documents in language arts.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

Section 2: Teacher Preparation Experiences

(Question 10 of 13: Designing and Using Assessments of Student Learning)

	As part of your preparation program for *initial certification*, how often did you:																				How useful have your preparation experiences been for your classroom instruction?				
	Read about, hear about or see a role play of this strategy (such as during coursework)?					**Observe** a teacher using this strategy in a K-12 classroom (include videos and direct observations during your fieldwork or student teaching)?					**Practice** this strategy in a K-12 classroom prior to becoming a full-time teacher?					**Receive feedback** on your use of this strategy from program staff or a cooperating teacher that included information about what you did well/how you could improve?									
Teaching Strategies for *"Designing and Using Assessments of Student Learning"*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Have not used*	*Not useful*	*Somewhat useful*	*Useful*	*Very useful*
Clearly defining assessment criteria for students.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Modifying assessments to meet the needs of individual students.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Using results of assessments to guide planning of future instruction.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Using questions, prompts and assessments to regularly diagnose student learning.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Providing students with opportunities to monitor their own understanding and progress.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

Section 2: Teacher Preparation Experiences

(Question 11 of 13: Effective English Language Arts Instruction)

Please answer the questions about your preparation experiences in English language arts, even if you are not currently teaching this subject area.

	As part of your preparation program for *initial certification*, how often did you:																								
	Read about, hear about or see a role play of this strategy (such as during coursework)?					**Observe** a teacher using this strategy in a K-12 classroom (include videos and direct observations during your fieldwork or student teaching)?					**Practice** this strategy in a K-12 classroom prior to becoming a full-time teacher?					**Receive feedback** on your use of this strategy from program staff or a cooperating teacher that included information about what you did well/how you could improve?					**How useful** have your preparation experiences been for your classroom instruction?				
Teaching Strategies for *"Effective English Language Arts Instruction"*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Have not used*	*Not useful*	*Somewhat useful*	*Useful*	*Very useful*
Teaching students strategies to help in reading comprehension, such as the use of graphic or semantic organizers, and monitoring students for correct application and use of these strategies.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Visibly enacting strategies, skills, and processes, for example, leading a "think aloud" to show students how to identify the theme of a story or how to support a statement with a citation from text.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Teaching students meta-cognitive strategies for monitoring their reading comprehension, such as pausing to ask themselves if they understood what they just read or what the author wanted them to know, and monitoring students for correct application and use of these strategies.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Providing students opportunities for guided reading during which they can apply newly-learned comprehension strategies and receive performance-based feedback on their performance.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

	As part of your preparation program for *initial certification*, how often did you:																				How useful have your preparation experiences been for your classroom instruction?				
	Read about, hear about or see a role play of this strategy (such as during coursework)?					**Observe** a teacher using this strategy in a K-12 classroom (include videos and direct observations during your fieldwork or student teaching)?					**Practice** this strategy in a K-12 classroom prior to becoming a full-time teacher?					**Receive feedback** on your use of this strategy from program staff or a cooperating teacher that included information about what you did well/how you could improve?									
Teaching Strategies for *"Effective English Language Arts Instruction"*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Have not used*	*Not useful*	*Somewhat useful*	*Useful*	*Very useful*
Providing language arts assignments that require students to analyze, infer, explain their ideas, or justify their answers, for example, assignments involving text analysis, summarizing and evaluating information for an argument, or taking a position and defending it.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

Section 2: Teacher Preparation Experiences

(Question 12 of 13: Effective Mathematics Instruction)

Please answer the questions about your preparation experiences in mathematics, even if you are not currently teaching this subject area.

	As part of your preparation program for *initial certification*, how often did you:																								
	Read about, hear about or see a role play of this strategy (such as during coursework)?					**Observe** a teacher using this strategy in a K-12 classroom (include videos and direct observations during your fieldwork or student teaching)?					**Practice** this strategy in a K-12 classroom prior to becoming a full-time teacher?					**Receive feedback** on your use of this strategy from program staff or a cooperating teacher that included information about what you did well/how you could improve?					**How useful** have your preparation experiences been for your classroom instruction?				
Teaching Strategies for *"Effective Mathematics Instruction"*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Have not used*	*Not useful*	*Somewhat useful*	*Useful*	*Very useful*
Helping students to use different mathematical approaches to solving a problem and explaining the advantages (efficiency, ease of use) and disadvantages of each.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Asking students to explain why their solution to a math problem works and how they know their answer is right.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Giving students problems to help them understand their thinking errors and what other methods might have worked better.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Identifying the source of student errors or misconceptions and helping students understand why their method of solving a math problem didn't work.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Helping students understand how they use math in their lives, e.g., when they have to figure out how to double a recipe or to calculate the probability of a team winning by more than 2 points.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

Section 2: Teacher Preparation Experiences

(Question 13 of 13: Instruction for English Learners)

	As part of your preparation program for *initial certification*, how often did you:																				How useful have your preparation experiences been for your classroom instruction?				
	Read about, hear about or see a role play of this strategy (such as during coursework)?					**Observe** a teacher using this strategy in a K-12 classroom (include videos and direct observations during your fieldwork or student teaching)?					**Practice** this strategy in a K-12 classroom prior to becoming a full-time teacher?					**Receive feedback** on your use of this strategy from program staff or a cooperating teacher that included information about what you did well/how you could improve?									
Teaching Strategies for *"Effective Instruction for English Learners"*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Rarely/Never*				*Very often*	*Have not used*	*Not useful*	*Somewhat useful*	*Useful*	*Very useful*
Teaching ELs word-learning strategies such as using cognates (words that share a common origin in multiple languages) or context clues, focusing on word parts, or practicing using different forms of a root word.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Facilitating discussions in which students have assigned roles to increase opportunities for ELs to talk about academic words.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Using strategies that help ELs process content and practice language, such as having students read and discuss short text passages, act out word meanings, or ask each other questions.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Using modeling, hands-on materials, visuals, demonstrations, gestures, and videos to engage ELs and to stimulate group discussion.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Creating small groups of students with varying levels of English proficiency so that students with stronger English skills can provide language models for less proficient students.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

Appendix E. Measures of Preparation Experiences

As depicted in appendix D, the survey asked novice teachers about experiences they obtained as part of their preparation program for initial teacher certification. Within each of the 13 competency areas, teachers described the frequency of their preparation experiences with five instructional strategies by assigning a rating from 1 to 5, where higher scores imply more frequent experiences. Instead of asking teachers to rate the overall frequency of their experiences related to a strategy, the survey asked teachers about the frequency of experiences with each strategy through four types of learning opportunities: (1) Coursework: reading or hearing about, or seeing a role play of the strategy (such as during coursework); (2) Observation: observing a teacher using the strategy in a K–12 classroom; (3) Practice: practicing the strategy themselves in a K–12 classroom; or (4) Feedback: receiving feedback from a supervisor/mentor teacher on their use of the strategy.

This approach yielded 260 separate ratings from each teacher, because teachers rated the frequency of their preparation experiences related to 65 strategies for each of the four types of learning opportunities. Because this is too much data to report directly, we created three types of average frequencies for analysis and reporting.

1. First, we computed an *average frequency of preparation experiences obtained about each of the competency areas through each of the four types of learning opportunities.* These scores represent the average frequency of preparation experiences obtained across the five instructional strategies within each competency area for each type of learning opportunity separately. For example, figure E.1 shows an average frequency of preparation experiences obtained with the competency area across the five strategies through Coursework of 3.6, through Observation of 3.0, through Practice of 2.0, and through Feedback of 1.6. Each teacher had **52 scores** corresponding to the 13 competency areas and four types of learning opportunities. We report the results of these scores in chapter 3, figure 3.1.

2. Second, we computed an *average frequency of preparation experiences for each of the 13 competency areas.* These scores represent the average frequency of preparation obtained about a competency area across the five instructional strategies *and* four types of learning opportunities. In figure E.1, this average is shown as 2.6, which is the average of the 20 ratings in the grid. Each teacher had **13 scores** corresponding to the 13 competency areas. Because these scores represent the average frequency of preparation experiences obtained about a competency area *regardless of the type of learning opportunity*, teachers with the same or similar scores for a competency area could have obtained these preparation experiences through different frequencies of Coursework, Observation, Practice, and Feedback. We report these scores as the sample averages for each competency in chapter 3, figure 3.2.

3. Third, we computed an *average frequency of preparation experiences for each of the four types of learning opportunities*. These scores represent the average frequency of preparation experiences obtained through a learning opportunity across all 65 instructional strategies (five for each of 13 competency areas). For example, figure E.1 shows an average frequency of preparation experiences obtained through Coursework of 3.6 for the competency area. For each teacher, we averaged her/his average frequency score through a learning opportunity across all 13 competency areas. This resulted in **four scores** per teacher—one each in Coursework, Observation, Practice, and Feedback. Because these scores represent the average frequency of preparation experiences obtained through a type of learning opportunity *regardless of the*

competency area, teachers with the same or similar scores for a learning opportunity could have obtained these preparation experiences through different frequencies of the 13 competency areas. The average frequencies for the types of learning opportunities do not, in and of themselves, provide any information about how the frequency of any one of the types of learning opportunities is related to the frequencies of the other types of learning opportunities. We report these scores as the sample averages for each type of learning opportunity in chapter 3, figure 3.5.

Figure E.1: Average Frequencies of Preparation Experiences Obtained About a Competency Area Through Four Types of Learning Opportunities

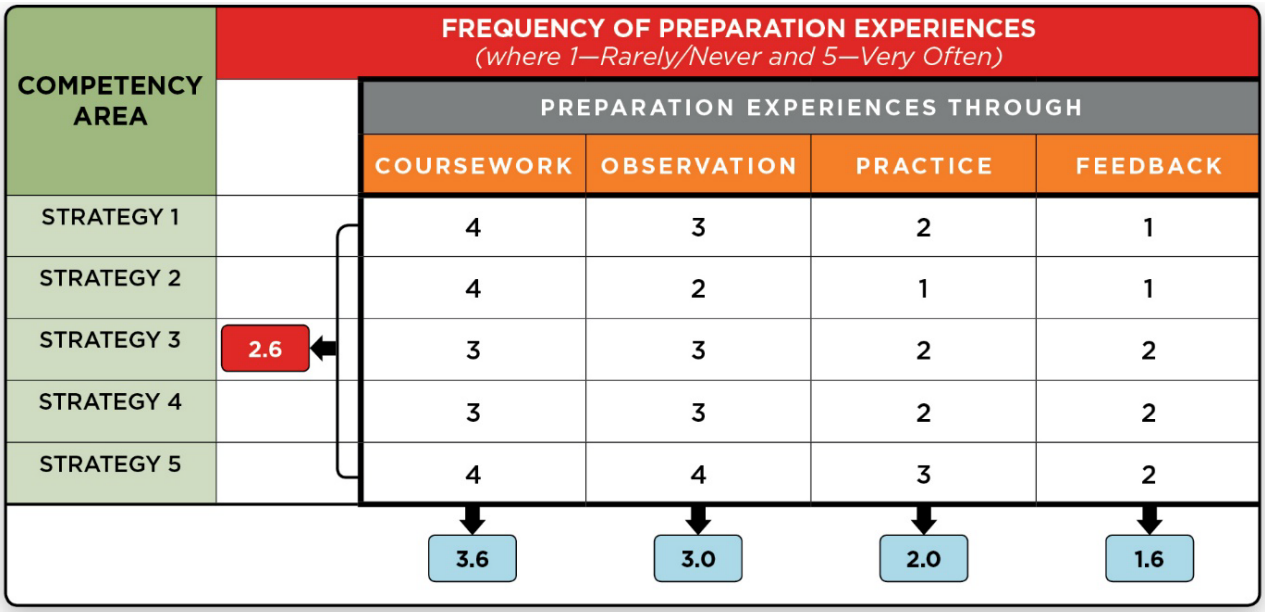


Table E.1: Measures of Teacher Preparation Experiences Derived From Exploratory Factor Analyses

Ratings of Preparation Experiences With Two Broad Categories of Preparation Experiences *Calculation Method: 4 ratings (one for each type of learning opportunity) for each of the 2 broad categories*	
1.	Creating a Productive Learning Environment—Coursework
2.	Creating a Productive Learning Environment—Observation
3.	Creating a Productive Learning Environment—Practice
4.	Creating a Productive Learning Environment—Feedback
5.	Promoting Analytic Thinking Skills—Coursework
6.	Promoting Analytic Thinking Skills—Observation
7.	Promoting Analytic Thinking Skills—Practice
8.	Promoting Analytic Thinking Skills—Feedback

Appendix F. Teachers' Assessment of the Usefulness of Preparation Experiences

The teacher survey asked teachers to rate how useful their preparation experiences with each of five instructional strategies for each of the 13 competency areas (65 strategies total) had been now that they were in the classroom[4] (table F.1). We conducted analyses of teachers' responses to the usefulness of their preparation experiences to provide context to the analyses presented in chapter 3 that examine the frequency and variation in those experiences.

