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POLICY BRIEF

Investigation of Student Outcomes for Graduates of UTeach and Other Teacher Preparation Programs

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February 2020

What We Studied

How should Texas prepare teachers so that their students benefit the most? This question is hard to answer, but important to address, particularly in the critical areas of high school mathematics and science. We obtained three principal sets of results. First, we examined the learning gains of students whose teachers came from UTeach, a STEM-specific university-based program with 8 sites in Texas. Looking at student learning gains between 2011 and 2012, we found students of UTeach graduates learned more than comparable students of other teachers in the same schools. In the case of Biology, gifted students gained 10 more months of schooling per year, while Hispanic and economically disadvantaged students gained 5 more months of schooling per year. Gifted students in Algebra I also gained around 10 more months of schooling in a year from their UTeach teachers.

Second, we extended the analysis to the years 2011-2018 and examined all teachers from standard university programs in comparison with those who were alternatively certified. We found that Algebra I students whose teachers came from standard programs consistently gain one to two more months of schooling per year than students whose teachers were alternatively prepared. For Biology students there were fewer significant differences, but those differences almost all favored teachers from standard programs.

Finally, we examined how long STEM teachers remain in teaching. We found that around 80% of UTeach graduates are still teaching after five years, 70% of standard university program graduates are still teaching after five years, and around 60% of alternatively certified STEM teachers are still teaching after five years.

The United States faces a growing shortage of teachers, with recent estimates of 100,000 more new teachers needed each year than are available (Sutcher, Darling-Hammond, & Carver-Thomas, 2019). Some of the most acute shortages of secondary teachers arise in the STEM fields, as indicated by surveys of employers (American Association for Employment in Education, 2016). Nearly 40% of mathematics teachers either lack full teaching certification or lack a major or minor in mathematics. In the physical sciences, over 60% of teachers lack one or the other of these qualifications.

As shown in Figure 1, Texas is the greatest producer of science and mathematics teachers in the country, and unlike almost every other state, production of STEM teachers has not been dropping. The reason for this, as indicated in Figure 2, is that more than half of these teachers now come from alternative certification programs, the largest of which operate for profit. No other state approaches Texas in the number or percentage of its teachers prepared in this way. Texas is also home to UTeach, an effort to increase the number of STEM teachers coming from universities. This program originated at UT Austin and has spread to eight universities in Texas, as well as 45 in the nation overall (Backes, Goldhaber, Cade, Sullivan, & Dodson, 2018; “UTeach,” 2020).

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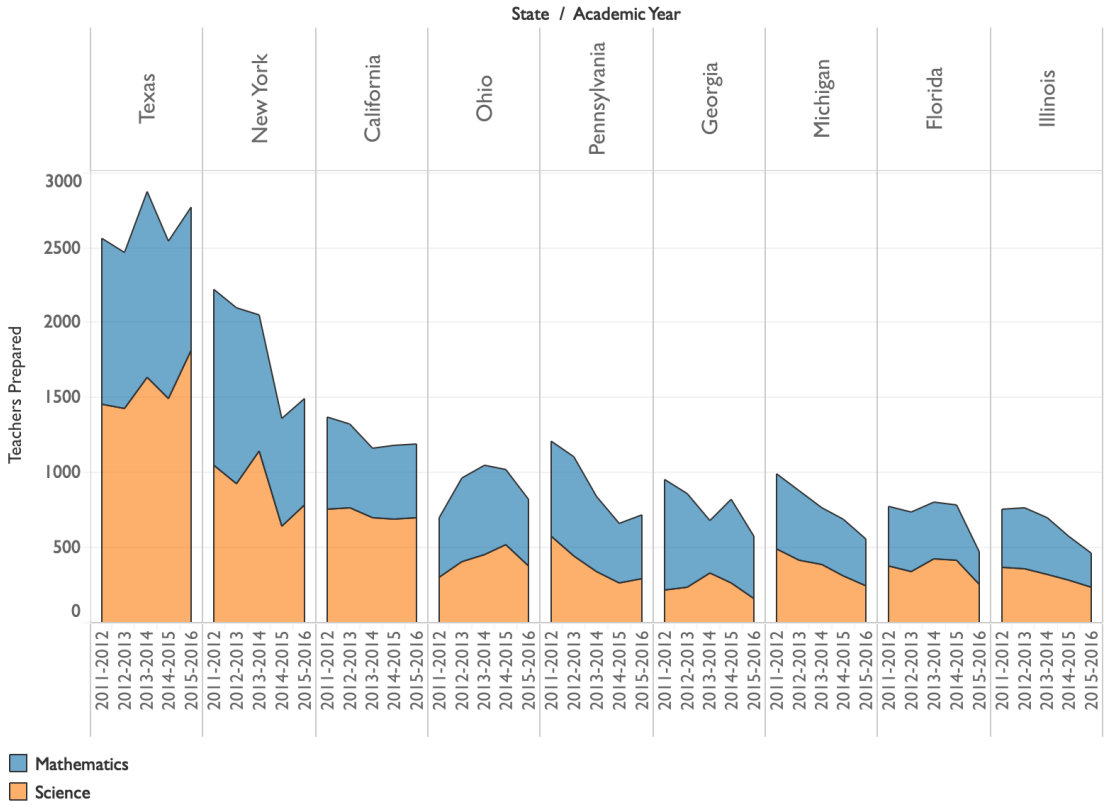

