The Effectiveness of Secondary Math Teachers from Teach For America and the Teaching Fellows Programs: Executive Summary

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Melissa A. Clark
Hanley S. Chiang
Tim Silva
Sheena McConnell
Kathy Sonnenfeld
Anastasia Erbe
Mathematica Policy Research

Michael Puma
Chesapeake Research Associates

Elizabeth Warner
Project Officer
Institute of Education Sciences

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U.S. Department of Education
Arne Duncan
Secretary

Institute of Education Sciences
John Q. Easton
Director

National Center for Education Evaluation and Regional Assistance
Ruth Curran Neild
Commissioner

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EXECUTIVE SUMMARY

Teach For America (TFA) and the Teaching Fellows programs are an important and growing source of teachers of hard-to-staff subjects in high-poverty schools, but comprehensive evidence of their effectiveness has been limited. This report presents findings from the first large-scale random assignment study of secondary math teachers from these programs. The study separately examined the effectiveness of TFA and Teaching Fellows teachers, comparing secondary math teachers from each program with other secondary math teachers teaching the same math courses in the same schools. The study focused on secondary math because this is a subject in which schools face particular staffing difficulties.

The study had two main findings, one for each program studied:

1. **TFA teachers were more effective than the teachers with whom they were compared.** On average, students assigned to TFA teachers scored 0.07 standard deviations higher on end-of-year math assessments than students assigned to comparison teachers, a statistically significant difference. This impact is equivalent to an additional 2.6 months of school for the average student nationwide.

2. **Teaching Fellows were neither more nor less effective than the teachers with whom they were compared.** On average, students of Teaching Fellows and students of comparison teachers had similar scores on end-of-year math assessments.

By providing rigorous evidence on the effectiveness of secondary math teachers from TFA and the Teaching Fellows programs, the study can shed light on potential approaches for improving teacher effectiveness in hard-to-staff schools and subjects. The study findings can provide guidance to school principals faced with the choice of hiring teachers who have entered the profession via different routes to certification. The findings can also aid policymakers and funders of teacher preparation programs by providing information on the effectiveness of teachers from various routes to certification that use different methods to identify, attract, train, and support their teachers.

Background

High-quality, effective teachers are critical to students' success in the classroom (Aaronson et al. 2003; Chetty et al. 2011), yet little is known about how best to identify, attract, train, and support such teachers. The need for effective teachers is especially acute in schools serving low-income students who already face numerous disadvantages (Monk 2007; Jacob 2007). These schools face particular difficulty attracting qualified teachers to teach secondary math and science classes (Ingersoll and Perda 2009; Ingersoll and May 2012).

TFA and The New Teacher Project (TNTP) Teaching Fellows programs take a distinctive approach to addressing the need for high-quality teachers of hard-to-staff subjects in high-poverty schools.[1] Like other programs that offer alternative routes to teacher certification, both TFA and the Teaching Fellows programs aim to lower the barriers to entering the teaching profession; both programs recruit individuals without prior teaching experience and enable them to begin teaching before completing all of the training requirements for certification. However, unlike most programs providing alternative routes to certification that do not have restrictive selection criteria and admit most applicants (Walsh and Jacobs 2007; Mayer et al. 2003), TFA and the Teaching Fellows programs have highly selective admissions criteria designed to admit only applicants who have demonstrated a high level of achievement in academics or other endeavors and who possess characteristics that the programs view as being associated with effective teaching.

Research Questions and Study Design

The study addresses two analogous primary research questions, one for each program studied:

1. How effective are **TFA teachers** at teaching secondary math compared with other teachers teaching the same math courses in the same schools?
2. How effective are **Teaching Fellows** at teaching secondary math compared with other teachers teaching the same math courses in the same schools?

The study used an experimental design to learn about the effectiveness of teachers from each of the two programs studied. At the beginning of the school year, the study team assigned students who enrolled in an eligible middle or high school math course to either a class taught by a math teacher from the program being studied (TFA or Teaching Fellows) or to a similar math class in the same school taught by a teacher who did not participate in either of the programs studied. This latter teacher is referred to as the comparison teacher. The comparison teacher could have entered teaching after completing all certification requirements (the traditional route to certification) or through a less selective alternative route to certification. Students were assigned to teachers randomly—that is, completely by chance—to ensure that there would be no systematic differences between the types of students assigned to the different types of teachers. To estimate the effectiveness of the TFA or Teaching Fellows teachers relative to the comparison teachers, we compared the end-of-year math test scores of students assigned to the different types of teachers. The study design is summarized in the box below.