Table F.1: Average Measures of Usefulness

Ratings of Usefulness of Preparation Experiences With 13 Competency Areas (Combined Across Types of Learning Opportunities) *Calculation Method: Average of 5 usefulness ratings for each competency area: 1 rating for each of 5 instructional strategies representing that competency area*	
1.	Usefulness of preparation experiences received about Facilitating Extended Classroom Discussions
2.	Usefulness of preparation experiences received about Maintaining A Positive Classroom Climate
3.	Usefulness of preparation experiences received about Productive Use Of Time In The Classroom
4.	Usefulness of preparation experiences received about Demonstrating Sensitivity To Student Needs
5.	Usefulness of preparation experiences received about Conveying The Importance Of Learning
6.	Usefulness of preparation experiences received about Managing Student Behavior To Maximize Learning Time
7.	Usefulness of preparation experiences received about Building Comprehension Of Academic Concepts
8.	Usefulness of preparation experiences received about Providing Feedback That Helps Student Learning
9.	Usefulness of preparation experiences received about Building Students' Higher-Order Thinking Skills
10.	Usefulness of preparation experiences received about Designing And Using Assessments Of Student Learning
11.	Usefulness of preparation experiences received about Effective English Language Arts Instruction
12.	Usefulness of preparation experiences received about Effective Mathematics Instruction
13.	Usefulness of preparation experiences received about Effective Instruction For English Learners

Teachers ranked the usefulness of each instructional strategy on a five-point scale, where 1 = "Have not used," 2 = "Not useful," 3 = Somewhat useful," 4 = "Useful," and 5 = "Very useful" (see figure 2.7 in chapter 2 for an example set of survey items, for the competency Maintaining a Positive Classroom Climate). The average rating of usefulness for a competency area is the average of the usefulness ratings across the five instructional strategies for that competency area.

> **Teachers reported that their preparation experiences were at least *somewhat useful,* on average.**

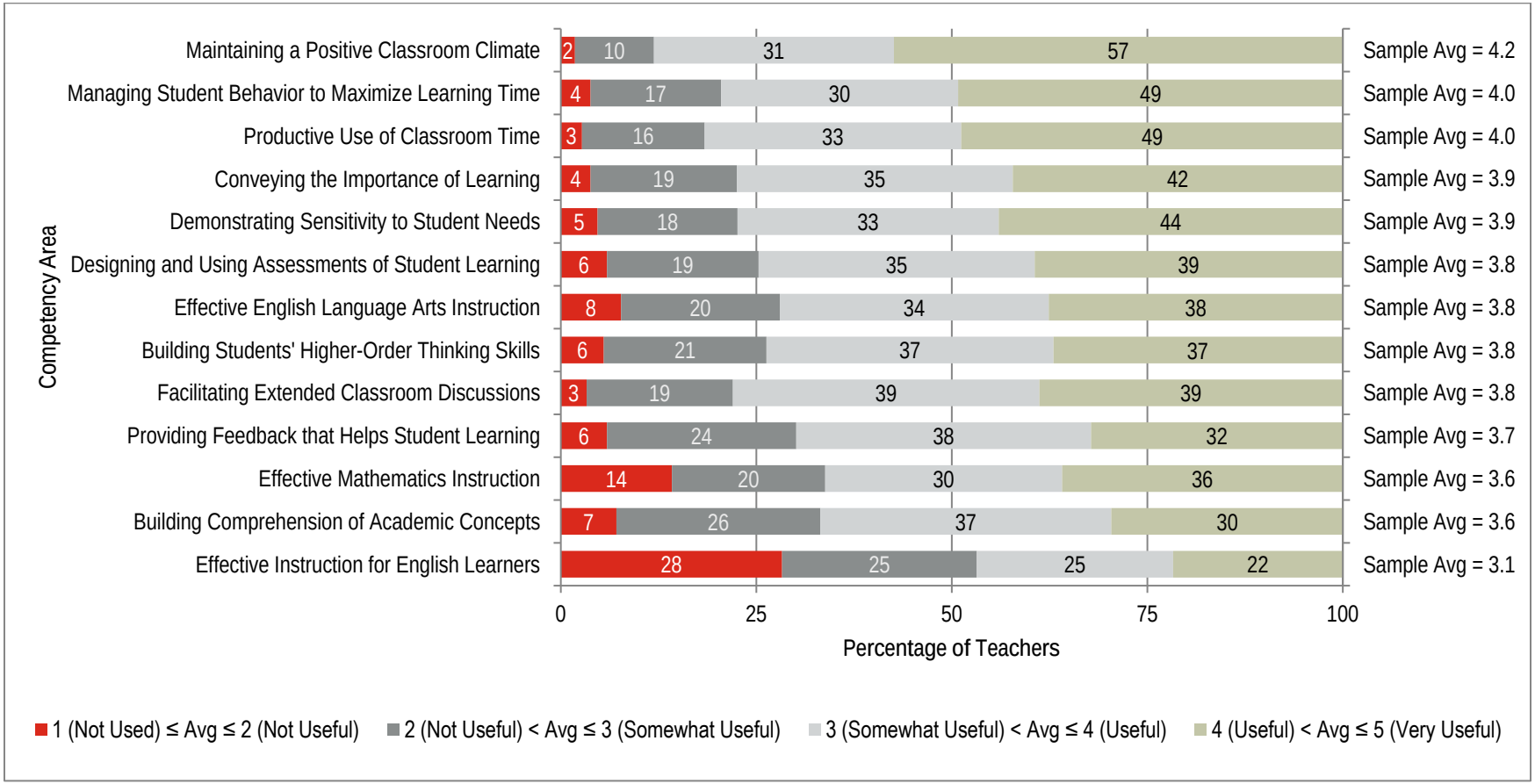
Average usefulness ratings reported by teachers across the 13 competency areas were greater than 3 on the five-point scale (see figure F.1). Maintaining a Positive Classroom Climate had the highest average rating (4.2) and Effective Instruction for English Learners had the lowest average rating (3.1).

[4] The survey asked teachers to rate the usefulness of each instructional strategy within a competency area without considering the type of learning opportunity.

A majority of teachers rated their preparation experiences with all but one competency area as more than *somewhat useful*. The exception was Effective Instruction for English Learners.

Between 88 and 67 percent of teachers—yielded by summing the two rightmost sections of each bar in figure F.1—reported a rating greater than 3 on the five-point scale. Only 47 percent of teachers rated the competency area Effective Instruction for English Learners as more than *somewhat useful*. In fact, 28 percent of teachers rated this competency area as *not used* or *not useful.*

Figure F.1: Teacher-Reported Average Usefulness Ratings of Preparation Experiences by Competency Area



NOTE: Teachers rated the usefulness of each of a competency area's five instructional strategies across all four types of learning opportunities. Responses ranged from 1 to 5, where 1 = "Have not used," 2 = "Not useful," 3 = "Somewhat useful," 4 = "Useful," and 5 = "Very useful." The average usefulness rating for each competency area is the average of the usefulness ratings across the five instructional strategies for that competency area. This figure shows the proportion of teachers in four groups based on their average usefulness rating for each competency area. Sample size varied between 3,254 and 3,287 due to nonresponse.
FIGURE READS: The average usefulness of preparation experiences with Maintaining a Positive Classroom Climate was greater than or equal to 1 and less than or equal to 2 on the five-point scale for 2 percent of teachers.
SOURCE: Study's teacher survey data, 2015.

Teachers' usefulness ratings for each of the 13 competency areas were strongly related to their ratings of the frequency of those preparation experiences.

The correlations of the frequency of preparation experiences with each of the 13 competency areas ranged from .78 to .85, with the lowest correlation for Managing Student Behavior to Maximize Student Learning and the highest for Effective Instruction for English Learners (table F.2).

Table F.2: Correlations Between Teacher-Reported Usefulness Ratings and Ratings of the Frequency of Their Preparation Experiences With the 13 Competency Areas (in Order of Increasing Correlation)

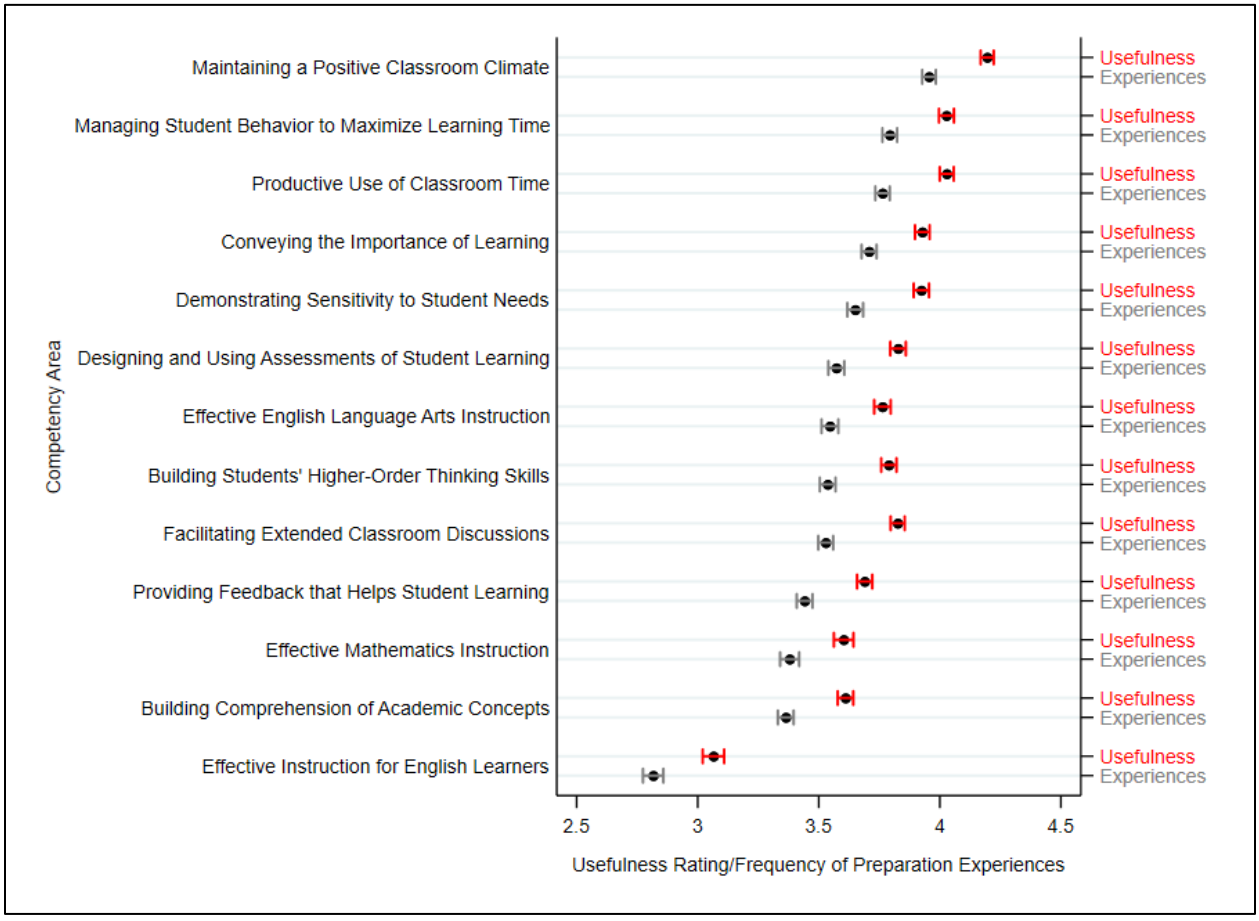
	Correlation with Teachers' Usefulness Ratings
Competency Area	
Managing Student Behavior to Maximize Learning Time	.78**
Maintaining a Positive Classroom Climate	.79**
Productive Use of Classroom Time	.79**
Conveying the Importance of Learning	.81**
Demonstrating Sensitivity to Student Needs	.82**
Designing and Using Assessments of Student Learning	.82**
Effective English Language Arts Instruction	.84**
Building Students' Higher-Order Thinking Skills	.83**
Facilitating Extended Classroom Discussions	.82**
Providing Feedback That Helps Student Learning	.84**
Effective Mathematics Instruction	.85**
Building Comprehension of Academic Concepts	.83**
Effective Instruction for English Learners	.85**

** $p < .01$.
NOTE: Competency area ratings are an average of teachers' rating across all four types of learning opportunities (Coursework, Observation, Practice, and Feedback).
TABLE READS: The correlation between the average usefulness rating and the average frequency rating of preparation experiences with Maintaining a Positive Classroom Environment was .79.
SOURCE: Study's teacher survey data, 2015.

Teachers tended to rate usefulness higher for competency areas for which they reported more preparation experiences (figure F.2). This could indicate that the practices that preparation programs focus on are subsequently more useful to teachers in the classroom than are less-emphasized practices. However, it also could reflect a reporting bias whereby teachers tended to use the same rating for frequency and usefulness when considering their preparation experiences with a competency area.

We did not see any evidence that usefulness ratings varied among teachers with similar ratings of frequency of preparation experiences. That is, teachers who reported receiving more frequent preparation experiences for a competency area also consistently rated those preparation experiences as more useful. In other words, there was little variation in the usefulness ratings to suggest that some teachers were getting *more frequent* preparation experiences but the experiences were *less highly useful* or *less high-quality* and ultimately might not be as likely to be positively related to teaching effectiveness.

