Addressing Teacher Shortages in Disadvantaged Schools: Alternative Routes to Teacher Certification and Student Achievement

September 12, 2013

Elizabeth Warner • Jill Constantine • Melissa Clark
Vicki Bernstein • Russ Whitehurst
Highlighting Two IES Sponsored Studies

- The Evaluation of Teachers Trained Through Different Routes to Certification (Constantine et al. 2009)
  - Capitalizes on existing variation in amount of required coursework and content emphasis of teacher preparation

- The Effectiveness of Secondary Math Teachers from Teach For America and the Teaching Fellows Programs (Clark et al. 2013)
  - Focus on selectivity of teacher preparation programs

- Addressing Teacher Shortages in Disadvantaged Schools: Lessons from Two Institute of Education Sciences Studies (Clark et al. 2013)
  - Evaluation Brief: Synthesis of the two IES studies
Can alternative certification routes broaden the pool of effective teachers in high-need schools?

What have we learned that may inform teacher preparation policy?
Speakers/Panelists

- Elizabeth Warner, Institute of Education Sciences, U.S. Department of Education
  - Moderator

- Jill Constantine, Mathematica
  - Presenter

- Melissa Clark, Mathematica
  - Presenter

- Vicki Bernstein, New York City Department of Education
  - Discussant

- Grover “Russ” Whitehurst, Brookings Institution
  - Discussant
Evaluation of Teachers Trained Through Different Routes to Certification

Jill Constantine
Study Focus

- Less selective alternative certification programs with admissions requirements similar to traditional certification programs
  - Minimum G. P. A. requirement of 3.0 or less
  - No other stringent selection criteria (SAT scores or interviews)

- Divided sample into alternative certification programs with relatively low and high coursework requirements
Research Questions

1. What are the effects on student achievement of teachers trained through different routes to certification?

2. What aspects of teacher preparation are associated with teacher effectiveness?
   - Amount of coursework
   - Timing of coursework
   - Content of coursework
Summary of Findings

- Students of alternatively certified teachers performed the same, on average, as students of traditionally certified teachers in their schools.

- Completing required coursework while teaching is associated with lower student achievement.

- Variation in the amount and content of required coursework in teacher preparation was not linked to teachers' effectiveness in terms of student achievement.
Rigorous Random Assignment Design

- **Research design and participants:** Randomly assigned students in same schools and grades to novice teachers from traditional or alternative certification programs

- **Analysis:** Compared outcomes of students randomly assigned to the different teachers

- **Study design:** Provided a test of the effectiveness of teachers from different preparation programs; we can't separate the effect of the teacher from the program
In 7 states, 63 schools, 174 teachers

Students
- High poverty
- Students in grades K–5, but two-thirds were in K–3; reflects typical placement of novice alternative route teachers
- 92 percent minority
- Below average test scores

Collected data on teacher training programs, teachers, and students
Characteristics of Alternative Certification Programs
Alternatively Certified Teachers Required to Complete Fewer Coursework Hours

Low AC Teachers

Comparison Teachers

High AC Teachers

Comparison Teachers

Coursework Hours
Alternatively Certified Teachers Required To Complete Many Hours Of Coursework While Teaching

- **High AC Teachers**
  - Before becoming teacher of record: 150 hours
  - During first year of teaching: 150 hours
  - After first year of teaching: 131 hours

- **Low AC Teachers**
  - Before becoming teacher of record: 115 hours
  - During first year of teaching: 63 hours

Legend:
- Blue: Before becoming teacher of record
- Light yellow: During first year of teaching
- Red: After first year of teaching
Personal and Professional Backgrounds of Teachers Differed

- Alternatively certified teachers were:
  - Four to six years older than traditionally certified teachers
  - More likely to be African American
  - Less likely to be white
  - More likely to have children

- Less likely to major in education as undergraduates

- More likely to be taking coursework during the study year
Findings on Teacher Effectiveness
Novice Alternatively Certified Teachers Neither More Nor Less Effective Than Novice Traditionally Certified Teachers

Note: None of the effects were significantly different from zero at the .05 level.
Students of alternatively certified teachers in California scored statistically lower in math than students of their traditionally certified comparisons.