[1] TNTP, formerly known as The New Teacher Project, is a national nonprofit organization that partners with urban school districts to establish and operate local Teaching Fellows programs that recruit and train new teachers.

Study Design

Experimental design. We used the same experimental design to separately examine the effectiveness of teachers from each of two programs—TFA and the Teaching Fellows programs. In each participating school, we identified "classroom matches"—two or more classes covering the same middle or high school math course at the same level, with at least one class taught by a teacher from the program being studied (TFA or Teaching Fellows) and at least one class taught by another teacher, referred to as a comparison teacher, who did not enter teaching through a highly selective alternative route. The comparison teacher could have entered teaching through either a traditional or less selective alternative route to certification. In each classroom match, students were randomly assigned at the beginning of the school year to a class taught by a teacher from the program being studied or a class taught by a comparison teacher.

Sample. In order to obtain a large enough sample of teachers and students, we recruited participants into the study in both the 2009–2010 and 2010–2011 school years. The final TFA study sample consisted of 4,573 students, 111 classroom matches, 136 math teachers, 45 schools, and 11 districts in 8 states. The final Teaching Fellows study sample consisted of 4,116 students, 118 classroom matches, 153 math teachers, 44 schools, and 9 districts in 8 states. There was limited overlap between the two samples—only one-third of study districts, 9 percent of study schools, and less than three classroom matches provided study teachers from both the TFA and Teaching Fellows programs. Most (75 percent) of the classroom matches in the TFA study sample were in middle schools, while most (69 percent) of the classroom matches in the Teaching Fellows study sample were in high schools. Forty-one percent of the comparison teachers in the TFA sample entered teaching through less selective alternative routes to certification, compared with 27 percent of the comparison teachers in the Teaching Fellows sample.

Data on teacher characteristics. To collect information on the characteristics of teachers in the study, we administered a survey to all teachers in the study in the spring of each of the study school years. We also collected teachers' scores from either the Praxis II Middle School Mathematics assessment (for middle school math teachers) or the Praxis II Mathematics Content Knowledge assessment (for high school math teachers), administering the test to teachers who had not taken it previously and gathering existing scores from those who had.

Data on outcomes. The math achievement of students assigned to teachers in the study was the key outcome used to evaluate the teachers' effectiveness. Student math achievement was measured by math assessments administered at the end of the school year in which the students were randomly assigned. For students in grades 6 to 8, we obtained scores on state-required assessments. For students in grades 9 to 12, we administered end-of-course math assessments developed by the Northwest Evaluation Association (NWEA). The state assessments were expected to align more closely with state curriculum standards, whereas the NWEA assessments were expected to be less prone to floor or ceiling effects for high- and low-achieving students.

Analysis. To estimate the effectiveness of TFA or Teaching Fellows teachers relative to the comparison teachers, we compared end-of-year test scores of the students assigned to the TFA or Teaching Fellows teachers and the students assigned to the comparison teachers. We estimated the effectiveness of TFA and Teaching Fellows teachers separately.

This experimental design ensured that any differences in math achievement between the students of TFA or Teaching Fellows teachers and the students of comparison teachers could be attributed to differences in the teachers' effectiveness rather than differences in the characteristics of the students they taught, the subject they taught, or the school in which they taught.

Although students in the study were randomly assigned among teachers from different routes to certification, teachers were not randomly assigned to these routes. TFA and the Teaching Fellows programs may attract different types of candidates than other routes to certification—these differences can arise both from the programs' approaches to recruitment and selection and from the teachers' decisions on which programs to apply to and attend. Therefore, differences in effectiveness between TFA teachers and comparison teachers, and between Teaching Fellows and comparison teachers, do not reflect the effectiveness of the programs alone. Instead, they reflect the influence of *both* differences in the types of individuals who choose to enter teaching through TFA or a Teaching Fellows program versus some other training program and differences in the recruitment and selection procedures and training and support the programs offer. The study cannot rigorously disentangle these components.

No restriction was placed on the experience levels of the TFA teachers, Teaching Fellows, or comparison teachers. Hence, in some comparisons, novice TFA (or Teaching Fellows) teachers were compared with more experienced comparison teachers. However, the study also explored the effectiveness of the TFA (or Teaching Fellows) teachers when they were compared with teachers with similar levels of experience.