Figure F.2: Means and 95 Percent Confidence Intervals for Teacher-Reported Usefulness Ratings and Ratings of the Frequency of Their Preparation Experiences With the 13 Competency Areas (in Order of Increasing Usefulness)



NOTE: Teachers' responses to the survey questions about usefulness of preparation experiences ranged from 1 to 5, where 1 = "Have not used" and 5 = "Very useful." Teachers' responses to the survey questions about frequency of preparation experiences ranged from 1 to 5, where 1 = "Rarely/Never" and 5 = "Very often." The 13 competency areas are listed in order of highest to lowest average score. Sample size varied between 3,249 and 3,289 due to nonresponse.
FIGURE READS: The average rating of usefulness of preparation experiences with Maintaining a Positive Classroom Climate was 4.2. The average rating of the frequency of preparation experiences with Maintaining a Positive Classroom Climate was 4.0.
SOURCE: Study's teacher survey data, 2015.

Appendix G. Factor Analysis Methodology

The methodology for creating the two broad categories of preparation experiences was a two-stage exploratory factor analysis. In the first stage, we examined the factor structure among the 65 individual survey items that comprised the 13 competency areas separately within each of the four types of learning opportunities. The first-stage exploratory factor analysis reduced the set of 65 individual strategies to a set of 11 competency areas.[5] We created factor scores for the 11 competency areas using SAS Proc Factor (version 9.4) after applying an oblique (promax) rotation. This process creates factor scores as weighted means of the individual strategy items, where weights are proportional to the factor loadings. We calculated Cronbach's alpha to measure the internal reliability of the strategies that made up each competency area.[6] The alpha coefficients ranged from 0.87 to 0.97 across the 44 competency area measures (11 competency area measures within each of the four types of learning opportunities).

The second-stage analysis reduced the set of 11 competency areas within each type of learning opportunity to two broad categories (see table G.1). Of the 11 competency areas, 8 loaded heavily on one or the other of the two broad categories for all four types of learning opportunities (Coursework, Observation, Practice, Feedback). We defined "heavily" as when a competency area had factor loadings that were larger than 0.40 and were more than 1.5 times as large as their loadings for the other broad category. The three remaining competency areas loaded heavily on one of the two broad categories for only one or two of the types of learning opportunities (and did not load heavily on the other category for any of the types of learning opportunities). Specifically, Demonstrating Sensitivity to Student Needs loaded heavily on *creating a productive learning environment* only for Coursework; Facilitating Extended Classroom Discourse loaded heavily on *promoting analytic thinking skills* only for Observation and Practice; and Designing and Using Assessments of Student Learning loaded heavily on *promoting analytic thinking skills* only for Coursework and Practice (see table G.2).

We created factor scores for the two broad categories within each type of learning opportunity as described for the first-stage analysis. For each of the broad categories, we calculated a factor score by weighting the means of the 11 competency areas proportional to their factor loadings. For ease of interpretation, we re-scaled the factor scores of the two broad categories to make them roughly equivalent to the scale of the original strategy items that ranged from 1 = "Rarely/Never" to 5 = "Very often." Re-scaling had no effect on the inferences from the relational analyses relating preparation experiences to teaching effectiveness, but re-scaling facilitated interpretation of the regression coefficients from those relational models. Cronbach's alpha ranged from 0.96 to 0.98 across the eight broad category measures (two measures within each of four types of learning opportunities).

[5] Decisions regarding the number of factors to retain were based on results from the revised version of Velicer's MAP test described in O'Connor (2000).

[6] Each strategy loaded most highly onto a single competency area. We define the set of strategies that make up a competency area as the set that has their largest factor loading on that competency area.

Table G.1: Loading of 11 Competency Areas on Two Broad Categories

	Two Broad Categories From Second-Stage Factor Analysis	
	Creating a Productive Learning Environment	*Promoting Analytic Thinking Skills*
Of the 11 competency areas from the first-stage factor analysis, 8 loaded heavily on only one of the two broad categories across all four types of learning opportunities	1) Maintaining a Positive Classroom Climate 2) Managing Student Behavior to Maximize Learning Time 3) Productive Use of Classroom Time 4) Conveying the Importance of Learning	5) Building Comprehension of Academic Concepts / Building Students' Higher-Order Thinking Skills / Providing Feedback That Helps Student Learning 6) Effective ELA Instruction 7) Effective Math Instruction 8) Effective Instruction for English Learners
Of the 11 competency areas from the first-stage factor analysis, 3 loaded heavily on the two broad categories across the four types of learning opportunities	9) Demonstrating Sensitivity to Student Needs (Coursework only)	10) Facilitating Extended Classroom Discussions (Observation, Practice) 11) Designing and Using Assessments of Student Learning (Coursework, Practice)

Table G.2: Items and Loading Used to Create Two Broad Categories Within Each Type of Learning Opportunity

Competency Area	Coursework		Observation		Practice		Feedback	
	Creating a Productive Learning Environment	***Promoting Analytic Thinking Skills***	***Creating a Productive Learning Environment***	***Promoting Analytic Thinking Skills***	***Creating a Productive Learning Environment***	***Promoting Analytic Thinking Skills***	***Creating a Productive Learning Environment***	***Promoting Analytic Thinking Skills***
Maintaining a Positive Classroom Climate	0.64*	0.10	0.69*	0.07	0.69*	0.06	0.63*	0.13
Managing Student Behavior to Maximize Learning Time	0.55*	0.16	0.66*	0.08	0.68*	0.08	0.58*	0.17
Productive Use of Classroom Time	0.73*	0.03	0.71*	0.05	0.61*	0.10	0.60*	–0.01
Conveying the Importance of Learning	0.58*	0.15	0.53*	0.22	0.55*	0.21	0.52*	0.23
Demonstrating Sensitivity to Student Needs	0.51*	0.15	0.27	0.33*	0.27	0.32*	0.38*	0.29
Facilitating Extended Classroom Discussions	0.31	0.35*	0.27	0.41*	0.17	0.47*	0.35*	0.34
Designing and Using Assessments of Student Learning	0.20	0.49*	0.35	0.35*	0.34*	0.34	0.26	0.41*
Building Students' Higher-Order Thinking Skills / Providing Feedback That Helps Student Learning / Building Comprehension of Academic Concepts	0.25	0.62*	0.24	0.65*	0.21	0.67*	0.18	0.66*
Effective ELA Instruction	0.10	0.64*	0.24	0.52*	0.22	0.54*	0.17	0.57*
Effective Math Instruction	0.09	0.54*	0.20	0.49*	0.21	0.46*	0.14	0.53*
Effective Instruction for English Learners	0.04	0.50*	0.06	0.61*	0.02	0.59*	–0.01	0.58*

NOTE: Loading "heavily" is defined as when a competency area had factor loadings that were larger than 0.40 and were more than 1.5 times as large as their loadings for the other broad category.

Key

	Competency loads "heavily" on *creating a productive learning environment*
	Competency loads "heavily" on *promoting analytic thinking skills*

Appendix H. Assessing Measurement Error in Teacher Survey Responses

In this section, we present more detailed results of analyses that examined variation in preparation experiences associated with teachers' route to certification, which we conducted to help assess the measurement error in the survey. We expected that teachers certified through traditional routes would report more preparation experiences than would teachers certified through alternative routes, since teachers certified through traditional routes generally spend more time in their preparation programs and complete their programs prior to becoming teachers of record. If teachers' reported experiences are related to providers, it supports the assumption that the observed variation in teachers' survey is systematic and not solely the result of measurement error. Variation that arises from measurement error would not be correlated with a teacher's provider. The analyses showed that teachers prepared through traditional routes to certification reported more preparation experiences with 12 of the 13 competency areas than did teachers certified through alternative routes to certification, which contributed to our confidence that the variation in teacher responses was systematic. Our approach to and results of the analysis are described below.

We compared the preparation experiences of teachers in traditional routes to certification, alternative routes to certification excluding Teach For America (TFA), and TFA.[7] We separated TFA from other alternative routes to certification because it has been the most studied alternative route and has been shown to be associated with higher student achievement, specifically in math (Clark et al. 2013, 2015; Decker, Mayer, and Glazerman 2004).[8]

Teachers prepared through traditional routes to certification reported more frequent preparation experiences with 12 of the 13 competency areas than did teachers certified through alternative routes to certification. For example, as shown in figure H.1, teachers certified through traditional routes reported an average rating for Maintaining a Positive Classroom Climate of 4.1, compared to a rating of 3.5 and 3.4 for those certified through non-TFA and TFA alternative routes, respectively.[9] The frequency of preparation experiences of the two groups of teachers trained through alternative routes to certification were not significantly different from each other for 7 of the 13 competency areas. The difference between

[7] The study sample included 2,578 teachers from traditional routes to certification, 628 teachers from non-TFA alternative routes to certification, and 85 teachers from TFA. Information on route to certification was not available for three teachers. We tested the statistical significance of the differences in the experiences measures across the three groups, as well as the differences between any two of the groups, using two-sided tests that accounted for the clustering of teachers within sites. See table H.1 for the *p*-values from these tests.

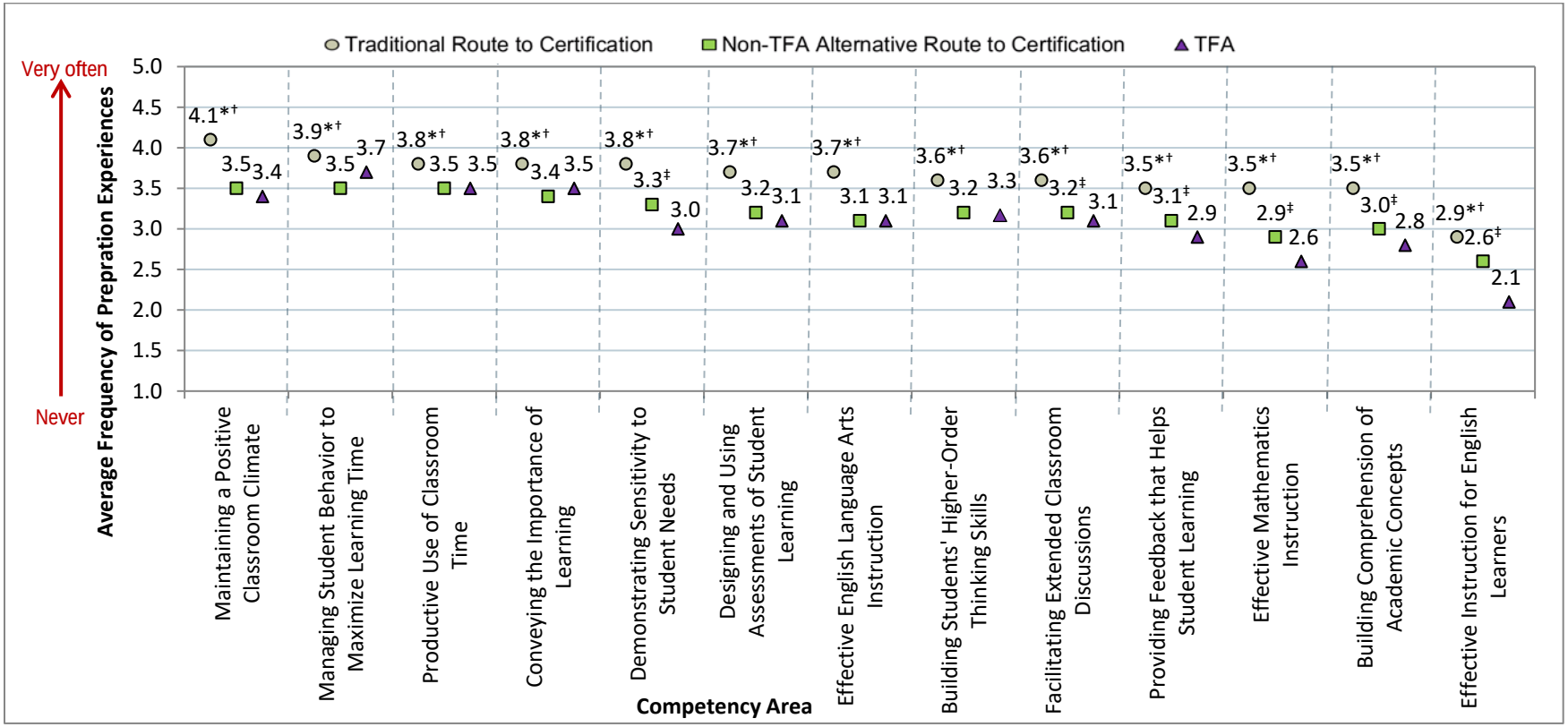
[8] The differences in the effectiveness of non-TFA teachers and their TFA colleagues could reflect differences in their preparation as well as differences in individual characteristics, which could be the result of the recruitment process used by TFA.

[9] For 12 of the 13 competency areas, the differences between the preparation experiences of teachers from traditional routes to certification and teachers from non-TFA or TFA alternative routes to certification were statistically significant at the $p < .05$ level (all values $p < .01$). The exception was the difference between teachers from traditional routes to certification and TFA teachers for the competency area Managing Student Behavior ($p = .06$).

the two groups was the largest for Effective Instruction for English Learners (average 2.6 for non-TFA and 2.1 for TFA alternative certification teachers).[10]

[10] This difference was statistically significant ($p < .01$). Differences between the two groups were also statistically significant for Building Comprehension of Academic Concepts ($p < .01$), Effective Mathematics Instruction ($p = .04$), Providing Feedback That Helps Student Learning ($p = 0.03$), Facilitating Extended Classroom Discussions ($p = .01$), and Demonstrating Sensitivity to Student Needs ($p = .01$).