Students of alternatively certified teachers taking coursework scored statistically lower in math than students of their traditionally certified counterparts.

No other teacher or program characteristics were related to teacher effectiveness.
The Effectiveness of Secondary Math Teachers from Teach For America and the Teaching Fellows Programs

Melissa Clark
TFA and Teaching Fellows Programs

- Follow similar models
  - Recruit and select high-achieving individuals
  - Provide 5 to 7 weeks of training in summer
  - Place in high-poverty schools
  - Provide ongoing training and support

- Programs differ in some ways
  - TFA recruits mainly college graduates; Teaching Fellows programs recruit mainly professionals
  - TFA requires two-year commitment; Teaching Fellows programs expect long-term commitment
Research Questions

Compared with other teachers teaching the same math courses in the same schools…

1. How effective are secondary math teachers from TFA?
2. How effective are secondary math teachers from the Teaching Fellows programs?
Secondary math teachers from Teach For America (TFA) were more effective than other math teachers in the same schools.

Secondary math teachers from the Teaching Fellows programs were at least as effective as, and in some cases more effective than, other math teachers in the same schools.
Randomly assigned students to teachers within same school and math course
  – Class taught by TFA or Teaching Fellows teacher
  – Class taught by “comparison teacher” who entered teaching via either alternative or traditional route
  – No limits on teacher experience

Compared student math scores at end of year to estimate teacher effectiveness
  – Can’t compare effectiveness of TFA and Teaching Fellows teachers
Large Samples, Comprehensive Data Collection

- **TFA analysis sample**
  - 4,573 students, 136 teachers, 45 schools, 11 districts, 8 states

- **Teaching Fellows analysis sample**
  - 4,116 students, 153 teachers, 44 schools, 9 districts, 8 states

- **Data collection**
  - Student math achievement
    - State tests for middle school students
    - Study-administered, subject-specific tests for high school students (algebra I, II, geometry)
  - Teacher characteristics
    - Survey of background and preparation
    - Praxis II math scores to measure math content knowledge
Characteristics of Study Teachers
Relative to comparison teachers, TFA and Teaching Fellows teachers:
- Younger and more likely to be white
- More likely to have attended a selective college
- Have less teaching experience
- Less likely to have a math degree, but scored higher on Praxis II math assessment
- More likely to have taken coursework during study year (TFA only)
Effectiveness of TFA Teachers
TFA Teachers More Effective Than Comparison Teachers

Difference in effectiveness (in standard deviations of test scores)

- 0.07** (2.6 months)
- 0.06**
- 0.09**

TFA vs. all comparison teachers
TFA vs. teachers from traditional routes
TFA vs. teachers from less selective alternative routes

Difference is statistically significant at 5% (*) or 1% (**) level.
Novice TFA Teachers More Effective Than Both Novice and Experienced Comparison Teachers

Difference in effectiveness (in standard deviations of test scores)

- Novice TFA vs. novice comparison teachers: 0.08**
- Novice TFA vs. experienced comparison teachers: 0.07**

Difference is statistically significant at 5% (*) or 1% (**) level.
Effectiveness of Teaching Fellows
Teaching Fellows Just as Effective as Comparison Teachers, and in Some Cases More Effective

Difference in effectiveness (in standard deviations of test scores)

-0.08
-0.04
0
0.04
0.08
0.12
0.16

Teaching Fellows vs. all comparison teachers
Teaching Fellows vs. teachers from traditional routes
Teaching Fellows vs. teachers from less selective alternative routes

Difference is statistically significant at 5% (*) or 1% (**) level.
Novice Teaching Fellows More Effective Than Novice Comparison Teachers