The study was not designed to compare the effectiveness of TFA teachers with that of Teaching Fellows. There are some substantive differences between the programs; for instance, TFA requires its teachers to commit to two years in teaching, whereas Teaching Fellows programs expect their teachers to teach for many years. In addition, TFA focuses more on recruiting new college graduates, whereas the Teaching Fellows programs focus more on recruiting professionals who want to switch careers. However, there are also many reasons not directly related to the effectiveness of the programs that might lead estimates of the effectiveness of their teachers to differ. Students were not randomly assigned between TFA teachers and Teaching Fellows, and thus any differences in the estimated effectiveness of TFA teachers and Teaching Fellows could be due to differences in the students they teach, the teachers with whom they were compared, or the schools or districts in which they teach.

In fact, TFA and Teaching Fellows teachers in the study largely taught in different schools and districts—only one-third of study districts, 9 percent of study schools, and less than three classroom matches provided study teachers from both the TFA and Teaching Fellows programs. Moreover, TFA teachers in the study were more likely to teach in middle schools, whereas Teaching Fellows were more likely to teach in high schools, consistent with the fact that, nationwide, secondary math teachers from TFA are more likely to be placed in middle schools and those from Teaching Fellows programs are more likely to be placed in high schools. Because the challenges of teaching may vary across grade levels and because the study used different student assessments at the middle and high school levels, it could be misleading to directly compare the effectiveness of the TFA and Teaching Fellows teachers in the study. Finally, TFA and Teaching Fellows teachers were also compared with different types of teachers; 41 percent of the teachers with whom TFA teachers were compared entered teaching through less selective alternative routes to certification, while 27 percent of the teachers with whom Teaching Fellows

were compared entered teaching through less selective alternative routes. For all of these reasons, the study findings cannot be used to compare the effectiveness of TFA and Teaching Fellows teachers.

Teach For America

Selection, Training, and Support of TFA Program Participants

TFA is a national program that places teachers in numerous regions across the country—43 as of August 2011. TFA recruits, selects, trains, and supports its teachers. Each of these elements of the program could influence the effectiveness of its secondary math teachers, so information on TFA's operations can provide important context for interpreting the study's findings.

TFA focuses its recruitment efforts on new college graduates, targeting seniors at many of the nation's most distinguished colleges and universities. Individuals apply to TFA as a whole, not to a regional program; they may specify regional preferences, but the program will assign them to whatever region is deemed the best fit. Furthermore, TFA requires its teachers to commit to two years in teaching. The selection process includes a written application, a telephone interview, an analysis and writing exercise, an in-person interview, a monitored group discussion, and a five-minute sample teaching lesson. Using a computer-based algorithm to help identify applicants with the greatest potential to be effective teachers, TFA accepts about 12 percent of applicants nationwide.

TFA teachers receive training and support both before and after they start teaching. The main training experience before participants become classroom teachers is an intensive five-week summer institute in which they receive formal instruction and engage in practice teaching. Most TFA regional programs do not provide all of the instruction necessary for certification, so participants typically must also enroll in a separate state-authorized alternative certification program in order to complete coursework toward their certification during their first years of teaching. Staff from participating TFA programs reported that the alternative certification programs where most of their secondary math teachers had enrolled in the three preceding years involved an average of 137 hours of coursework. In addition, TFA provides information, feedback, and mentoring to its teachers in their first one to two years of teaching.

TFA works with districts to place teachers in high-need schools. Compared with the average U.S. secondary school, secondary schools with new TFA teachers are more likely to be located in urban areas and to be eligible for Title I funds for schools with high percentages of low-income students. In addition, they serve a higher percentage of students from racial and ethnic minorities and students eligible for free or reduced-price lunch.

Study Schools with TFA Teachers

Because the study's findings about TFA teachers pertain to the types of schools represented in the TFA study sample, it is important to understand the characteristics of these schools.

Schools with TFA teachers in the study served disadvantaged populations. Eighty-two percent of schools with TFA teachers in the study were eligible for Title I funds. Eighty-nine percent of students in schools with TFA study teachers were Hispanic or black. Students in the

TFA study sample scored below average for their states in both reading and math before participating in the study.

Schools with TFA teachers in the study were similar to schools employing secondary math teachers from TFA nationwide. Over 80 percent of students at both sets of schools were from racial and ethnic minority groups, and close to 80 percent were eligible for free or reduced-price lunch. However, there were some differences—for example, urban schools were overrepresented and charter schools were underrepresented in the TFA study sample.

Teachers in the TFA Sample

Interpreting the study estimates of teacher effectiveness requires understanding the characteristics of both TFA teachers and the teachers with whom they were compared. TFA has unique procedures for recruiting and selecting individuals with particular characteristics that it believes are associated with effectiveness in the classroom. Hence, it is not surprising that we found many differences in the characteristics and experiences of the TFA teachers in the study and the teachers with whom they were compared.