Figure H.1: Teacher-Reported Frequency of Preparation Experiences With Competency Areas by Certification Route

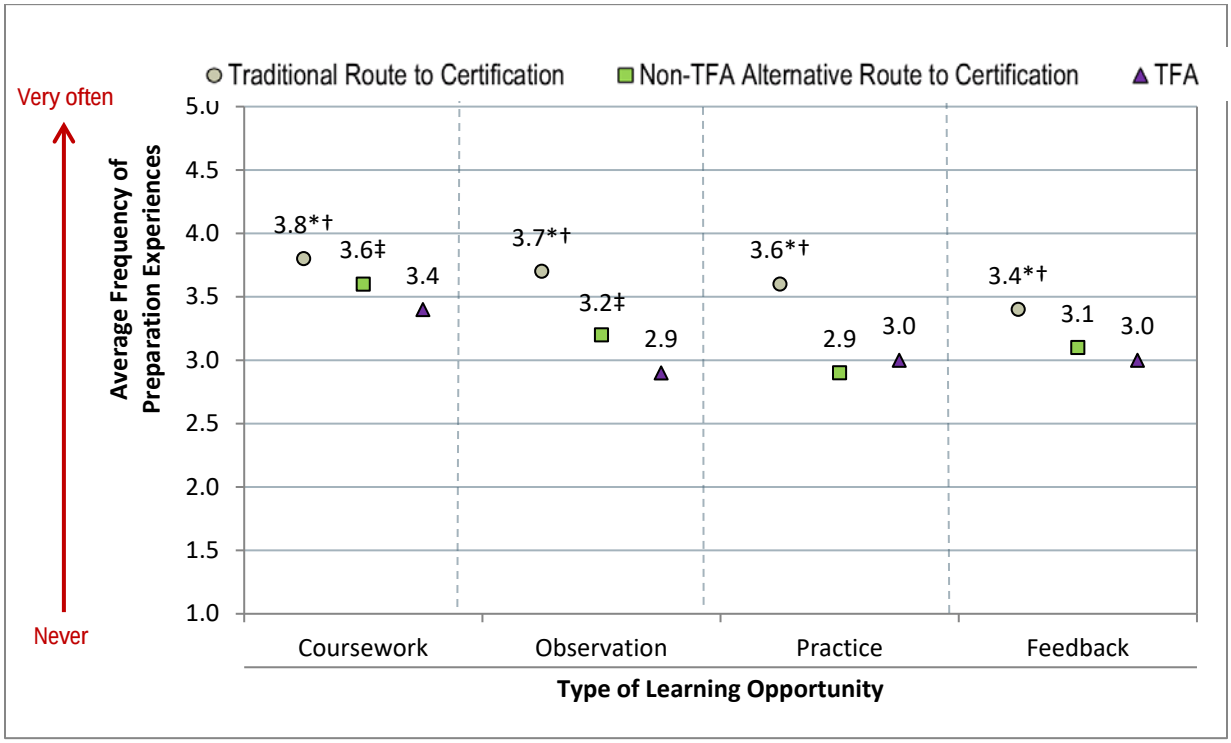


* indicates that the difference in the preparation experiences of teachers from traditional routes to certification and teachers from TFA was statistically significant at the $p < .05$ level.
† indicates that the difference in the preparation experiences of teachers from traditional routes to certification and teachers from non-TFA alternative routes to certification was statistically significant at the $p < .05$ level.
‡ indicates that the difference in the preparation experiences of teachers from non-TFA alternative routes to certification and TFA teachers was statistically significant at the $p < .05$ level.
NOTE: Teachers' responses to the survey questions about preparation experiences ranged from 1 to 5, where 1 = "Rarely/Never" and 5 = "Very often." Traditional refers to teachers prepared through traditional routes to certification, Non-TFA Alternative Route refers to teachers prepared through all alternative routes to certification except Teach For America, and TFA refers to teachers prepared through Teach For America. Sample size for teachers prepared through traditional routes varied from 2,545 to 2,575 due to nonresponse. Sample size for teachers prepared through non-TFA alternative routes to certification varied from 618 to 627. Sample size for TFA varied from 82 to 85.
FIGURE READS: For Maintaining a Positive Classroom Climate, the sample average of preparation experiences was 4.1 for teachers prepared through traditional routes to certification, 3.5 for teachers prepared through non-TFA alternative routes, and 3.4 for TFA teachers. The difference between teachers prepared through traditional routes and teachers from either of the two alternative routes was statistically significant at the $p < .05$ level.
SOURCE: Study's teacher survey data, 2015.

Teachers prepared through traditional routes to certification reported significantly more frequent preparation experiences through each of the four types of learning opportunities than those prepared through alternative routes to certification. For teachers prepared through traditional routes to certification, averages on the four types of learning opportunities ranged from 3.4 to 3.8, whereas for teachers from non-TFA and TFA alternative routes to certification, averages ranged from 2.9 to 3.6.

Comparing teachers prepared through non-TFA and TFA alternative routes to certification, teachers from TFA reported significantly fewer experiences obtained through Coursework and Observation than did teachers from non-TFA alternative routes to certification. Teachers from TFA and teachers from non-TFA routes to certification reported frequencies of experiences obtained through Practice and Feedback that did not differ significantly (figure H.2). For detailed results of these analyses, see table H.1.

Figure H.2: Teacher-Reported Frequency of Preparation Experiences Through Types of Learning Opportunities by Certification Route



* indicates that the difference in the preparation experiences of teachers from traditional routes to certification and teachers from TFA was statistically significant at the $p < .05$ level.
† indicates that the difference in the preparation experiences of teachers from traditional routes to certification and teachers from non-TFA alternative routes to certification was statistically significant at the $p < .05$ level.
‡ indicates that the difference in the preparation experiences of teachers from non-TFA alternative routes to certification and TFA teachers was statistically significant at the $p < .05$ level.
NOTE: Teachers' responses to the survey questions about preparation experiences ranged from 1 to 5, where 1 = "Rarely/Never" and 5 = "Very often." Traditional refers to teachers prepared through traditional routes to certification, Non-TFA Alternative Route refers to teachers prepared through all alternative routes to certification except Teach For America, and TFA refers to teachers prepared through Teach For America. Sample size for traditional routes to certification varied from 2,573 to 2,574. Sample size for non-TFA alternative routes to certification varied from 625 to 626. Sample size for TFA was 85.
FIGURE READS: For coursework, the sample average of preparation experiences was 3.8 for teachers from traditional routes to certification, 3.6 for teachers from non-TFA alternative routes to certification, and 3.4 for TFA teachers. The difference between teachers prepared through traditional routes and teachers from either of the two other routes was statistically significant at the $p < .05$ level.
SOURCE: Study's teacher survey data, 2015.

Table H.1: Descriptive Statistics of Preparation Experiences With Competency Area and Type of Learning Opportunity by Certification Route

	(1) Traditional Route to Certification		(2) Alternative Route to Certification, Non–Teach For America		(3) Teach For America		*p*-Value for Significance Test of…			
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	(1) vs (2)	(1) vs (3)	(2) vs (3)	(1) vs (2) vs (3)
Competency Area										
Maintaining a Positive Classroom Climate	4.07	0.74	3.54	0.98	3.44	0.79	< .001	< .001	.053	< .001
Managing Student Behavior to Maximize Learning Time	3.87	0.84	3.51	1.01	3.66	0.89	< .001	< .001	.101	< .001
Productive Use of Classroom Time	3.84	0.82	3.50	1.01	3.52	0.75	< .001	< .001	.863	< .001
Conveying the Importance of Learning	3.79	0.86	3.39	1.02	3.48	0.93	< .001	< .001	.113	< .001
Demonstrating Sensitivity to Student Needs	3.76	0.89	3.30	1.05	2.96	0.92	< .001	< .001	< .001	< .001
Designing and Using Assessments of Student Learning	3.69	0.91	3.17	1.06	3.12	0.89	< .001	< .001	.438	< .001
Effective English Language Arts Instruction	3.67	0.94	3.08	1.11	3.07	0.99	< .001	< .001	.833	< .001
Building Students' Higher-Order Thinking Skills	3.64	0.90	3.15	1.02	3.25	0.92	< .001	< .001	.071	< .001
Facilitating Extended Classroom Discussions	3.62	0.86	3.22	0.97	3.10	0.81	< .001	< .001	.013	< .001
Providing Feedback That Helps Student Learning	3.54	0.91	3.10	1.03	2.90	0.87	< .001	< .001	< .001	< .001
Effective Mathematics Instruction	3.52	1.09	2.91	1.20	2.62	1.19	< .001	< .001	< .001	< .001

	(1) Traditional Route to Certification		(2) Alternative Route to Certification, Non–Teach For America		(3) Teach For America		*p*-Value for Significance Test of…			
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	(1) vs (2)	(1) vs (3)	(2) vs (3)	(1) vs (2) vs (3)
Building Comprehension of Academic Concepts	3.47	0.91	3.01	1.02	2.84	0.87	< .001	< .001	.002	< .001
Effective Instruction for English Learners	2.89	1.23	2.61	1.17	2.13	1.07	< .001	< .001	< .001	< .001
Type of Learning Opportunity										
Coursework	3.82	0.77	3.56	0.85	3.40	0.72	< .001	< .001	< .001	< .001
Observation	3.67	0.77	3.20	1.00	2.94	0.78	< .001	< .001	< .001	< .001
Practice	3.64	0.78	2.94	1.16	2.97	0.81	< .001	< .001	.737	< .001
Feedback	3.44	0.91	3.05	1.07	3.03	0.81	< .001	< .001	.609	< .001

NOTE: Teachers' responses to the survey questions about preparation experiences ranged from 1 to 5, where 1 = "Rarely/Never" and 5 = "Very often." Sample sizes for teachers from traditional routes to certification varied from 2,545 to 2,574. Sample sizes for teachers from alternative routes to certification (excluding Teach For America) varied from 615 to 627. Sample sizes for Teach For America varied from 82 to 85. Tests for statistical significance are clustered at the district or state level.

TABLE READS: The sample mean of Maintaining a Positive Classroom Climate was 4.07 with a standard deviation of 0.74 for teachers from traditional routes to certification. For alternative routes to certification (excluding Teach For America), the sample mean was 3.54 and the standard deviation was 0.98. For Teach For America, the sample mean was 3.44 and the standard deviation was 0.79. The test that the mean of Maintaining a Positive Classroom Climate for teachers from traditional routes to certification was equal to teachers from alternative routes to certification (excluding Teach For America) had $p < .001$. The test that the mean of Maintaining a Positive Classroom Climate for teachers from traditional routes to certification was equal to teachers from Teach For America had $p < .001$. The test that the mean of Maintaining a Positive Classroom Climate for teachers from alternative routes to certification (excluding Teach For America) was equal to teachers from Teach For America had $p = 0.053$. The test that all three means were equal had $p < .001$.

SOURCE: Study's teacher survey data, 2015.

Appendix I. Value-Added Modeling Methodology

In this appendix, we first describe how the measures of effectiveness were created, and then describe the regression modeling approach to estimating the relationships of preparation experiences to effectiveness.

Section I.1: Measures of Effectiveness

In order to estimate teaching effectiveness, student achievement outcomes were obtained from administrative data linking student-level ELA and math state achievement test results to the teacher or teachers who were responsible for students' grade 4, 5, or 6 ELA or math instruction in the 2012–13, 2013–14, or 2014–15 school year.[11] Student records were linked over time and went back to the prior year (2011–12) such that baseline (pre-test) measures of ELA and math achievement and baseline student demographic measures were available for each student. The student-teacher linked data were obtained from 19 separate "sites" in 14 states. Each "site" was a state or district educational agency that was able to provide the study with student-teacher linked data for all students and teachers in the relevant grades and years.[12] We use the term "site" going forward to reference the state or district in which teachers were clustered for analysis.

Teaching effectiveness was estimated separately for (1) effectiveness of ELA instruction for all of a teacher's students; (2) effectiveness of ELA instruction for a teacher's EL students (if she/he had at least one EL student); (3) effectiveness of math instruction for all of a teacher's students; and (4) effectiveness of math instruction for the teacher's EL students (if she/he had at least one EL student). Each of these four types of teaching effectiveness was estimated separately within sites, grades, and school years. When a teacher taught students in multiple grades in a single school year, his/her multiple effectiveness measures across grades were combined as a weighted mean into a single measure for that school year. When a teacher had effectiveness measures from multiple years—for example, from his/her first, second, and/or third year of teaching—those were retained as separate measures such that relationships of preparation experiences to teaching effectiveness could be examined for first-, second-, and third-year teachers.