Difference in effectiveness
(in standard deviations of test scores)

Novice Teaching Fellows vs. novice comparison teachers
0.13**

Experienced Teaching Fellows vs. experienced comparison teachers
0.03

Difference is statistically significant at 5% (*) or 1% (**) level.
Analysis of Factors That Predict Teacher Effectiveness
Examined a range of teacher characteristics
- Selectivity of college, college courses taken, math content knowledge, student teaching experience, coursework

With a few exceptions, none of the characteristics examined predicted teacher effectiveness
- Teaching experience and content knowledge at high school level associated with increased effectiveness
- Coursework taken while teaching associated with decreased effectiveness
Lessons Learned from the Two Studies

- Teachers from both highly selective and less selective alternative certification programs can help fill teacher shortages without decreasing student achievement
  - Secondary math teachers from TFA, and in some cases Teaching Fellows, can increase student achievement

- Coursework taken while teaching may decrease teacher effectiveness

- Difficult to predict teacher effectiveness
Grover “Russ” Whitehurst

BROOKINGS
Questions and Answers

- **Moderator:** Elizabeth Warner (IES)

- **Presenters**
  - Jill Constantine
  - Melissa Clark

- **Discussants**
  - Vicki Bernstein
  - Russ Whitehurst
For More Information

Evaluation Brief

Contacts

- Elizabeth Warner
  • elizabeth.warner@ed.gov

- Melissa Clark
  • mclark@mathematica-mpr.com

- Jill Constantine
  • jconstantine@mathematica-mpr.com
Jill Constantine: Back-up Slides
Novice Alternatively Certified Teachers Were Neither More Nor Less Effective Than Novice Traditionally Certified Teachers

<table>
<thead>
<tr>
<th></th>
<th>AC Classroom Average Score</th>
<th>TC Classroom Average Score</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reading</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>38.51</td>
<td>38.62</td>
<td>-0.01</td>
</tr>
<tr>
<td>Low coursework</td>
<td>38.29</td>
<td>38.50</td>
<td>-0.01</td>
</tr>
<tr>
<td>High coursework</td>
<td>38.76</td>
<td>38.76</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Math</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>41.75</td>
<td>42.77</td>
<td>-0.05</td>
</tr>
<tr>
<td>Low coursework</td>
<td>41.52</td>
<td>42.12</td>
<td>-0.03</td>
</tr>
<tr>
<td>High coursework</td>
<td>42.03</td>
<td>43.53</td>
<td>-0.07</td>
</tr>
</tbody>
</table>
Comprehensive Data Collection

- **Student achievement**
  - Study team administered California Achievement Test, 5th edition

- **Teacher practices**
  - Trained observers rated classroom practices using the Vermont Classroom Observation Tool
  - Principal ratings

- **Teacher characteristics**
  - Teacher survey

- **Program characteristics**
  - In depth phone and in person interviews with directors of alternative and traditional certification programs
# Teacher Characteristics (1)

<table>
<thead>
<tr>
<th></th>
<th>Low Coursework</th>
<th></th>
<th>High Coursework</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AC</td>
<td>TC</td>
<td>p-Value</td>
<td>AC</td>
</tr>
<tr>
<td>White</td>
<td>49%</td>
<td>74%</td>
<td>.02*</td>
<td>41%</td>
</tr>
<tr>
<td>Black</td>
<td>40%</td>
<td>20%</td>
<td>.01*</td>
<td>32%</td>
</tr>
<tr>
<td>Female</td>
<td>96%</td>
<td>98%</td>
<td>.56</td>
<td>79%</td>
</tr>
<tr>
<td>Have children</td>
<td>70</td>
<td>28</td>
<td>0.00**</td>
<td>38</td>
</tr>
<tr>
<td>Experience (yrs)</td>
<td>2.4</td>
<td>3.0</td>
<td>.06</td>
<td>2.7</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>34</td>
<td>28</td>
<td>.00**</td>
<td>34</td>
</tr>
<tr>
<td>N</td>
<td>46</td>
<td>46</td>
<td></td>
<td>42</td>
</tr>
</tbody>
</table>