TFA teachers had less teaching experience than comparison teachers. Consistent with TFA requiring a two-year commitment to teaching, TFA teachers in our study had significantly less teaching experience than comparison teachers. Eighty-three percent of the TFA teachers were in either their first or second year of teaching during the study school year, compared with 10 percent of the comparison teachers. TFA teachers in the study also had less nonteaching work experience than the comparison teachers.

TFA teachers were less likely than comparison teachers to be from racial or ethnic minorities and less likely to be female. Eighty-nine percent of TFA teachers in the study were white and non-Hispanic, compared with 30 percent of the comparison teachers. Sixty-one percent of TFA teachers in the study were female, compared with 79 percent of the comparison teachers. In terms of both race and gender distribution, TFA teachers were more similar to secondary teachers nationwide than the comparison teachers—84 percent of secondary teachers nationwide were white and non-Hispanic, and 59 percent were female.

TFA teachers had graduated from more selective colleges than comparison teachers. Eighty-one percent of TFA teachers in the study had graduated from a selective college or university, compared with 23 percent of the comparison teachers.[2]

TFA teachers were less likely than comparison teachers to have majored in math, but scored higher on a test of math content knowledge. Relative to the comparison teachers, TFA teachers in the study were less likely to have a major or minor in math or secondary math education; they had also taken significantly fewer college-level math courses. Despite these differences, on average, TFA teachers scored significantly higher on the Praxis II math exam than the comparison teachers. TFA teachers who took the Mathematics Content Knowledge Test scored 22 points (or 0.93 standard deviations) higher than their counterparts from other routes;

[2] College selectivity was defined based on *Barron's Profiles of American Colleges 2003*. Selective colleges were defined as those ranked by Barron's as very competitive, highly competitive, or most competitive.

TFA teachers who took the Middle School Mathematics Test outscored their counterparts by 22 points (or 1.19 standard deviations).

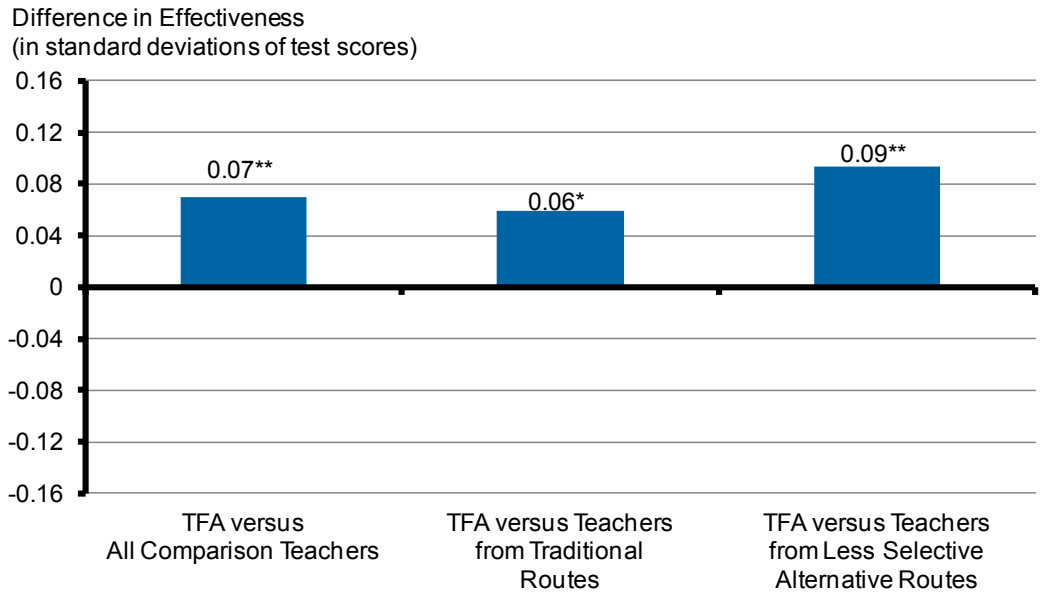
TFA Teachers Were More Effective Than Comparison Teachers

On average, students assigned to TFA teachers scored higher (by 0.07 standard deviations) on end-of-year math assessments than students assigned to comparison teachers (Figure ES.1). This difference in math scores was equivalent to an increase in student achievement from the 27th to the 30th percentile. This difference also translated into an additional 2.6 months of school for the average student nationwide.

In addition, TFA teachers were more effective than the teachers with whom they were compared across several key teacher subgroups we examined.