Effectiveness measures were calculated for all teachers within each site who taught the relevant grades in the relevant years. Those measures were standardized such that, within each site, the distribution of effectiveness scores had a mean of 0 and a standard deviation of 1. This means that a teacher who was equally effective as the average teacher within his/her site would have an effectiveness score of 0. A teacher with an effectiveness score of, say, 0.50 was more effective than the average teacher within the site by 0.50 standard deviation units. A score of, say, –0.50 means that the teacher was less effective than the average teacher in that site by 0.50 standard deviation units. A negative score indicates that a teacher's

[11] When two (or more) teachers were responsible for a student's instruction in one subject (either ELA or math), the student's achievement contributed to the effectiveness measures of both (or all) teachers who were responsible for instruction. For example, if two teachers were responsible for the student's ELA instruction, then each of the two teachers received half of the credit for that student's achievement growth (or more accurately, for the difference between the student's observed and predicted math achievement score).

[12] Surveys regarding preparation experiences were administered to teachers from 30 sites, but due to considerations of cost and expected numbers of surveyed teachers in each site, we limited the collection of student-teacher linked achievement data to the 19 largest sites.

students performed worse on their end-of-year assessments than did similar students taught by different teachers in the district or state.

The effectiveness scores of the surveyed teachers from each site were extracted from the larger sets of effectiveness scores of all teachers within the sites, and subsequently were merged to the survey data on preparation experiences. The merged dataset was used to estimate relationships between preparation experiences and teaching effectiveness (appendix I.2). The measures of teaching effectiveness are *estimates* that were obtained from fitting statistical models to student-teacher linked data. We will refer to the statistical models that produced the estimates of effectiveness as "*level-1 models.*" A second set of statistical models, which we refer to as "*level-2 models*" was used to estimate the relationships between preparation program experiences and teaching effectiveness.

The remainder of this section provides additional details on the estimation of teaching effectiveness scores (the level-1 models). Appendix section I.2 provides details on the level-2 models.

Students Who Link to More Than One Teacher

A fundamental challenge in estimating the effect that a teacher has on the achievement of his/her students is that, in some cases, more than one teacher is responsible for the math or reading instruction of a particular student. To account for shared teaching responsibility, analyses were conducted in several steps. First, a cell identifier ("cell-ID") was created for each unique combination of links of teachers to students. In the first sub-step of the "level-1 model," student achievement was modeled as the dependent variable, with pre-tests and other covariates on the right-hand side of the regression model, and dummy variables for each of the cell-IDs. The model produces an estimate (and standard error) of the level-1 cell effect for each cell-ID. In a subsequent sub-step, teacher level-1 scores were calculated as weighted means of the cell effect scores to which the particular teacher contributed.

The table below illustrates example cells for grade 5 math students who were assessed in the spring of 2014. The "cell" in row 1 represents 18 students who were taught math by a single teacher (Teacher ID =T1). The 27 students in row 2 were taught by two teachers (Teacher IDs T2 and T3). In the model shown in equation 1, dummy variables for cell IDs are included in the model.

Table I.1: Example Cells for Grade 5 Math Students

Row	Teacher ID	Cell-ID	COUNT
1	T1	Cell 1	18
2	T2, T3	Cell 4	27

Model Used to Estimate Level-1 Cell Effects

The first step of the level-1 analysis will produce a cell value added estimate (and standard error) for each cell using the following prototypical model specification:

$$(Y_{ic}) = \sum_{c=1}^{C} \psi_c Cell_{ic} + \sum_{n=1}^{N} \delta_n (X_{ic}^n) + \varepsilon_{ic} \qquad \text{(Eqn. 1)}$$

where: Y_{ic} is the spring reading/ELA or math achievement test score from i^{th} student (i in 1,2,...,I) of the c^{th} cell (c in 1,2,...,C cells); $Cell_{ic}$ is the indicator variable for the c^{th} cell (i.e., the fixed effect for cells); X_{ic}^n is the n^{th} student-level covariate, which included prior-year test scores in both math and reading/ELA, gender, race/ethnicity, English learner status, age, FRPL status, and other student characteristics available in the administrative database of a given site.

The outputs equation 1 model that were used in subsequent steps were the level-1 cell effectiveness estimates $\widehat{\psi_1}$ … $\widehat{\psi_C}$; and the standard error estimates of the level-1 cell estimates SE($\widehat{\psi_1}$) … SE($\widehat{\psi_c}$).

Calculating Level-1 Teacher Estimates From Level-1 Cell Estimates

The level-1 teacher scores were calculated as weighted means of all level-1 cell scores to which a teacher contributed.

$$\widehat{\beta_j} = \frac{\sum_{c=1}^{C} \widehat{\psi_c} w_c}{\sum_{c=1}^{C} w_c} \qquad \text{(Eqn. 2)}$$

where the weights, w_c, are instructional responsibility weights and are equal to the number of students in the cell divided by the number of teachers in the cell. The outputs from this step were the level-1 teaching effectiveness scores $\widehat{\beta_1}$ … $\widehat{\beta_J}$; and their standard errors SE($\widehat{\beta_1}$) … SE($\widehat{\beta_J}$).

Standardizing the Level-1 Teacher Estimates

The "raw" level-1 teacher estimates yielded by the steps above ($\widehat{\beta_1}$ … $\widehat{\beta_J}$) were subject to an adjustment that was motivated by the observation that teaching effectiveness estimates tend to be more variable in elementary grades than in middle school grades (Koedel, Mihaly, and Rockoff 2015). At face value, this suggests that differences in true teaching effectiveness are larger at earlier, rather than later, grades. However, it is plausible that differences in the variances of teacher effects are an artifact of the procedures used to convert raw test scores into scale scores (Morgan et al. 2004). To address this issue, level-1 teacher scores were standardized for each subject (math or reading/ELA), administrative data source (state or district), grade level (4, 5, 6), and school year (2012–13, 2013–14, 2014–15) such that the variance and thus the range of level-1 teacher scores are the same for all grade levels in all districts in all years. That standardization and calculation of the standard errors of the standardized level-1 scores are described below.

This standardization step was done within administrative data source (district or state), subject (math or reading/ELA) and grade level (4, 5, 6), and school year (2012–13, 2013–14, 2014–15). The standardized scores were calculated as

$$\hat{z}_j = \frac{\hat{\beta}_j - \overline{\hat{\beta}_w}}{wgtSD(\hat{\beta}_j)} \qquad \text{(Eqn. 3)}$$

where $\hat{\beta}_j$ = the level-1 estimate for teacher *j*; $\overline{\hat{\beta}_w}$ = the mean of the level-1 estimates for teachers weighted by the number of students taught by teacher *j*; and $wgtSD(\hat{\beta})$ is the standard deviation of the level-1 teachers scores, weighted by the number of students taught by teacher *j*.

The outputs from this step that were used in the level-2 model (described in appendix section I.2) were: $\hat{z}_{jdgy}$ = the standardized measure of teaching effectiveness for the j^{th} teacher in the d^{th} administrative data source in the g^{th} grade in the y^{th} year; and SE($\hat{z}_{jdgy}$) = the standard error of the standardized measure of teaching effectiveness.

Section I.2: Estimating the Relationships of Preparation Experiences to Effectiveness

Relational analyses were conducted to address the following questions concerning the relationships of preparation experiences to math or ELA teaching effectiveness of grade 4–6 teachers who were in their first, second, or third year of teaching:

- *What, if any, preparation experiences are related to teaching effectiveness for all students?*
- *Do relationships of experiences and effectiveness diminish (or increase, or stay the same) as teachers gain more experience in the classroom?*

The dependent variables in the regression models were *estimates* of teaching effectiveness, and the estimates for teachers with greater numbers of students are more precise than estimates for teachers with fewer students. Thus, the regression models used to estimate the relationships between experiences and effectiveness used regression weights such that teachers with more-precise estimates of effectiveness were given greater weight than those with less-precise estimates.[13]

The models include indicators for the sites (state or school districts) from which the measures of effectiveness were estimated, and controls for whether teachers were in their first, second, or third year of teaching at the time their effectiveness was measured. The site indicators were a crucial part of the models because the measures of effectiveness are *relative to* other teachers *within the site*. This means that an average teacher in Site A is more effective than a below-average teacher in Site A, and an average teacher in Site B is more effective than a below-average teacher in Site B, but what the models do not tell us is whether an average teacher at Site A is more, less, or equally as effective as an average teacher in Site B.

By including indicator variables for sites as covariates in the models, we ensure that the relationships between preparation experiences and effectiveness are estimated *within sites*, where relative effectiveness is measured, and then that the within-site relationships are averaged *across* sites to give an overall, average measure of the relationships between preparation experiences and effectiveness. The primary models also control for years of teaching experience, because tenure was found to have a strong relationship to effectiveness in our data and has been consistently shown to be related to teaching effectiveness in other studies.[14]

To account for the multiple observations per teacher that occurred when teachers had effectiveness measured at more than one time point (in their first, second, and/or third year of teaching), two-level hierarchical linear models were fit to the data with repeated observations (level-1) nested in teachers (level-2). The regression models were of the form:

$$\hat{z}_{ij} = \beta_0 + \alpha_{0j} + \beta_1 PrepExp_j + \beta_2 Yr1_{ij} + \beta_3 Yr2_{ij} + \sum_{s=1}^{S-1} \pi_s Site_j^s + \varepsilon_{ij} \quad \text{(Eqn. 4)}$$

where,

[13] The weights were calculated using feasible generalized least squares weights as described in Lewis and Linzer (2005) and Hanushek (1974).

[14] The following studies have found years of experience to be related to effectiveness: Boyd et al. (2009), Harris and Sass (2007, 2011), Kini and Podolsky (2016), and Xu, Hannaway, and Taylor (2009).

$\hat{z}_{ij}$ = The i^{th} effectiveness measure for the j^{th} teacher. Teachers could have up to three effectiveness outcomes measures if their effectiveness was measured in their first, second, and third year of teaching. Each model had either ELA or math effectiveness as the outcome measure.

α_{0j} = A random intercept term for teacher *j*.

$PrepExp_j$ = A preparation experience measure for teacher *j*. Each model included one of the eight following preparation experience measures:

creating a productive learning environment through Coursework
creating a productive learning environment through Observation
creating a productive learning environment through Practice
creating a productive learning environment through Feedback
promoting analytic thinking skills through Coursework
promoting analytic thinking skills through Observation
promoting analytic thinking skills through Practice
promoting analytic thinking skills through Feedback

$Yr1_{ij}$ = A dummy variable taking the value 1 if teaching effectiveness was measured when the teacher was in the first year of teaching, and taking the value 0 when the teacher was in the second or third year of teaching when effectiveness was measured.

$Yr2_{ij}$ = A dummy variable taking the value 1 if teaching effectiveness was measured when the teacher was in the second year of teaching, and taking the value 0 when the teacher was in the first or third year of teaching when effectiveness was measured.

$Site_j^s$ = Dummy variables for sites taking the value 1 if teaching effectiveness of the j^{th} teacher was measured in site *s* (*s* = 1,2…,19) and taking the value 0 otherwise.

ε_{ij} = Residual error.

The parameter estimate $\hat{\beta}_1$ that is produced by the model describes the relationship between preparation experiences and teaching effectiveness. The parameter estimate is interpreted as in the following example. An estimate $\hat{\beta}_1$ = 0.09 indicates that a one-unit increase in the experiences measure (on a five-point scale ranging from 1 = Rarely/Never to 5 = Very often) is associated with an increase in teaching effectiveness equal to 0.09 standard deviation units of teaching effectiveness.

To further facilitate the interpretation of parameter estimates, we calculated the average increase in teaching effectiveness between first- and second-year teachers and between second- and third-year teachers and compared the magnitudes of the increases in teaching effectiveness associated with additional preparation experiences versus the increases in teaching effectiveness associated with gaining an additional year of teaching experience.

Models with additional control covariates were also fit to the data to assess whether the results were sensitive to the inclusion/exclusion of additional controls for classroom contextual variables and other teacher characteristics (see appendix K for descriptions and results of these robustness analyses).

Subgroups

To investigate the relationships between preparation experiences with *creating a productive learning environment* and with *promoting analytic thinking skills* to teaching effectiveness for subgroups of teachers with differing student populations of at-risk students, we added interaction terms ($PrepExp_j * AtRiskStudents_j$) to the model shown in equation (1). These terms produced estimates of the relationships of experiences to effectiveness for teachers who had higher and lower proportions of students who were eligible for free or reduced-price lunch, and for teachers who taught students whose average baseline performance was in the bottom half or top half of the performance distribution. (See appendix L for details and cut-points for the indicators.)

We conducted additional analyses to estimate the relationships between preparation experiences with *creating a productive learning environment* and with *promoting analytic thinking skills* to effectiveness of teaching English learners. For these analyses, we calculated the measures of effectiveness of teaching English learners using only the student-teacher linked data of students who were English learners. The method for estimating teaching effectiveness for these students was exactly the same as described above in appendix section I.1. Those measures of teaching effectiveness for English learners were the dependent measures in the level-2 models, described above in this section.

More Classroom Experience

To investigate whether the relationships between preparation experiences and effectiveness diminished (or increased, or remained the same) as teachers gained more experience in the classroom, interaction terms ($PrepExp_j * Yr1_{ij}$ and $PrepExp_j * Yr2_{ij}$) were added to the model shown in equation (1). These terms produced estimates of the relationships of experiences to effectiveness when teachers where in their first, second, and third years of teaching, and they produced a test of whether the relationships varied by years of teaching experience. For results of these analyses, see appendix M.