*Significantly different at the 5% level
**Significantly different at the 1% level.
Teacher Characteristics (2)

<table>
<thead>
<tr>
<th></th>
<th>Low Coursework</th>
<th></th>
<th></th>
<th>High Coursework</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AC</td>
<td>TC</td>
<td>p-Value</td>
<td>AC</td>
<td>TC</td>
<td>p-Value</td>
</tr>
<tr>
<td>SAT score</td>
<td>930</td>
<td>959</td>
<td>0.43</td>
<td>1,010</td>
<td>1,013</td>
<td>0.95</td>
</tr>
<tr>
<td>Selective undergraduate (%)</td>
<td>15.0</td>
<td>31.0</td>
<td>0.09</td>
<td>26.0</td>
<td>33.3</td>
<td>0.50</td>
</tr>
<tr>
<td>Education major</td>
<td></td>
<td></td>
<td><strong>0.00</strong></td>
<td>21.4</td>
<td>56.8</td>
<td><strong>0.00</strong></td>
</tr>
<tr>
<td>Currently taking courses</td>
<td>30.4</td>
<td>19.6</td>
<td>0.24</td>
<td>57.1</td>
<td>29.5</td>
<td><strong>0.01</strong></td>
</tr>
<tr>
<td>N</td>
<td>46</td>
<td>46</td>
<td></td>
<td>42</td>
<td>44</td>
<td></td>
</tr>
</tbody>
</table>

*Significantly different at the 5% level
**Significantly different at the 1% level
## Geographic Distribution of Sample

<table>
<thead>
<tr>
<th>Districts</th>
<th>Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Districts</td>
</tr>
<tr>
<td>California</td>
<td>5</td>
</tr>
<tr>
<td>Illinois, Wisconsin,</td>
<td>7</td>
</tr>
<tr>
<td>Louisiana, Georgia</td>
<td></td>
</tr>
<tr>
<td>New Jersey</td>
<td>3</td>
</tr>
<tr>
<td>Texas</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
</tr>
</tbody>
</table>
## Grade Distribution of Sample

<table>
<thead>
<tr>
<th>Grade</th>
<th>Number of Mini-Experiments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kindergarten</td>
<td>20</td>
</tr>
<tr>
<td>First</td>
<td>30</td>
</tr>
<tr>
<td>Second</td>
<td>14</td>
</tr>
<tr>
<td>Third</td>
<td>9</td>
</tr>
<tr>
<td>Fourth</td>
<td>11</td>
</tr>
<tr>
<td>Fifth</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>90</td>
</tr>
</tbody>
</table>
## Baseline Measures of Students

<table>
<thead>
<tr>
<th></th>
<th>AC Classrooms</th>
<th>TC Classrooms</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading pretest</td>
<td>38.71</td>
<td>38.03</td>
<td>0.38</td>
</tr>
<tr>
<td>Math pretest</td>
<td>42.07</td>
<td>42.14</td>
<td>0.92</td>
</tr>
<tr>
<td>Eligible for free or reduced-price lunch</td>
<td>75%</td>
<td>78%</td>
<td>0.08</td>
</tr>
<tr>
<td>Male</td>
<td>51%</td>
<td>49%</td>
<td>0.37</td>
</tr>
<tr>
<td>Nonwhite</td>
<td>92%</td>
<td>91%</td>
<td>0.56</td>
</tr>
<tr>
<td>Total students</td>
<td>1,276</td>
<td>1,334</td>
<td></td>
</tr>
</tbody>
</table>
Alternative and Traditional Certification
Differences in Required Coursework

