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The STEM Pipeline: Teacher Diversity and Preparation

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Abstract

States routinely cite a lack of mathematics and science teachers as one of their most pressing labor shortages. While the demand for more Science, Technology, Engineering and Mathematics (STEM) teachers is well documented, the preparation of highly effective STEM teachers of color has proven to be challenging. With students of color quickly becoming the majority of the K-12 population, the need for a more diverse teaching workforce persists. The reauthorization of the Higher Education Act provides an opportunity for Congress to increase the number of exceptional STEM teachers of color by investing in teacher preparation programs at Hispanic-Serving Institutions (HSIs). Strategies include prioritizing funding for the Augustus F. Hawkins Centers for Excellence program, conducting a longitudinal study that measures the effectiveness of teacher preparation programs for prospective Latino STEM educators, and authorizing and extending the Presidential Teaching Fellows teacher scholarships to include all minority-serving institutions (MSIs).

Introduction

In his 2011 State of the Union address, former President Barack Obama an-

nounced his ambitious goal to add 100,000 Science, Technology, Engineering and Mathematics (STEM) teachers to the nation's schools. His announcement was timely, as schools report more vacancies in STEM than any other fields. In fact, as of 2013, the total amount of STEM educators nationally rested below 20,000 nationwide. The call to prepare quality STEM educators is fueled by a need to fill STEM occupations in our country. The U.S. Bureau of Labor Statistics (BLS) projects that occupations in the STEM fields will grow at a faster rate than the overall average for all sectors, with an increase of approximately 1 million newly created jobs between 2012 and 2022. Though the need to fill STEM occupations continues to grow, Latinos were only 7 percent of the STEM workforce in 2011. Unlike their lack of representation in STEM fields, Latinos constituted 17.6 percent of the total U.S. population in 2015, making them the largest racial or ethnic minority in the nation.

STEM skills are essential in U.S. efforts to compete in the global workforce. Training in mathematics and science at the elementary and secondary levels has been linked to the academic preparation and interests of students who pursue careers in STEM. However, the academic preparation gained by many

Hispanic students is negatively impacted by disparities in teacher quality and school resources. While notable academic gains have been made in the past decades, Latino students continue to score lower than national averages on math and science achievement tests. Research shows that top-performing teachers can dramatically affect student achievement, which suggests that the impact of assigning students to highly effective teachers can significantly narrow achievement gaps. As other student groups decrease and the Latino student population continues to grow, it is imperative to prepare a high-quality STEM teacher workforce that reflects the changing demographics of our nation's students.

National Trends in the Teacher Workforce

A majority-minority educational setting was created in 2014 when the percentage of Hispanic, African-American, Asian, and other students of color exceeded the percentage of white students for the first time in U.S. public school history. Despite this demographic shift, 84 percent of teachers are White and more than 40 percent of public schools in the U.S. do not have a single teacher of color. Hispanics represented 25 percent of students and only 8 percent of teachers in the 2011-

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2012 school year. Ethnically diverse teachers are particularly underrepresented in the STEM fields and are overwhelmingly female. The population of public school teachers has become more diverse over time, though large gaps still persist. In the 1987–88 school year, 87 percent of public school teachers were white compared to 82 percent in the 2011–12 school year. Over the same time period, the proportion of Hispanic public school teachers grew by 5 percent. According to the National Collaborative on Diversity in the Teaching Force, the West and Northeast regions of the U.S. have the highest percentage of Latino teachers.

Along the teacher pipeline, enrollment and completion of teacher preparation programs affect the diversity talent pool. The majority of education majors enrolled in teacher preparation programs are white. In the 2012–2013 school year, 25 percent of individuals enrolled in a teacher preparation program based in an institution of higher education (IHE) were individuals of color, while 37 percent of all individuals in those same institutions were individuals of color. Additionally, Bachelor's degree completion rates for students who major in education are lower for Hispanic (49 percent) students than for white students (73 percent). Investment in teacher preparation programs at institutions that primarily serve a large number of minority students can aid in diversifying the teacher workforce and benefit K-12 students of color.