- **TFA teachers were more effective than their counterparts from both traditional and less selective alternative routes to certification.** One criticism of alternative routes to certification, both less and highly selective routes, is that, because they provide less preparation for teaching, their teachers are less effective than teachers from traditional routes to certification (Darling-Hammond 1990, 2000; Darling-Hammond et al. 2005). To explore the validity of this criticism as it applies to TFA teachers, we conducted a subgroup analysis estimating the effectiveness of TFA teachers relative to their counterparts from traditional routes. We found that students of TFA teachers outperformed those of teachers from traditional routes by 0.06 standard deviations. We also examined the effectiveness of TFA teachers relative to their counterparts from less selective alternative routes—the hard-to-staff schools in which TFA teachers are placed may often be faced with the choice of hiring a TFA teacher or a teacher from these other alternative routes. We found that students of TFA teachers scored higher than students of teachers from less selective alternative routes by 0.09 standard deviations.
- **Novice TFA teachers were more effective than both novice and experienced comparison teachers.** Another common criticism of TFA is that it seeks teachers willing to make a two-year rather than a longer-term commitment to teaching. Critics claim that too many TFA teachers leave teaching before they accumulate the experience needed to be as effective as their counterparts from other routes (Heilig and Jez 2010). To examine this concern, we compared novice TFA teachers (defined as those in their first three years of teaching) with both novice and experienced comparison teachers. We found that novice TFA teachers were more effective than comparison teachers regardless of the comparison teachers' experience. Students of TFA teachers in their first three years of teaching scored higher on math assessments (by 0.08 standard deviations) than students of their counterparts in their first three years of teaching. Students of TFA teachers in their first three years of teaching also had higher student math achievement (by 0.07 standard deviations) compared with students of comparison teachers with more than three years of experience.

Figure ES.1. Differences in Effectiveness Between Teach For America Teachers and Comparison Teachers, Overall and by Entry Route into Teaching



Sources: District administrative records and study-administered Northwest Evaluation Association (NWEA) assessments.

*Estimate is statistically significant at the 0.05 level based on a two-tailed test after adjusting for multiple hypothesis testing.
**Estimate is statistically significant at the 0.01 level based on a two-tailed test after adjusting for multiple hypothesis testing.

TFA = Teach For America.

- **TFA teachers were more effective than comparison teachers in both middle and high schools.** Because the effective teaching of math might require different knowledge or skills depending on the level of math being taught, we examined TFA teachers' effectiveness separately in middle and high schools. We found that TFA teachers were more effective than comparison teachers at both the middle and high school levels. At the middle school level, students of TFA teachers outperformed students of comparison teachers by 0.06 standard deviations. At the high school level, students of TFA teachers outperformed students of comparison teachers by 0.13 standard deviations.

Teaching Fellows

Selection, Training, and Support of Teaching Fellows Program Participants

TNTP works with districts—19 as of August 2011—to establish locally run Teaching Fellows programs. The local programs have distinct identities, but TNTP guidance ensures basic consistency in their approach to recruiting, selecting, training, and supporting their teachers.

Teaching Fellows programs accept new college graduates but focus their recruitment efforts more on professionals who want to switch careers. Individuals apply to a specific Teaching Fellows program in the locality in which they want to teach. Teaching Fellows programs expect their participants to make an open-ended commitment to teaching rather than a short-term

commitment. The selection process includes a written application, an analysis and writing exercise, an in-person interview, a monitored group discussion, and a five-minute sample teaching lesson. Trained staff apply specific selection criteria and use their judgment to identify applicants with the greatest potential to be effective teachers. Teaching Fellows programs nationwide accept about 13 percent of applicants.

Teaching Fellows teachers receive training and support both before and after they start teaching. The main training experience before participants become classroom teachers is an intensive five- to seven-week summer institute in which they receive formal instruction and engage in practice teaching. Most Teaching Fellows programs do not provide all of the instruction necessary for certification, so participants typically must also enroll in a separate state-authorized alternative certification program in order to complete coursework toward their certification during their first years of teaching. Staff from participating Teaching Fellows programs reported that the alternative certification programs where most of their secondary math teachers had enrolled in the three preceding years involved an average of 137 hours of coursework. In addition, Teaching Fellows programs provide information, feedback, and mentoring to their teachers in their first one to two years of teaching.

Teaching Fellows programs work with districts to place teachers in high-need schools. Compared with the average U.S. secondary school, secondary schools with new Teaching Fellows teachers are more likely to be located in urban areas and to be eligible for Title I funds. In addition, they serve a higher percentage of students from racial and ethnic minorities and students eligible for free or reduced-price lunch.