Appendix J. Teachers' Preparation Experiences by Preparation Provider and Degree Program

In this appendix, we examine teacher survey responses by preparation provider and degree program.[15] With these analyses, we can see how much of the observed variation in preparation experiences documented in chapter 3 is at the individual teacher level, even among teachers who attend the same preparation provider or are in the same degree program within a program.

Variation in Preparation Experiences Associated With Preparation Provider and Degree Program

Within each of the competency areas and across each of the types of learning opportunities, we examined teachers' preparation experiences by preparation providers and by degree programs within a provider. Figure J.1 provides an illustrative example based on one of the competency areas (Maintaining a Positive Classroom Climate) showing findings for three preparation providers that offer both a bachelor's (BA) and a master's (MA) degree program.

> **We found a pattern of more variation in preparation experiences *within* providers (and degree programs within a provider) than *across* providers for each of the competency areas, as well as for each of the types of learning opportunities.**

As can be seen in the figure, teachers' individual preparation experiences varied widely, ranging between 1.5 and 5 for Providers 1 and 3 and between 3 and 5 for Provider 2. In contrast, the average of this competency area for each of the providers (and degree programs within providers) was very similar—between 3.7 and 4.4, as shown by the large black diamonds in the figure.

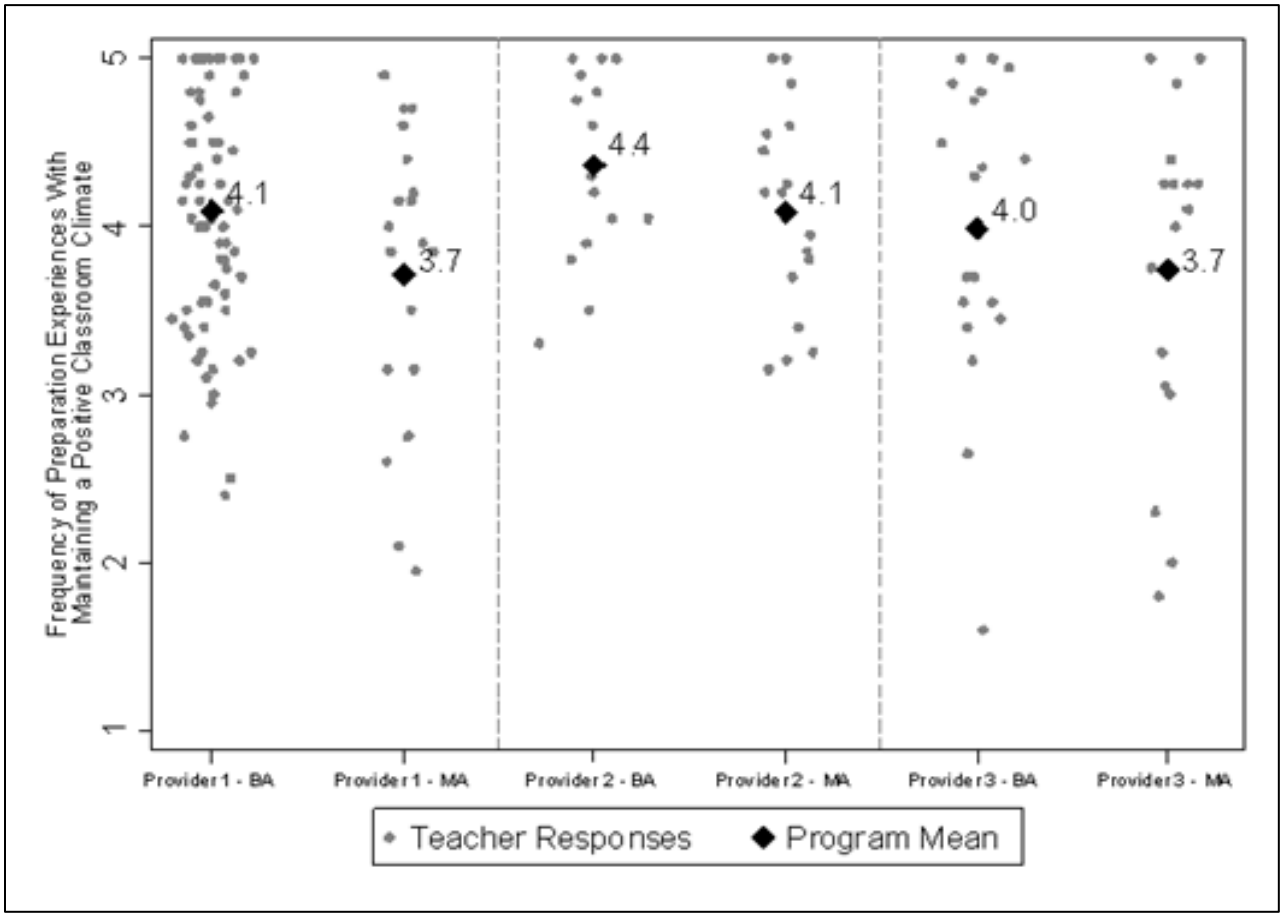
We also conducted variance decomposition analyses using preparation experiences responses from all 159 preparation providers that had at least five responding teachers each. The analysis used the nested structure of the data (teachers nested within degree programs within preparation providers[16]) and estimated hierarchical linear models to decompose the total variance observed in each of the competency areas and in each of the types of learning opportunities average experiences measures to components at three levels:

1. **Preparation provider level:** Percentage of the total variance that was explained by preparation providers. The larger this percentage was, the more varied the preparation experiences were between the preparation providers represented in the sample.

[15] To ensure some degree of statistical stability in these analyses, we included only the 2,601 teachers from 159 preparation providers that had at least five responding teachers each.

[16] The analysis was restricted to preparation providers that were represented by five or more teachers in order to increase the reliability of estimated variance components. The nesting structure was as follows: For preparation providers that offered only traditional routes to certification, we placed teachers into two groups: BA program (which included four-year and five-year degree programs) or MA program. For preparation providers that offered only alternative routes, we placed teachers into two groups: MA degree program or no (additional) degree program. For preparation providers that offered both traditional and alternative routes, we placed teachers into one of four groups: BA degree-traditional certification program, MA degree-traditional certification, MA degree-alternative certification, or no degree-alternative certification.

Figure J.1: Variation in Preparation Experiences With Maintaining a Positive Classroom Climate Within Degree Programs for Three Preparation Providers



NOTE: This figure shows the actual average frequency of preparation experiences (y-axis) for the competency area Maintaining a Positive Classroom Climate. The graph added jitter on the x-axis to distinguish teachers who had similar/very close average preparation experiences. Preparation Provider 1 accounted for 91 teachers (72 in its bachelor's program and 19 in its master's program). Preparation Provider 2 accounted for 33 teachers (16 in its bachelor's program and 17 in its master's program). Preparation Provider 3 accounted for 38 teachers (21 in its bachelor's program and 17 in its master's program).
FIGURE READS: The average frequency of preparation experiences with Maintaining a Positive Classroom Climate for teachers in the BA program in Provider 1 is 4.1. Teacher responses varied from 2.4 to 5.0.
SOURCE: Study's teacher survey data, 2015.

2. **Degree program level:** Percentage of the total variance that was explained by degree programs within preparation providers. The larger this percentage was, the more varied the preparation experiences were between degree programs within preparation providers.

3. **Teacher level:** Percentage of the total variance that was explained by teachers within degree programs within preparation providers. The larger this percentage was, the more varied the preparation experiences were across teachers within the same degree program and preparation provider.

For all preparation experiences, we found a pattern of more variation among teachers from programs by the same provider than between teachers from different program providers.

For example, for the 13 competency areas, a minimum of 86 percent of the variance in preparation experiences was at the level of individual teachers. With the exception of the Practice learning opportunity, individual teachers accounted for nearly 90 percent of the variance in types of learning opportunities. For Practice, a somewhat smaller portion of the variance (82 percent) was at the level of individual teachers. (See table J.1.)

Table J.1: Decomposition of the Total Variance in the Average Frequency of Preparation Experiences With Competency Areas and Through Types of Learning Opportunities

	Percentage of Total Variance at the…		
	Preparation Provider Level	Degree Program Level	Teacher Level
Competency Area			
Maintaining a Positive Classroom Climate	4%	10%	86%
Managing Student Behavior to Maximize Learning Time	2%	5%	94%
Productive Use of Classroom Time	4%	6%	90%
Conveying the Importance of Learning	1%	6%	93%
Demonstrating Sensitivity to Student Needs	7%	5%	88%
Designing and Using Assessments of Student Learning	3%	5%	92%
Effective English Language Arts Instruction	4%	6%	90%
Building Students' Higher-Order Thinking Skills	3%	6%	91%
Facilitating Extended Classroom Discussions	1%	9%	90%
Providing Feedback That Helps Student Learning	4%	5%	91%
Effective Mathematics Instruction	2%	7%	91%
Building Comprehension of Academic Concepts	6%	5%	89%
Effective Instruction for English Learners	6%	5%	88%
Type of Learning Opportunity			
Coursework	3%	4%	93%
Observation	3%	8%	89%
Practice	6%	11%	83%
Feedback	4%	5%	91%

NOTE: Teachers' responses to the survey questions about preparation experiences ranged from 1 to 5, where 1 = "Rarely/Never" and 5 = "Very often." Three observations were excluded from this analysis due to missing data on degree program. The sample was restricted to preparation providers that were represented by five or more teachers. Sample size varied between 2,572 and 2,598. Columns may not equal 100 percent across rows due to rounding.
TABLE READS: Preparation providers accounted for 4 percent of the variation in teachers' *overall average preparation experiences*; the specific degree programs teachers attended within the preparation providers accounted for an additional 9 percent. The remaining variance (86 percent) was estimated to be at the teacher level.
SOURCE: Study's teacher survey data, 2015.

Appendix K. Robustness of Results to Alternative Statistical Models

The study's primary models of the relationships of preparation experiences to teaching effectiveness include indicators for the sites (state or school districts)[17] from which the measures of effectiveness were estimated, and controls for whether teachers were in their first, second, or third year of teaching at the time their effectiveness was measured. The site indicators were a crucial part of the models because the measures of effectiveness are *relative to* other teachers *within the site*. This means that an average teacher in Site A is more effective than a below-average teacher in Site A, and an average teacher in Site B is more effective than a below-average teacher in Site B, but that the models do not tell us whether an average teacher at Site A is more, less, or equally as effective as an average teacher in Site B.

By including indicator variables for sites as covariates in the models, we ensure that the relationships between preparation experiences and effectiveness are estimated *within sites*, where relative effectiveness is measured, and then that the within-site relationships are averaged *across* sites to give an overall, average measure of the relationships between preparation experiences and effectiveness. The primary models also control for years of teaching experience because tenure was found to have a strong relationship to effectiveness in our data and has been consistently shown to be related to teaching effectiveness in other studies.[18]

Other characteristics of teachers and their classes, however, may be hypothesized to be related to both preparation experiences and teaching effectiveness, and could therefore confound the estimates of the relationship between the two if not accounted for either by the study design or by statistical control. For example, it may be hypothesized (but it has not been shown) that teacher candidates with more grit may seek more and find more preparation experiences, and they may be more effective teachers regardless of their preparation experiences. Additionally, although the measures of teaching effectiveness account for the demographic characteristics of the students taught, it is possible that the concentrations of students with particular characteristics may be related to teaching effectiveness above and beyond the effects of the demographics of individual students. Those aggregates of student characteristics (or measures of classroom composition) could also be correlated with preparation experiences if teachers with particular preparation experiences were more likely to be placed in settings with higher concentrations of students with particular demographic characteristics. If classroom characteristics were correlated with both preparation experiences and effectiveness, then failure to account for those classroom composition characteristics may confound the estimates of the relationships of preparation experiences to effectiveness.

The ability of the present study to control for potential confounding factors of the types described above was limited by the availability of measures of those types of factors. It is therefore a limitation of the study that it cannot rule out competing hypotheses about why particular relationships were or were not observed. The lack of the ability to rule out all competing hypotheses is what makes the study an exploratory endeavor, as opposed to a study that can support causal inferences about relationships (e.g., a randomized controlled trial). Within the limitations of the study as designed, we sought to determine

[17] The student-teacher linked data were obtained from 19 separate "sites" in 14 states. Each site was a state or district educational agency that was able to provide the study with student-teacher linked data for all students and teachers in the relevant grades and years.

[18] The following studies have found years of experience to be related to effectiveness: Boyd et al. (2009), Harris and Sass (2007, 2011), Kini and Podolsky (2016), and Xu, Hannaway and Taylor (2009).