The Importance of Teacher Diversity

Teaching has a greater effect on student learning than student ethnicity or

family income, school attended by student, or class size, and research shows that the effects are stronger for high-poverty school students than for their counterparts in affluent schools. Teacher diversity in particular plays an important role in improving outcomes for students and schools. For example, teachers of color can serve as role models for minority students. Ochoa (2007) found that serving as a role model for Latino students was of central importance to Latino teachers. Teachers of color can help increase confidence and motivation, while lessening the sense of marginalization for minority students. Furthermore, minority students can benefit greatly from having access to role models who "(1) understand their home cultures, (2) understand the education system and have succeeded in it, (3) are interested in the students' educational progress, and (4) will challenge students academically." Ochoa argues that interest in mentoring minority students and credibility is greater among culturally similar teachers.

Teacher diversity can also improve academic outcomes for Latino students. Hispanic fourth and sixth graders had significantly higher test score gains in math when taught by Hispanic teachers compared to those taught by racially dissimilar teachers. Findings also indicate significant differences in Latino student high school graduation exam passing rates in school districts with greater representation of Latino teachers. Furthermore, an increase in the proportion of Hispanic teachers in large urban high school systems with high Hispanic student enrollments reduced dropout rates and boosted the college-going rates. Latino students were also less likely to be assigned to special education, more likely to be placed in gifted classes, and had lower

rates of suspension and expulsions from school when there was an increase in Latino representation in a school district's teaching force.

Teacher turnover can also be reduced when teachers of color are recruited into the classroom. An analysis of data from North Carolina and Michigan revealed that teachers of color were less likely to leave teaching than White teachers, even after controlling for factors such as school size and poverty level. Likewise, in a study of 541 teachers in one California elementary school district, Latino teachers were more likely than White teachers to remain in low-performing, high-minority schools. Since urban public schools with low-income minority students experience severe teacher shortages, increasing the representation of teachers of color at these schools may help to address the lack of teachers at hard-to-staff schools.

The Role of Hispanic-Serving Institutions

Hispanic-Serving Institutions (HSIs) were recognized in legislation in the mid-1990s to identify institutions of higher education with a high enrollment concentration of Latino students and limited resources to serve those students. Title V of the Higher Education Act established the Developing Hispanic-Serving Institutions (DHSI) Program, providing grants to assist HSIs in improving the educational attainment of Hispanic students. While HSIs represent only 12 percent of colleges and universities in the U.S., they enroll 60 percent of all Latino undergraduates. Furthermore, almost half of all students enrolled at HSIs are His-

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panic. In 2013, the majority of the top 25 institutions conferring bachelor degrees to Latinos in STEM were identified as HSIs. These institutions provide an important opportunity for the federal government to support STEM initiatives and teacher preparation programs that would directly benefit a significant number of potential STEM teachers of color.

Existing Policies and Programs

Federal policies designed to increase the number of quality STEM teachers must be fine-tuned to attract more teachers of color and fill the current workforce gap. The Higher Education Act of 1965 (HEA), as amended, authorizes programs that provide federal support to postsecondary institutions of higher education (IHEs) and federal student aid programs that assist with financing the cost of a postsecondary education. The Department of Education (ED) administers the programs authorized by the HEA. In FY2015, approximately \$128.7 billion in financial assistance was made available to over 11 million students under these programs and approximately \$2.2 billion in federal support to institutions of higher education.

Title II of the HEA “authorizes grants for improving teacher education programs, strengthening teacher recruitment efforts, and providing training for prospective teachers.” Furthermore, this title includes reporting requirements on the quality of teacher education programs for states and IHEs. ED’s existing definitions for the Title II reporting system define a teacher preparation program as a “state-approved course of study, the completion of which signifies that an enrollee has met all the state’s educational require-

ments, or training requirements (or both) for an initial credential to teach in the state’s elementary, middle, or secondary schools.” Title II reports include information such as statewide pass rates, criteria for identifying low-performing schools of education, number of teachers prepared by area, and other factors. The lack of reporting targeting teacher preparation programs at HSI’s and other minority-serving institutions (MSIs) is an area that needs improvement in order to recruit more teachers of color.

The Honorable Augustus F. Hawkins Centers of Excellence program was established under Title II when the HEA was reauthorized in 2008. This program supports teacher preparation programs at minority-serving institutions (MSIs), including HSI’s, by providing competitive grants to MSIs or partnerships with MSI’s and other institutions of higher education. Projects under this program could include heightened standards for teacher candidates, additional support to help promising candidates meet rigorous standards, and partnerships with local school districts and non-profit organizations with a record of effective practices in preparing and placing educators. Though authorization of this program occurred, Congress never funded its implementation.