Study Schools with Teaching Fellows

Because the study's findings about Teaching Fellows pertain to the types of schools represented in the Teaching Fellows study sample, it is important to understand the characteristics of these schools.

Schools with Teaching Fellows in the study served disadvantaged populations. Eighty-two percent of all study schools with Teaching Fellows were eligible for Title I funds. More than 80 percent of students in study schools with Teaching Fellows were Hispanic or black. Students in the Teaching Fellows study sample scored below average for their states in both reading and math before participating in the study.

Schools with Teaching Fellows in the study were similar to schools employing secondary math teachers from Teaching Fellows programs nationwide. Over 80 percent of students at both sets of schools were from racial or ethnic minority groups, and close to 80 percent were eligible for free or reduced-price lunch. However, as in the TFA study sample, urban schools were overrepresented and charter schools were underrepresented in the Teaching Fellows study sample.

Teachers in the Teaching Fellows Sample

Teaching Fellows programs have unique procedures for recruiting and selecting individuals with particular characteristics that they believe are associated with effectiveness in the classroom. Hence, as with TFA teachers and their counterparts, we found many differences in

the characteristics and experiences of the Teaching Fellows in the study and the teachers with whom they were compared.

Teaching Fellows had less teaching experience than comparison teachers. Consistent with the Teaching Fellows programs' expectations that their teachers remain in teaching for many years, 76 percent of Teaching Fellows had three or more years of teaching experience. However, on average, they still had less experience than comparison teachers. Twenty-three percent of Teaching Fellows were in their first or second year of teaching, compared with 7 percent of the comparison teachers. This may reflect the fact that the Teaching Fellows programs were only launched in the year 2000 or after, and hence teachers from these programs have not had time to gain decades of experience. Consistent with the focus of Teaching Fellows programs on recruiting professionals to transition into teaching, Teaching Fellows had more nonteaching work experience than did the comparison teachers.

Teaching Fellows were less likely than comparison teachers to be from racial or ethnic minorities. Seventy-one percent of Teaching Fellows in the study were white and non-Hispanic, compared with 43 percent of the comparison teachers. Teaching Fellows were more similar to secondary teachers nationwide than the comparison teachers in terms of racial and ethnic distribution—84 percent of secondary teachers nationwide were white and non-Hispanic. Both Teaching Fellows and comparison teachers were similar to the average secondary teacher nationwide in terms of gender distribution. Fifty-four percent of Teaching Fellows and 57 percent of comparison teachers were female, compared with 59 percent of secondary teachers nationwide—these differences were not statistically significant.

Teaching Fellows had graduated from more selective colleges than comparison teachers. Seventy-two percent of Teaching Fellows in the study had graduated from a selective college or university, compared with 34 percent of the comparison teachers.[3]

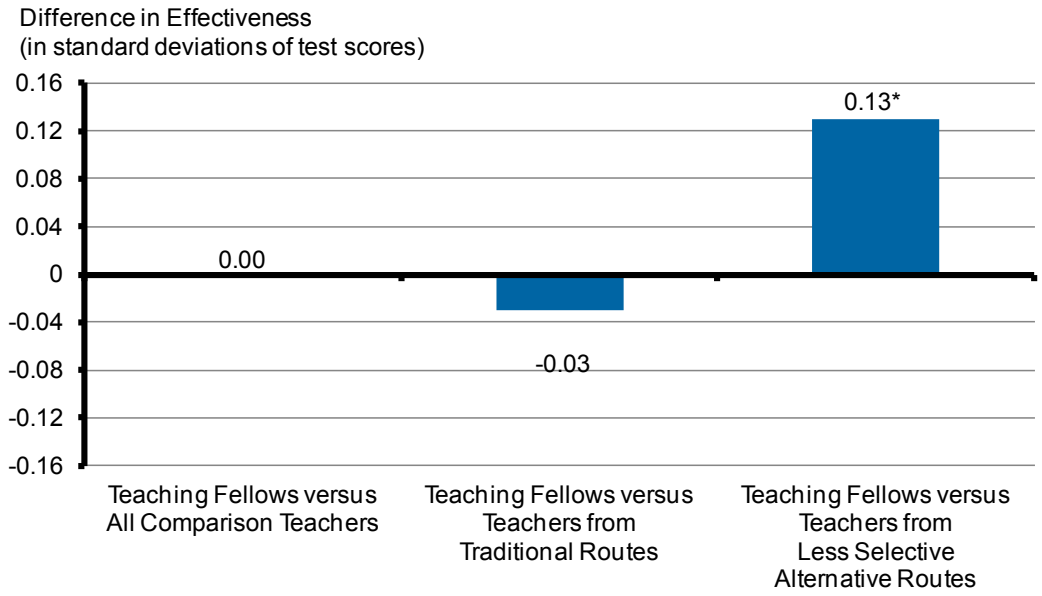
Teaching Fellows were less likely than comparison teachers to have majored in math, but scored higher on a test of math content knowledge. Relative to the comparison teachers, Teaching Fellows were less likely to have majored in math or secondary math education; nonetheless, they had taken about the same number of math courses. Despite being less likely to have majored in math, Teaching Fellows scored significantly higher on the Praxis II math exam than the comparison teachers. Teaching Fellows who took the Mathematics Content Knowledge Test scored 19 points (or 0.80 standard deviations) higher than their counterparts from other routes, whereas Teaching Fellows who took the Middle School Mathematics Test outscored their counterparts by 17 points (or 0.92 standard deviations).