Figure 1: . Mathematics and science teachers prepared in the highest-producing states, 2012-2016. Data from US Department of Education (2018a).

How We Analyzed the Data

The goal of this project was to assess the quality of science and mathematics teachers prepared by UTeach and other university-based teacher preparation programs. The primary way this was done was examining the test scores in Algebra I and Biology of high school students who had UTeach or standard university-prepared teachers, and comparing the scores with those of students taking the same class from other teachers in the same school.

The main technical tool was value-added modeling (Hanushek, 1971; Koedel, Mihaly, & Rockoff, 2015; Sanders & Rivers, 1996). This means that before comparing student test scores between classrooms, a wide variety of factors was taken into account. These include the student's prior test scores, their race and free lunch eligibility, the overall quality of their school, and demographic characteristics of all students in the classroom.

In addition, the project examined the likelihood that STEM teachers prepared through different pathways would stay in teaching. Three groups we compared are graduates of UTeach Austin, graduates of all standard university programs in Texas, and graduates of alternative certification programs in Texas.

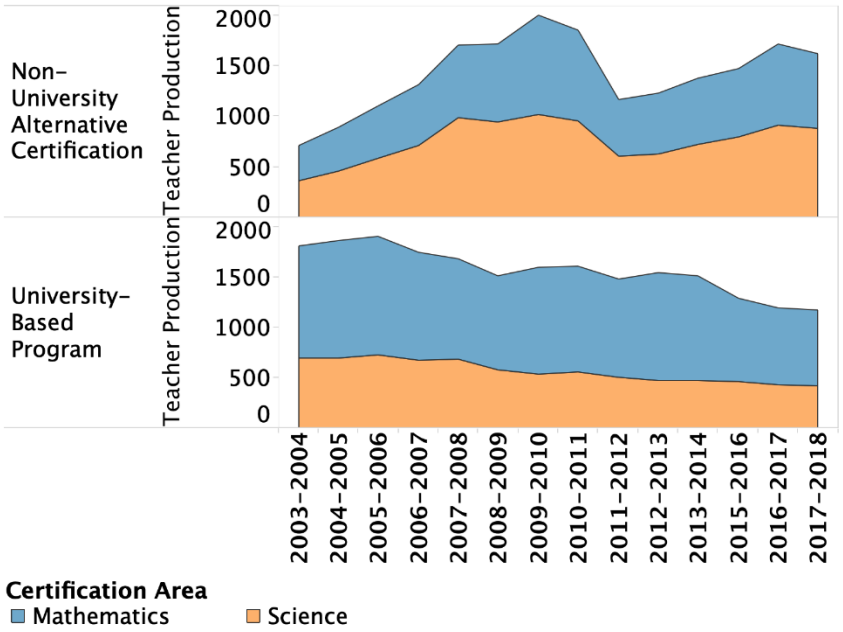

Figure 2: STEM teacher production in Texas from 2004 until 2017, comparing production from standard and alternative certification pathways