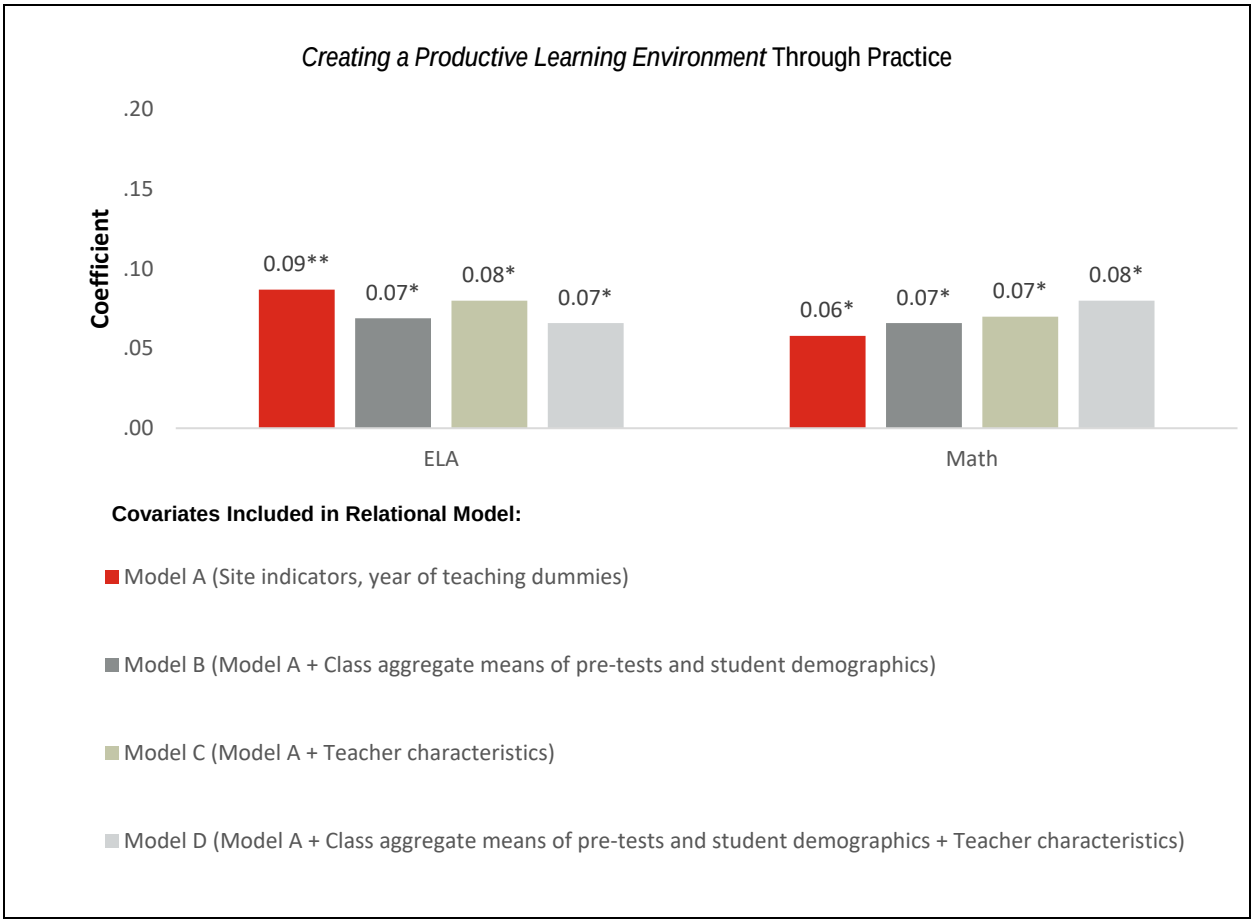
whether the estimates of relationships between preparation experiences and teaching effectiveness were sensitive to inclusion or exclusion of covariates representing measures of characteristics of teachers and classroom composition. To conduct these sensitivity analyses, we fit our primary model (Model A below) and three additional models with the following sets of covariates to the data:

- Model A—included indicators for sites (districts or states) and years of teaching experience (first, second, or third year);
- Model B—included Model A covariates plus aggregate means of students' baseline achievement scores and demographic characteristics;
- Model C—included Model A covariates plus measures of teacher characteristics; and
- Model D—included Model A covariates plus aggregate means of students' baseline achievement scores and demographic characteristics and measures of teacher characteristics.

Figure K.1 presents estimates for Models A–D for *creating a productive learning environment* through Practice for ELA and math effectiveness and shows that estimates were similar whether they were estimated using Model A or Models B–D. For the relationships of the other preparation experience measures[19] to ELA and math effectiveness, Models B–D also produced similar results to those obtained from Model A.

[19] *Creating a productive learning environment* through Coursework; *creating a productive learning environment* through Observation; and *creating a productive learning environment* through Feedback.

Figure K.1: Using Alternative Sets of Covariates in Models to Estimate Relationships of Preparation Experiences to Effectiveness Produced Estimates That Were Similar to Those From the Primary Model



* indicates that the coefficient was statistically different from zero at the $p < .05$ level.
** indicates that the coefficient was statistically different from zero at the $p < .01$ level.
NOTE: Results based on preparation experiences and effectiveness measures of 2,032 ELA and 1,894 math teachers. Class aggregate means of pre-tests and student demographics included measures of baseline class averages of ELA and math scores, percentages of students who were eligible for free or reduced-price lunch, in special education, male, Hispanic, or Asian. Teacher characteristics included measures of grit, prior leadership experience, age, race/ethnicity, and years of teaching at the time of the survey (which could be different than year of teaching at the time of the measurement of effectiveness).
FIGURE READS: Similar results were obtained from models with different sets of covariate controls. The estimates of the relationship of *creating a productive learning environment* through Practice to effectiveness in ELA were slightly attenuated when additional control covariates were included in the model. Estimates of the relationship of *creating a productive learning environment* through Practice to effectiveness in math were slightly larger when additional control covariates were included in the model.
SOURCE: Preparation experience measures: study's teacher survey data, 2015. Effectiveness measures: study's teacher-student linked data, 2012–15.

Appendix L. Subgroup Analyses for Relational Findings

The study investigated the relationships of preparation experiences with *creating a productive learning environment* and with *promoting analytic thinking skills* to teaching effectiveness for subgroups of teachers with differing student populations of at-risk students. Specifically, the study looks at subgroups of teachers who had (1) higher and lower percentages of students eligible for free or reduced-price lunch (FRPL), and (2) classrooms in which average baseline achievement was above and below the median of baseline achievement for the site (district or state).[20] The study also looks at teaching effectiveness with a particular subgroup of students: English learners.

Results Based on the Proportion of FRPL-Eligible Students

In our sample of teachers, the percentage of students in their classrooms who were eligible for FRPL ranged from 0 percent to 100 percent. The mid-point break in the distribution of classroom averages for percentage of FRPL-eligible students was 86 percent (i.e., half of teachers had 86 percent or more FRPL-eligible student and half had less than 86 percent). We used this mid-point break to create two subgroups of teachers. We also examined the sensitivity of the findings to the choice of the average percentage used to create the two subgroups of teachers, by conducting parallel analyses using 50 percent and 100 percent FRPL-eligible as the break points.

In these analyses, we estimated the size of the relationships between preparation experiences and effectiveness for each of the subgroups of teachers (those with higher and lower proportions of at-risk students). We estimated these relationships for both of the broad categories of preparation experiences and for both math and ELA teaching effectiveness, using the methodology described in appendix I.

For the teachers with higher proportions of students eligible for FRPL there were some significant, positive relationships between both ELA and math teaching effectiveness and preparation experiences with *creating a productive classroom environment* (tables L.1 and L.2). No relationships were found between teaching effectiveness in ELA or math for preparation experiences with *promoting analytic thinking skills* for any subgroups of teachers.

[20] The student-teacher linked data were obtained from 19 separate "sites" in 14 states. Each site was a state or district educational agency that was able to provide the study with student-teacher linked data for all students and teachers in the relevant grades and years.

Table L.1: Relationships of Preparation Experiences to ELA Teaching Effectiveness for Subgroups of Teachers Defined by Proportion FRPL-Eligible Students in Classrooms

Preparation Experience	Type of Learning Opportunity	Subgroup			
		FRPL Classification of Students			
		≤ 86% (*n* = 1,424)		> 86% (*n* = 1,405)	
		Coefficient	Standard Error	Coefficient	Standard Error
Creating a Productive Learning Environment	Coursework	0.020	0.046	0.056	0.048
	Observation	0.038	0.049	0.100 *	0.049
	Practice	0.053	0.046	0.096 *	0.045
	Feedback	0.019	0.042	0.082	0.043
Promoting Analytic Thinking Skills	Coursework	0.006	0.043	0.048	0.044
	Observation	–0.015	0.044	0.038	0.043
	Practice	–0.010	0.044	0.064	0.043
	Feedback	–0.002	0.039	0.058	0.039
		≤ 50% (*n* = 508)		> 50% (*n* = 2,321)	
Creating a Productive Learning Environment	Coursework	0.032	0.073	0.040	0.037
	Observation	0.031	0.080	0.076 *	0.038
	Practice	0.091	0.074	0.070 *	0.036
	Feedback	0.059	0.066	0.050	0.033
Promoting Analytic Thinking Skills	Coursework	0.024	0.072	0.022	0.034
	Observation	0.016	0.072	0.018	0.034
	Practice	0.026	0.072	0.030	0.034
	Feedback	0.034	0.062	0.028	0.031
		< 100 % (*n* = 2,073)		= 100 % (*n* = 756)	
Creating a Productive Learning Environment	Coursework	0.027	0.038	0.072	0.066
	Observation	0.047	0.040	0.154 *	0.069
	Practice	0.047	0.037	0.193 *	0.065
	Feedback	0.025	0.034	0.140 *	0.060
Promoting Analytic Thinking Skills	Coursework	0.010	0.036	0.075	0.060
	Observation	–0.007	0.036	0.070	0.061
	Practice	0.002	0.035	0.107	0.060
	Feedback	0.011	0.031	0.090	0.056

* Coefficient for relationship of experience to effectiveness is significantly different than zero ($p < .05$).
NOTE: Data from one site were omitted from this analysis because there was no variation among teachers within the site in the percentage of students who were FRPL eligible. For all teachers in that site, 100 percent of students were FRPL eligible. The total sample size for this analysis was 2,829 ELA teachers.
TABLE READS: Among teachers whose classrooms had 86 percent or fewer FRPL students, a one unit increase in experience in *creating a productive learning environment* obtained through coursework was associated with a 0.020 standard deviation unit increase in teaching effectiveness. This association was not significantly different than zero.
SOURCE: Preparation experience measures: study's teacher survey data, 2015. Effectiveness measures: study's teacher/student linked data, 2012–15.

Table L.2. Relationships of Preparation Experiences to Math Teaching Effectiveness for Subgroups of Teachers Defined by Proportion FRPL-Eligible Students in Classrooms

Preparation Experience	Type of Learning Opportunity	Subgroup: FRPL Classification of Students			
		≤ 86% (*n* = 1,319)		> 86% (*n* = 1,328)	
		Coefficient	Standard Error	Coefficient	Standard Error
Creating a Productive Learning Environment	Coursework	–0.062	0.044	0.082	0.045
	Observation	–0.013	0.047	0.112 *	0.047
	Practice	0.012	0.042	0.109 *	0.044
	Feedback	0.004	0.040	0.053	0.041
Promoting Analytic Thinking Skills	Coursework	–0.010	0.040	0.004	0.040
	Observation	–0.036	0.041	0.039	0.041
	Practice	–0.027	0.041	0.056	0.040
	Feedback	–0.024	0.037	0.030	0.037
		≤ 50% (*n* = 470)		> 50% (*n* = 2,177)	
Creating a Productive Learning Environment	Coursework	0.021	0.070	0.006	0.036
	Observation	0.053	0.075	0.050	0.037
	Practice	0.093	0.068	0.050	0.034
	Feedback	0.111	0.066	0.007	0.032
Promoting Analytic Thinking Skills	Coursework	0.029	0.068	–0.011	0.031
	Observation	0.044	0.068	–0.005	0.032
	Practice	0.077	0.069	0.003	0.032
	Feedback	0.069	0.061	–0.012	0.029
		< 100% (*n* = 1,945)		= 100% (*n* = 702)	
Creating a Productive Learning Environment	Coursework	–0.021	0.037	0.097	0.062
	Observation	0.024	0.038	0.128	0.066
	Practice	0.052	0.035	0.086	0.061
	Feedback	0.014	0.033	0.068	0.056
Promoting Analytic Thinking Skills	Coursework	–0.003	0.033	–0.000	0.055
	Observation	–0.002	0.034	0.018	0.055
	Practice	0.022	0.034	0.003	0.055
	Feedback	0.004	0.030	0.006	0.051

* Coefficient for relationship of experience to effectiveness is significantly different than zero ($p < .05$).
NOTE: Data from one site were omitted from this analysis because there was no variation among teachers within the site in the percentage of students who were FRPL eligible. For all teachers in that site, 100 percent of students were FRPL eligible. The total sample size for this analysis was 2,647 math teachers.
TABLE READS: Among teachers whose classrooms had 86 percent or fewer FRPL students, a one unit increase in experience in *creating a productive learning environment* obtained through coursework was associated with a 0.062 standard deviation unit decrease in teaching effectiveness. This association was not significantly different than zero.
SOURCE: Preparation experience measures: study's teacher survey data, 2015. Effectiveness measures: study's teacher/student linked data, 2012–15.