Teaching Fellows Did Not Differ in Effectiveness from Comparison Teachers Overall, but the Study Found Differences for Some Subgroups

On average, students of Teaching Fellows and students of comparison teachers had similar scores on end-of-year math assessments (Figure ES.2). However, we found that effectiveness varied for specific subgroups of Teaching Fellows and comparison teachers:

[3] College selectivity was defined based on *Barron's Profiles of American Colleges 2003*. Selective colleges were defined as those ranked by Barron's as very competitive, highly competitive, or most competitive.

Figure ES.2. Differences in Effectiveness Between Teaching Fellows and Other Math Teachers in the Same Schools, Overall and by Entry Route into Teaching



Sources: District administrative records and study-administered Northwest Evaluation Association (NWEA) assessments.

*Estimate is statistically significant at the 0.05 level based on a two-tailed test after adjusting for multiple hypothesis testing.
**Estimate is statistically significant at the 0.01 level based on a two-tailed test after adjusting for multiple hypothesis testing.

- **Teaching Fellows were more effective than teachers from less selective alternative routes to certification, and neither more nor less effective than teachers from traditional routes to certification.** As an alternative route to teacher certification, Teaching Fellows programs are subject to the same criticisms mentioned earlier regarding TFA—specifically, that they, like other alternative routes to certification, provide insufficient preparation for teaching relative to traditional routes. However, we found that students of Teaching Fellows did not perform significantly better or worse than students of teachers from traditional routes. We also compared the effectiveness of Teaching Fellows with that of teachers from less selective alternative routes, as many schools may be faced with the choice of hiring a Teaching Fellow or a teacher from these other alternative routes. We found that students of Teaching Fellows outperformed students of teachers from less selective alternative routes by 0.13 standard deviations.

- **Novice Teaching Fellows were more effective than novice comparison teachers, but this difference dissipated among more experienced teachers.** Schools may often be faced with the choice of hiring a new Teaching Fellow or a new teacher from some other route. We found that novice Teaching Fellows (those in their first three years of teaching) were more effective than novice comparison teachers, increasing student achievement in math by 0.13 standard deviations. However, when Teaching Fellows from all levels of experience were compared with comparison teachers whose experience differed by no more than two years, there was no statistically

significant difference in math achievement between the students of these two groups of teachers.

- **Teaching Fellows were neither more nor less effective than comparison teachers in both middle and high schools.** We examined Teaching Fellows' effectiveness separately at the middle and high school levels. We found that math achievement did not differ significantly between students of Teaching Fellows and students of comparison teachers at either the middle or high school level.

Observed Characteristics and Teacher Effectiveness

Because teachers in the study varied substantially in their effectiveness, the study provided an opportunity to examine the associations between specific teacher characteristics and student math achievement. This analysis used the full sample of teachers in our study—TFA teachers, Teaching Fellows, and comparison teachers. Understanding the relationship between teacher characteristics and effectiveness can inform policies to improve teacher effectiveness and principals' hiring decisions. Because this analysis relied on nonexperimental methods, the results can generate hypotheses about the characteristics of effective math teachers, but cannot provide conclusive evidence about whether these characteristics *caused* the higher student math achievement.