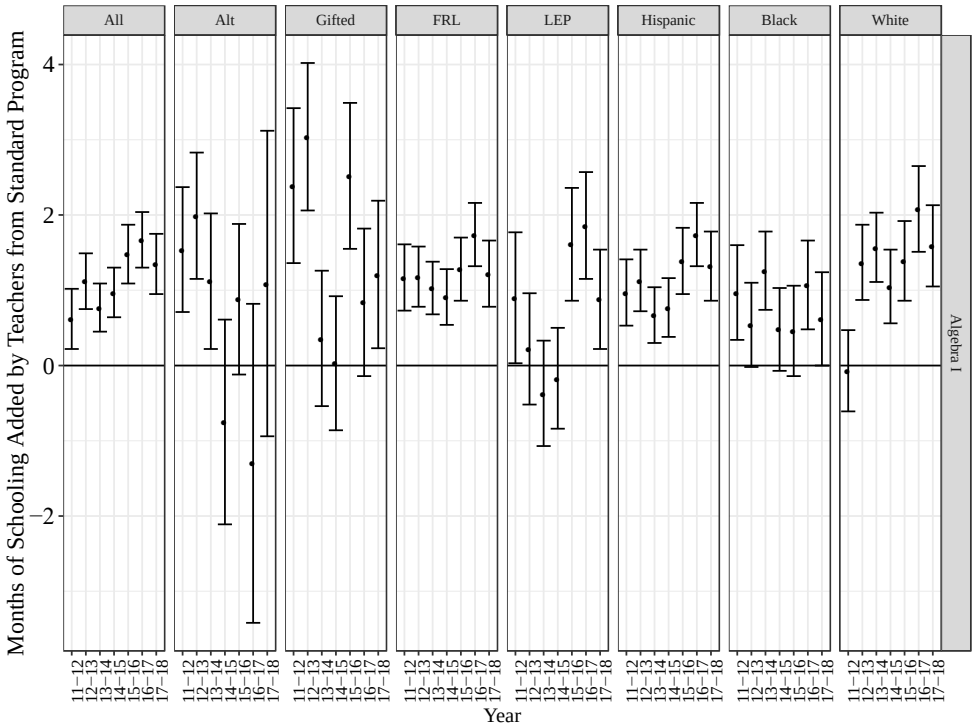

Figure 3: Value-added model gains in Months of Schooling units for all Algebra I teachers from standard programs in Texas as compared with teachers from alternative programs, overall and for student subgroups, showing change over time. Error bars show standard uncertainties. Data from Texas Education Agency through Education Research Center.

What We Discovered

We began by examining learning gains of the students of UTeach graduates in the academic year 2011-2012. We found that students of UTeach graduates learned more than comparable students of other teachers in the same schools. In the

case of Biology, gifted students gained 10 more months of schooling per year, while Hispanic and economically disadvantaged students gained 5 more months of schooling per year. Gifted students in Algebra I also gained around 10 more months of schooling in a year from their UTeach teachers. These findings were independently corroborated by Backes, Goldhaber, Cade, Sullivan, & Dodson (2018). We compared the learning gains in Algebra I and Biology of students with teachers from standard university programs to those from alternative certification programs for the period 2011-2018. We found particularly strong results in Algebra I, where overall students of teachers from standard programs gain more than a month of schooling per year compared to their counterparts in classrooms where teachers are alternatively certified. In Biology the results were less certain. Although on average students of teachers from standard programs also gained around a month more of schooling than students with alternatively certified teachers, we cannot rule out the possibility that this difference is due to aspects of school quality other than the teachers. Not only students overall, but also many different student subgroups benefited from teachers who were prepared in standard university programs. Figure 3 exhibits these results year by year for Algebra I. Results are particularly strong for students eligible for free and reduced lunch, Hispanic students, and White students. Technical details are in (Marder, Hamrock, & David, 2020).