The Obama administration’s FY2012 budget included the Presidential Teaching Fellows program, which would provide formula aid to states, including scholarships to high-quality final-year students attending high-quality teacher preparation programs with a priority on students with financial need. This program acts as the revised version of the Teacher Education Assistance for College and Higher Edu-

cation (TEACH) grant program, which provides grants of up to \$4,000 per year to students who meet certain academic requirements, agree to teach in a high-need school for four years, and teach a high-need subject, such as STEM. The Government Accountability Office (GAO) reported that many TEACH grant scholarship recipients converted their grants to loans after failing to fulfill grant requirements. The Presidential Teaching Fellows program is intended to reduce these grant-to-loan conversions by reducing the high-needs school time commitment and providing funds to students during their final academic year. Another goal of this revised program is to promote high standards for teacher preparation programs by only allocating funds to those that are considered “top-tier”. While the definition of “top-tier” teacher preparation programs lacks clarity, identification of these programs would be based on three categories of outcome-based measures that include student learning growth, job placement and retention, and customer satisfaction survey results. Such outcome-based measures have the potential of excluding quality candidates of color attending teacher preparation programs at HSI’s from receiving incentives in the form of scholarships. Though the Presidential Teaching Fellows program has not been congressionally authorized, future decisions regarding this program should place priority on serving quality candidates with demonstrated financial need and attending minority-serving institutions.

Policy Recommendations

Prioritizing diversity as a necessary means to increase the number of high-quality STEM teachers of color proves

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important. The following recommendations create a foundation for improving approaches to STEM teacher preparation:

1. Prioritize funding for the congressionally authorized Augustus F. Hawkins Centers for Excellence program, under Title II, Part B, Subpart 2, Sec. 241-242. This program was authorized in 2008 and cannot be implemented until funded by Congress. The program would increase the number of exceptional minority educators by awarding competitive grants to teacher preparation programs at minority-serving institutions (MSI's) in partnership with other institutions of higher education. Funds would be used towards efforts to increase entry standards, prepare promising candidates to successfully reach entry requirements, and promote partnerships with organizations with demonstrated effectiveness in preparing high-quality candidates.

2. Conduct a longitudinal study through the Government Accountability Office on Hispanic Serving Institution teacher preparation programs on the use of funds and outcomes. Although Title II of the Higher Education Act requires state reports on the quality of teacher preparation at schools of education, longitudinal data on HSI's can aid in better decision-making to prepare prospective Latino STEM educators.

3. Authorize and extend the Presidential Teaching Fellows teacher scholarships to all minority-serving institutions (MSI's) by expanding the definition of "top-tier" programs. Final-year scholarships will continue to be awarded to high-achieving students from low-income backgrounds that commit

to teach in a high-need subject, such as science, technology, engineering, and mathematics, for at least three years in a high-need school. By expanding the definition, more students of color will be incentivized to pursue the teaching profession.

Conclusion

A targeted effort to support diversity in the STEM teacher workforce is necessary to create positive outcomes for communities, schools, and children from all backgrounds. By prioritizing funding for the Augustus F. Hawkins Centers for Excellence program, promoting better data collection on Hispanic Serving Institution teacher preparation programs, and authorizing and extending the Presidential Teaching Fellows teacher scholarships to all minority-serving institutions, Congress can support Latino success in the STEM field. With classrooms and the workforce becoming increasingly Latino within the next 50 years, it is imperative that teaching talent be retained for students as they prepare for the evolving workforce of the future.

Endnotes

Cown, James, and Dan Goldhaber. "Missing Elements in the Discussion of Teacher Shortages." Missing Elements in the Discussion of Teacher Shortages | CALDER. February 15, 2017. Accessed March 05, 2017. <http://www.caldercenter.org/missing-elements-discussion-teacher-shortages>.

Barth, Patte, Noomi Dillon, Jim Hull, and Holland Higgins. "Fixing the Hotels In The Teacher Pipeline." <http://www.centerforpubliceducation.org/Main-Menu/Staffingstudents/An-Overview-of-Teacher-Shortages-At-a-Glance/Overview-of-Teacher-Shortages-Full-Report-PDF.pdf>. April 2016.