Results Based on Classroom Average Baseline Student Academic Achievement

We also created subgroups of teachers based on the average baseline ELA or math achievement scores of the students in teachers' classrooms. We created two subgroups of teachers: (1) teachers whose students, on average, were in the bottom 50 percent of the distribution; and (2) teachers whose students were in the top 50 percent of the distribution. As with the analyses described above, we estimated the size of the relationships between preparation experiences and effectiveness for each subgroup of teachers for both of

the broad categories of preparation experiences and for both math and ELA teaching effectiveness (see table L.3).

For teachers with students at greater risk, there was a statistically significant relationship between experiences with *creating a productive learning environment* through Practice and ELA teaching effectiveness. No other relationships were found with teaching effectiveness in ELA or math.

Table L.3: Relationships of Preparation Experiences to Teaching Effectiveness in ELA and Math for Subgroups of Teachers Defined by Class Average Baseline ELA or Math Performance

	Preparation Experience	Type of Learning Opportunity	Subgroup: Baseline Performance Classification of Students: Top Half (n = 1,462) Coefficient	Top Half Standard Error	Bottom Half (n = 1,463) Coefficient	Bottom Half Standard Error
ELA	Creating a Productive Learning Environment	Coursework	0.062	0.044	0.019	0.050
		Observation	0.072	0.046	0.070	0.050
		Practice	0.093 *	0.044	0.063	0.046
		Feedback	0.047	0.040	0.070	0.043
	Promoting Analytic Thinking Skills	Coursework	0.037	0.040	0.008	0.046
		Observation	0.035	0.041	–0.001	0.045
		Practice	0.041	0.041	0.022	0.044
		Feedback	0.038	0.037	0.030	0.040
			Top Half (n = 1,365)		Bottom Half (n = 1,369)	
Math	Creating a Productive Learning Environment	Coursework	0.014	0.043	–0.001	0.047
		Observation	0.074	0.045	0.019	0.049
		Practice	0.079	0.043	0.044	0.043
		Feedback	0.038	0.040	0.021	0.041
	Promoting Analytic Thinking Skills	Coursework	0.007	0.039	–0.031	0.041
		Observation	–0.003	0.040	–0.002	0.041
		Practice	0.008	0.040	0.018	0.041
		Feedback	0.004	0.036	0.000	0.037

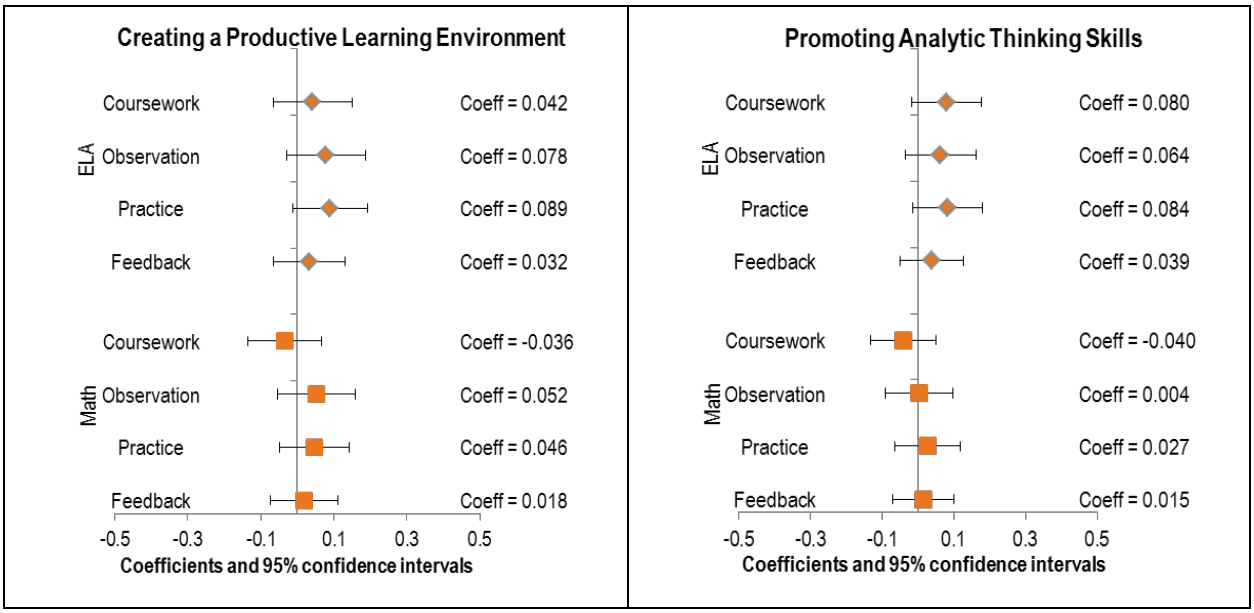
* Coefficient for relationship of preparation experiences to teaching effectiveness is significantly different than zero ($p < .05$).
TABLE READS: Among teachers whose classroom average baseline scores were in the top half of the distribution, a one unit increase in preparation experiences in *creating a productive learning environment* obtained through Coursework was associated with a 0.062 standard deviation unit increase in ELA teaching effectiveness. This association was not significantly different than zero.
SOURCE: Preparation experience measures: study's teacher survey data, 2015. Effectiveness measures: study's teacher/student linked data, 2012–15.

Results for Teachers of English Language Learners

We examined the relationships between teachers' preparation experiences and their effectiveness with English language learners. These analyses were based on the subset of just over a third of the sample teachers for whom we had test score data and who had at least one English learner in their classroom (1,146 ELA and 1,062 math teachers). We used the same value-added methodology that we used for creating the effectiveness scores with all students (see appendix I), but included only the test scores of English language learners in the value-added model.

There were no significant relationships between the two broad categories of preparation experiences measured in this study and teaching effectiveness with English learners, for either math or ELA (see figure L.1). There were also no significant relationships between preparation experiences in the competency area Effective Instruction for English Learners and teaching effectiveness with English learners, for either ELA or math (see table L.4).

Figure L.1: Relationships of Preparation Experiences With Creating a Productive Learning Environment or With Promoting Analytic Thinking Skills to ELA and Math Teaching Effectiveness for English Learners



NOTE: Results for EL students are based on preparation experiences and effectiveness measures of 1,146 ELA and 1,062 math teachers.
FIGURE READS: The coefficients summarizing the relationships of preparation experiences with *creating a productive learning environment* and *promoting analytic thinking skills* obtained through Coursework to effectiveness in ELA for EL students were 0.042 and 0.080, respectively. They were not statistically significant, as indicated by the confidence interval crossing zero.
SOURCE: Preparation experience measures: study's teacher survey data, 2015. Effectiveness measures: study's teacher/student linked data, 2012–15.

Table L.4: Standardized Regression Coefficients for Relationships of Preparation Experiences With Effective Instruction for English Learners to ELA and Math Teaching Effectiveness for English Learners

	Effective Instruction for English Learners by Type of Learning Opportunity			
	Coursework	Observation	Practice	Feedback
ELA (*n* = 1,146 teachers)	0.033	0.015	0.023	0.008
Math (*n* = 1,062 teachers)	–0.015	0.010	0.005	0.008

NOTE: None of the coefficients is statistically significant.
FIGURE READS: The regression coefficient for the relationship of preparation experiences with Effective Instruction for English Learners obtained through Coursework to ELA teaching effectiveness for English learners is 0.033, but is not statistically significantly greater than zero. The relationship was estimated using data from *n* = 1,146 ELA teachers of EL students.
SOURCE: Preparation experience measures: study's teacher survey data, 2015. Effectiveness measures: study's teacher/student linked data, 2012–15.

Appendix M. Relationships Between Preparation Experiences and Effectiveness by Year of Teaching

This appendix summarizes results of analyses to test whether the magnitudes of the relationships of preparation experiences to effectiveness differed for teachers in their first, second, and third years of teaching. The tests were conducted in models that included interaction terms between the preparation experience measure and the year of teaching. The *p*-values are from F-tests of the null hypothesis that the relationship between preparation experiences and effectiveness does not differ between first, second, and third year teachers. A significant result ($p < .05$) would indicate that the relationships vary by year of teaching experience. Results are presented for 16 separate analyses corresponding to:

- Relationships between preparation experiences in ***creating a productive learning environment*** and **effectiveness in ELA** by year of teaching, for each of the four types of learning opportunities (table M.1).
- Relationships between preparation experiences in ***creating a productive learning environment*** and **effectiveness in math** by year of teaching, for each of the four types of learning opportunities (table M.2).
- Relationships between preparation experiences in ***promoting analytic thinking skills*** and **effectiveness in ELA** by year of teaching, for each of the four types of learning opportunities (table M.3).
- Relationships between preparation experiences in ***promoting analytic thinking skills*** and **effectiveness in math** by year of teaching, for each of the four types of learning opportunities (table M.4).

The results of all 16 analyses indicated no significant differences in the relationship between preparation experiences and effectiveness by year of teaching.

Table M.1: Standardized Regression Coefficients for Relationships of Preparation Experiences With *Creating a Productive Learning Environment* to ELA Teaching Effectiveness by Year of Teaching

Type of Learning Opportunity	Year of Teaching			
	1st Year	2nd Year	3rd Year	*p*-value
Coursework	0.03	0.07	0.06	0.89
Observation	0.06	0.11	0.09	0.72
Practice	0.09	0.10	0.10	0.95
Feedback	0.05	0.10	0.09	0.68

p-Value is for test of whether relationship between preparation experience and teaching effectiveness differs by year of teaching.
FIGURE READS: The increase in ELA teaching effectiveness associated with a one-unit increase in *creating a productive learning environment* through Coursework (on a five-point scale ranging from 1 = "Rarely/Never" to 5 = "Very often") was 0.03 standard deviation (SD) units for first-year teachers, 0.07 SD units for second-year teachers, and 0.06 SD units for third-year teachers. There were no statistically significant differences in the relationships by year of teaching.
SOURCE: Preparation experience measures: study's teacher survey data, 2015. Effectiveness measures: study's teacher/student linked data, 2012–15.

Table M.2: Standardized Regression Coefficients for Relationships of Preparation Experiences With *Creating a Productive Learning Environment* to Math Teaching Effectiveness by Year of Teaching

Type of Learning Opportunity	Year of Teaching			
	1st Year	2nd Year	3rd Year	*p*-value
Coursework	–0.01	0.00	0.08	0.60
Observation	0.04	0.05	0.11	0.95
Practice	0.04	0.08	0.11	0.74
Feedback	0.00	0.07	0.10	0.54

p-Value is for test of whether relationship between preparation experience and teaching effectiveness differs by year of teaching.
FIGURE READS: The difference in math teaching effectiveness associated with a one-unit increase in *creating a productive learning environment* through Coursework (on a five-point scale ranging from 1 = "Rarely/Never" to 5 = "Very often") was –0.01 standard deviation (SD) units for first-year teachers, 0.00 SD units for second-year teachers, and 0.08 SD units for third-year teachers. There were no statistically significant differences in the relationships by year of teaching.
SOURCE: Preparation experience measures: study's teacher survey data, 2015. Effectiveness measures: study's teacher/student linked data, 2012–15.

Table M.3: Standardized Regression Coefficients for Relationships of Preparation Experiences With *Promoting Analytic Thinking Skills* to ELA Teaching Effectiveness by Year of Teaching

Type of Learning Opportunity	Year of Teaching			
	1st Year	2nd Year	3rd Year	*p*-value
Coursework	0.03	0.03	0.04	0.95
Observation	0.03	0.03	0.02	0.89
Practice	0.06	0.03	0.02	0.82
Feedback	0.05	0.05	0.06	0.90

p-Value is for test of whether relationship between preparation experience and teaching effectiveness differs by year of teaching.
FIGURE READS: The increase in ELA teaching effectiveness associated with a one-unit increase in *promoting analytic thinking skills* through Coursework (on a five-point scale ranging from 1 = "Rarely/Never" to 5 = "Very often") was 0.03 standard deviation (SD) units for first-year teachers, 0.03 SD units for second-year teachers, and 0.04 SD units for third-year teachers. There were no statistically significant differences in the relationships by year of teaching.
SOURCE: Preparation experience measures: study's teacher survey data, 2015. Effectiveness measures: study's teacher/student linked data, 2012–15.

Table M.4: Standardized Regression Coefficients for Relationships of Preparation Experiences With *Promoting Analytic Thinking Skills* to Math Teaching Effectiveness by Year of Teaching

Type of Learning Opportunity	Year of Teaching			
	1st Year	2nd Year	3rd Year	*p*-value
Coursework	-0.03	-0.03	0.11	0.37
Observation	-0.02	0.01	0.10	0.74
Practice	-0.02	0.03	0.11	0.51
Feedback	-0.02	0.01	0.09	0.69

p-Value is for test of whether relationship between preparation experience and teaching effectiveness differs by year of teaching.
FIGURE READS: The difference in math teaching effectiveness associated with a one-unit increase in *promoting analytic thinking skills* through Coursework (on a five-point scale ranging from 1 = "Rarely/Never" to 5 = "Very often") was -0.03 standard deviation (SD) units for first-year teachers, -0.03 SD units for second-year teachers, and 0.11 SD units for third-year teachers. There were no statistically significant differences in the relationships by year of teaching.
SOURCE: Preparation experience measures: study's teacher survey data, 2015. Effectiveness measures: study's teacher/student linked data, 2012–15.

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