We also examined the probability that a STEM teacher prepared in UTeach, in a standard university program, or an alternative certification program, would still be teaching after a certain number of years. The overall result appears in Figure 4.

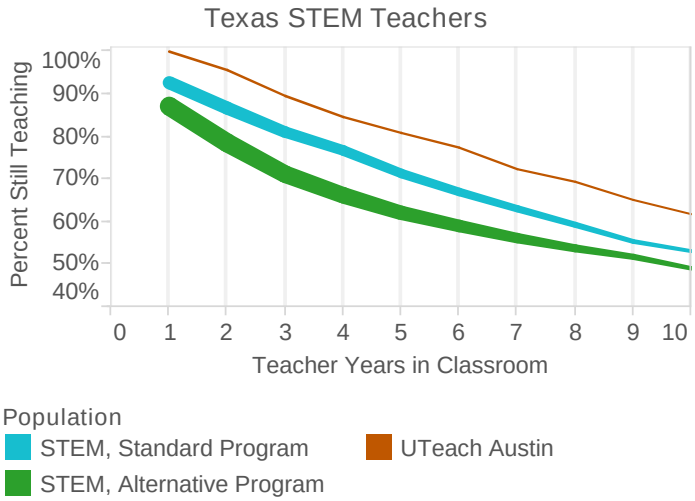

Figure 4: Percent of Texas STEM teachers still teaching after a certain number of years in the classroom. The three groups compared are UTeach graduates from UT Austin, all STEM teachers prepared by standard university programs, and all STEM teachers prepared by alternative certification programs. Data from the Texas ERC through 2017.

Policy Recommendations

Texas students in Algebra I and Biology learn more when their teachers come from standard university programs than when their teachers come from alternative certification programs. This is true both for UTeach, a model program at eight universities across Texas, as well as all standard university educator preparation programs in Texas. In the case of UTeach, the main results have been confirmed using ERC data by two independent groups (Backes et al., 2018; Marder & Hamrock, 2016). The results in Biology for teachers from all standard programs are less certain than those for Algebra I (Marder et al., 2020). STEM teachers from standard university programs also stay in teaching longer than those prepared by alternative certification. This finding also has been confirmed by an independent group working with ERC data (Van Overschelde & Wiggins, 2019).

Despite the fact that STEM teachers from standard university programs are superior to those from alternative certification for these two reasons, STEM teacher production from universities has been dropping at over 3% per year for more than a decade, while the Texas student population has been rising. The profound teacher shortages that could have resulted from this drop have been offset by alternative certification. Partially as a result, Texas is able to offer STEM courses at a scale the rest of the nation finds impossible (Marder, 2019). This benefit of alternative certification

deserves careful recognition and further study. In addition, even though we can measure increased student learning in classrooms of teachers from standard programs, in absolute terms the advantage over students whose teachers were alternatively certified is not very large, and should not by itself cause alarm.

The question policy must address, however, is how far the process should go. With the passage of HB 3217 in 2019 (Texas Legislature, 2019) Colleges of Education in Texas lost the primary incentive to collaborate with other colleges that led to programs such as UTeach and AggieTeach at Texas A&M ("AggieTeach," 2020). University-based STEM educator preparation programs could lose the financial support, instructional support, and recruitment strategies that have made such cross-college collaborations national models. This could lead to new sharp drops in the production of STEM teachers at Texas universities. These drops would mean that the net result of the Texas experiment with for-profit alternative certification is not in the end to redress shortages, but to replace the educator preparation routes of highest quality and lowest cost for preservice educators with routes of lower quality and higher cost for preservice educators. As schools are compelled to reach for alternatively prepared teachers with majors or credentials further and further from their teaching assignments, exacerbated by absence of candidates from universities, teacher quality is likely to suffer more than we measure at this point. We urge policy-makers to head off the possibility that Texas universities will accelerate their already rapid withdrawal from the preparation of STEM teachers. This would have negative consequences for the STEM knowledge of Texas citizens, and for the chances that Texas children can compete for the jobs of the future.

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