Id. At 1.

Santiago, Deborah, Morgan Taylor, and Emily Calderon Galdeano. Finding Your Workforce: Latinos in Science, Technology, Engineering, and

Math (STEM) | Excelencia in Education. June 01, 2015. <http://www.edexcelencia.org/research/workforce/stem>.

Landivar, Lina Christin. "Disparities in STEM Employment by Sex, Race, and Hispanic Origin." <https://www.census.gov/prod/2013pubs/acs-24.pdf>. September 2013.

"Hispanic Heritage Month 2016." Hispanic Heritage Month 2016. October 12, 2016. <https://www.census.gov/newsroom/facts-for-features/2016/cb16-ff16.html>.

Crisp, Gloria, and Amaury Nora. "Overview of Hispanics in Science, Mathematics, Engineering, and Technology (STEM): K-16 Representation, Preparation and Participation." http://www.hacu.net/images/hacu/OPAI/H3ERC/2012_papers/Crisp%20nora%20-%20hispanics%20in%20stem%20-%20updated%202012.pdf. July 12, 2012.

Id.

Calderon, Brenda, and Leticia Thomas Bustillos. "Latinos in New Spaces: Emerging Trends & Implications for Federal Education Policy." <http://www.ncl.org/Assets/uploads/Publications/2015latinoeducationstats.pdf>. September 2015.

<https://www2.ed.gov/policy/elsec/leg/blueprint/great-teachers-great-leaders.pdf>

Id. At 9.

Hrabowski, Freeman A., III, and Mavis G. Sanders. "Increasing Racial Diversity in the Teacher Workforce: One University's Approach." <https://www.nea.org/home/65429.htm>.

https://www.nea.org/assets/docs/Hrabowski_101-116_Layout%202-REV.pdf

Bell-Ellwanger, Jennifer. "The State of Racial Diversity in the Educator Workforce." July 2016. <http://www2.ed.gov/rschstat/eval/highered/racial-diversity/state-racial-diversity-workforce.pdf>.

Id.. At 13.

Id At 14.

Id.

Id. At 13.

Id.

Id.

Id.

"Teacher Quality and Student Achievement: Research Review." <http://www.centerforpubliceducation.org/Main-Menu/Staffingstudents/Teacher-quality-and-student-achievement-At-a-glance/Teacher-quality-and->

student-achievement-Research-review.html
November 1, 2005.

Villegas, Ana María, and Jacqueline Jordan Irvine. "Diversifying the Teaching Force: An Examination of Major Arguments." *The Urban Review* 42, no. 3 (2010): 175-92. doi: 10.1007/s11256-010-0150-1.

http://www.shankerinstitute.org/sites/shanker/files/The%20State%20of%20Teacher%20Diversity_0.pdf

Id. At 24.

Id.

Id. At 23.

Id.

Id.

Id.

Id. At 24.

Id. At 23.

Id. At 24.

Id. At 4.

Id.

Clark, Njeri. "Developing Hispanic-Serving Institutions Program - Title V." February 23, 2017. <https://www2.ed.gov/programs/idueshsi/index.html>.

Id.

Id. At 4.

[https://www.wisconsin.edu/government-relations/download/the_washington_view_blog/The-Higher-Education-Act-\(HEA\)---A-Primer.pdf](https://www.wisconsin.edu/government-relations/download/the_washington_view_blog/The-Higher-Education-Act-(HEA)---A-Primer.pdf)

Id.

Id. At 38.

Id.

Id. At 14.

"Establishment of the Augustus F. Hawkins Foundation." <http://augustusfhawkinsfoundation.org/resurgence.html>.

Duncan, Arne. "Our Future, Our Teachers: The Obama Administration's Plan for Teacher Education Reform and Improvement." <https://www.ed.gov/sites/default/files/our-future-our-teachers.pdf>. September 2011.

Id.

Id.

<https://studentaid.ed.gov/sa/sites/default/files/teach-grant.pdf>

Nowicki, Jacqueline. "Better Management of Federal Grant and Loan Forgiveness Programs for Teachers Needed to Improve Participant Outcomes." <http://www.gao.gov/products/GAO-15-314>. March 26, 2015.

Id. At 44.

Id.