Difference in hours

Low coursework

High coursework

-1400
-1200
-1000
-800
-600
-400
-200
0
200
400
Distribution of Effects

The bar chart shows the distribution of effects for reading and math. The x-axis represents different effect sizes ranging from -1.1 to 1.1, while the y-axis indicates the frequency. The chart is color-coded, with blue bars representing reading effects and red bars representing math effects. The peaks indicate areas where the distribution of effects is more concentrated.
Teacher Practices

![Bar chart showing teacher practices in literacy and math content, culture, and implementation.](chart.png)
Novice Alternatively Certified Teachers Were Neither More Nor Less Effective Than Novice Traditionally Certified Teachers

<table>
<thead>
<tr>
<th></th>
<th>AC Classroom Average Score</th>
<th>TC Classroom Average Score</th>
<th>Effect Size</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>38.51</td>
<td>38.62</td>
<td>-0.01</td>
<td>0.84</td>
</tr>
<tr>
<td>Low coursework</td>
<td>38.29</td>
<td>38.50</td>
<td>-0.01</td>
<td>0.81</td>
</tr>
<tr>
<td>High coursework</td>
<td>38.76</td>
<td>38.76</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Math</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>41.75</td>
<td>42.77</td>
<td>-0.05</td>
<td>0.12</td>
</tr>
<tr>
<td>Low coursework</td>
<td>41.52</td>
<td>42.12</td>
<td>-0.03</td>
<td>0.56</td>
</tr>
<tr>
<td>High coursework</td>
<td>42.03</td>
<td>43.53</td>
<td>-0.07</td>
<td>0.10</td>
</tr>
</tbody>
</table>
Melissa Clark: Back-up Slides
Study Schools Were Similar to Schools with Secondary Math Teachers from the Programs Nationwide

For schools in the TFA sample….

<table>
<thead>
<tr>
<th></th>
<th>Study Schools with TFA Teachers</th>
<th>All Secondary Schools with TFA Teachers</th>
<th>All Secondary Schools Nationwide</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Black</td>
<td>57%</td>
<td>57%</td>
<td>19%**</td>
</tr>
<tr>
<td>% Hispanic</td>
<td>31%</td>
<td>32%</td>
<td>20%*</td>
</tr>
<tr>
<td>% FRP</td>
<td>79%</td>
<td>80%</td>
<td>51%**</td>
</tr>
<tr>
<td>% Title I Eligible</td>
<td>82%</td>
<td>89%</td>
<td>60%**</td>
</tr>
<tr>
<td>% Urban</td>
<td>80%</td>
<td>70%</td>
<td>26%**</td>
</tr>
<tr>
<td>Enrollment per grade</td>
<td>240</td>
<td>184**</td>
<td>135**</td>
</tr>
</tbody>
</table>

Difference from study schools is statistically significant at 5% (*) or 1% (**) level.
Study Schools Were Similar to Schools with Secondary Math Teachers from the Programs Nationwide

...and for schools in the Teaching Fellows sample

<table>
<thead>
<tr>
<th></th>
<th>Study Schools with Teaching Fellows</th>
<th>All Secondary Schools with Teaching Fellows</th>
<th>All Secondary Schools Nationwide</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Black</td>
<td>47%</td>
<td>46%</td>
<td>19%**</td>
</tr>
<tr>
<td>% Hispanic</td>
<td>40%</td>
<td>35%</td>
<td>20%**</td>
</tr>
<tr>
<td>% FRP</td>
<td>80%</td>
<td>74%</td>
<td>51%**</td>
</tr>
<tr>
<td>% Title I Eligible</td>
<td>82%</td>
<td>87%</td>
<td>60%**</td>
</tr>
<tr>
<td>% Urban</td>
<td>&gt;95%</td>
<td>78%**</td>
<td>26%**</td>
</tr>
<tr>
<td>Enrollment per grade</td>
<td>298</td>
<td>248</td>
<td>135**</td>
</tr>
</tbody>
</table>

Difference from study schools is statistically significant at 5% (*) or 1% (**) level.
Demographics and Experience