Consistent with previous research (Kane et al. 2008), we found that different teachers who took the same route into teaching varied considerably in their effectiveness in the classroom. Yet, few observed characteristics appeared to explain these differences. We examined eight teacher characteristics: (1) the selectivity of the teacher's undergraduate institution, (2) amount of college-level math coursework completed, (3) use of college-level math in a prior nonteaching position, (4) performance on Praxis II math content knowledge assessments for teachers, (5) amount of pedagogy instruction received, (6) extent of student teaching completed, (7) amount of coursework taken during the school year, and (8) years of teaching experience. Of these characteristics, two were consistently associated with student achievement, and a third was associated with student achievement in some but not all analyses conducted:

1. **Teacher effectiveness increased with teacher experience.** Students assigned to a second-year teacher were predicted to score 0.08 standard deviations higher on math assessments than students assigned to a first-year teacher. Among teachers with at least five years of teaching experience, each additional year of teaching experience was associated with an increase of 0.005 standard deviations in student achievement.
2. **Teacher effectiveness declined with increasing amounts of teacher coursework during the school year.** For each additional 10 hours of coursework that teachers took during the school year, the math achievement of their students was predicted to drop by 0.002 standard deviations. These findings imply that a teacher who took an average amount of coursework during the school year, whether for initial certification or any other certification or degree, decreased student math achievement by 0.04 standard deviations relative to a teacher who took no coursework while teaching. Although we cannot directly examine why coursework was negatively related to teacher effectiveness, the findings are consistent with the hypothesis that coursework taken during the school year diverts teachers' energy and attention from the classes they are teaching.

3. **In some of the analyses we conducted, greater math content knowledge was positively associated with teacher effectiveness in high schools, but not in middle schools.** In high schools, we found that teachers' math content knowledge, as measured by their scores on the Praxis II math assessments, was positively associated with student achievement in some of our sensitivity analyses, but not in our main analysis. Our main analysis indicates that a one standard deviation increase in a high school teacher's Praxis II score—equivalent to rising from the 50th to the 84th percentile of Praxis II scores—was associated with an increase in student math achievement of 0.04 standard deviations, but this difference was not statistically significant at the 5 percent level (p-value = 0.051). Our sensitivity analyses found that high school students taught by teachers in the top half of the Praxis II score distribution had higher math achievement, by a statistically significant degree, than those taught by teachers in the bottom half of the distribution. In middle schools, we found no association between teachers' scores on the Praxis II and student achievement.

Collectively, the teacher characteristics we examined could not account for any portion of the difference in effectiveness between TFA teachers and the teachers with whom they were compared. Although TFA teachers would have been predicted to be *less* effective than comparison teachers on the basis of their characteristics—primarily because of the TFA teachers' relative inexperience in the classroom—TFA teachers were, in fact, more effective than their counterparts. The nonexperimental methods used for this analysis cannot provide conclusive evidence about the causal relationship between the characteristics examined and student math achievement, but the results suggest that TFA teachers' greater effectiveness might have been driven by teacher characteristics that we did not observe.

Conclusions

Teachers in the study who entered teaching through either TFA or the Teaching Fellows programs were at least as effective at teaching secondary math as those who entered via traditional or less selective alternative routes to certification, and in some cases they were more effective. Therefore, TFA and the Teaching Fellows programs represent two examples of program models for recruiting, selecting, training, and supporting teachers that can address teacher shortages in secondary math within high-need schools without decreasing student achievement.

The study findings can provide guidance to school principals considering hiring decisions. Although a specific teacher from TFA or a Teaching Fellows program might be more or less effective than a teacher from a traditional or less selective alternative route, our findings can shed light on the average effectiveness of the teachers from TFA relative to teachers from another route and on the average effectiveness of Teaching Fellows relative to teachers from another route.

Our study suggests that, on average, principals of the secondary schools in the study would raise student math achievement by hiring a TFA teacher rather than a teacher from a traditional or less selective alternative route to teach the math classes examined in the study. Although the TFA teachers in the study were less experienced, on average, than the comparison teachers, students of TFA teachers outperformed students of other teachers in the same grades and schools by a statistically significant margin. This result held true whether the comparison teachers were

from traditional routes or less selective alternative routes. Similarly, students of TFA teachers in their first three years of teaching outperformed students of other novice teachers in the same grades and schools as well as students of more experienced teachers. This latter finding is particularly important given the fact that TFA requires its teachers to make only a two-year commitment to teaching.

Our main impact findings for Teaching Fellows suggest that a secondary school in the study would experience neither higher nor lower student math achievement if its principal hired Teaching Fellows math teachers rather than math teachers from traditional or less selective alternative routes. Nevertheless, a principal faced with a more specific choice between a novice Teaching Fellow and a novice teacher from another route or a choice between a Teaching Fellow and a teacher from a less selective alternative route should expect higher student achievement, on average, from hiring the Teaching Fellow. If comparing a Teaching Fellow with another teacher with the same years of experience, on average, the principal would do just as well hiring either teacher.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