<table>
<thead>
<tr>
<th></th>
<th>TFA Sample</th>
<th></th>
<th>Teaching Fellows Sample</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TFA Teachers</td>
<td>Comparison Teachers</td>
<td>Teaching Fellows</td>
<td>Comparison Teachers</td>
</tr>
<tr>
<td>Average Age</td>
<td>25</td>
<td>38**</td>
<td>33</td>
<td>41**</td>
</tr>
<tr>
<td>% Female</td>
<td>61</td>
<td>79*</td>
<td>54</td>
<td>57</td>
</tr>
<tr>
<td>% White</td>
<td>89</td>
<td>30**</td>
<td>71</td>
<td>43**</td>
</tr>
<tr>
<td>Years of Work Experience</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-teaching</td>
<td>0</td>
<td>3**</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Teaching</td>
<td>2</td>
<td>10**</td>
<td>4</td>
<td>13**</td>
</tr>
</tbody>
</table>

Difference between TFA and comparison teachers or Teaching Fellows and comparison teachers statistically significant at the 1% (**) or 5% (*) level, two-tailed test.
## Education and Content Knowledge

<table>
<thead>
<tr>
<th></th>
<th>TFA Sample</th>
<th></th>
<th>Teaching Fellows Sample</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TFA Teachers</td>
<td>Comparison Teachers</td>
<td>Teaching Fellows</td>
<td>Comparison Teachers</td>
</tr>
<tr>
<td>% from Selective College</td>
<td>81</td>
<td>23**</td>
<td>72</td>
<td>34**</td>
</tr>
<tr>
<td>% with Math Major</td>
<td>8</td>
<td>26*</td>
<td>25</td>
<td>43*</td>
</tr>
<tr>
<td>% with Graduate Degree</td>
<td>41</td>
<td>70**</td>
<td>83</td>
<td>80</td>
</tr>
<tr>
<td># College-Level Math Courses</td>
<td>5</td>
<td>8**</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Average Praxis Score</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle School Math</td>
<td>180</td>
<td>158**</td>
<td>187</td>
<td>170**</td>
</tr>
<tr>
<td>High School Math</td>
<td>162</td>
<td>140*</td>
<td>158</td>
<td>139**</td>
</tr>
</tbody>
</table>

Difference between TFA and comparison teachers or Teaching Fellows and comparison teachers statistically significant at the 1% (**) or 5% (*) level, two-tailed test.
## Training and Support

<table>
<thead>
<tr>
<th></th>
<th>TFA Sample</th>
<th></th>
<th>Teaching Fellows Sample</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TFA Teachers</td>
<td>Comparison Teachers</td>
<td>Teaching Fellows</td>
<td>Comparison Teachers</td>
</tr>
<tr>
<td>Days Student Teaching</td>
<td>18</td>
<td>25</td>
<td>11</td>
<td>38**</td>
</tr>
<tr>
<td>Hours Math Pedagogy</td>
<td>35</td>
<td>37</td>
<td>49</td>
<td>48</td>
</tr>
<tr>
<td>Took Coursework During Study Year (%)</td>
<td>50</td>
<td>21**</td>
<td>29</td>
<td>23</td>
</tr>
<tr>
<td>Had Mentor During Study Year (%)</td>
<td>67</td>
<td>29**</td>
<td>23</td>
<td>17</td>
</tr>
</tbody>
</table>

Difference between TFA and comparison teachers or Teaching Fellows and comparison teachers statistically significant at the 1% (**) or 5% (*) level, two-tailed test.
Observed Factors Do Not Explain TFA Impact

- **Math content knowledge**
  - Accounts for only 16 percent of impact

- **Coursework taken during school year**
  - Coursework negatively associated with effectiveness, but TFA teachers took *more* coursework
  - Cannot explain TFA impact

- **Teaching experience**
  - Positively associated with effectiveness, but TFA teachers had *less* experience
  - Cannot explain TFA impact