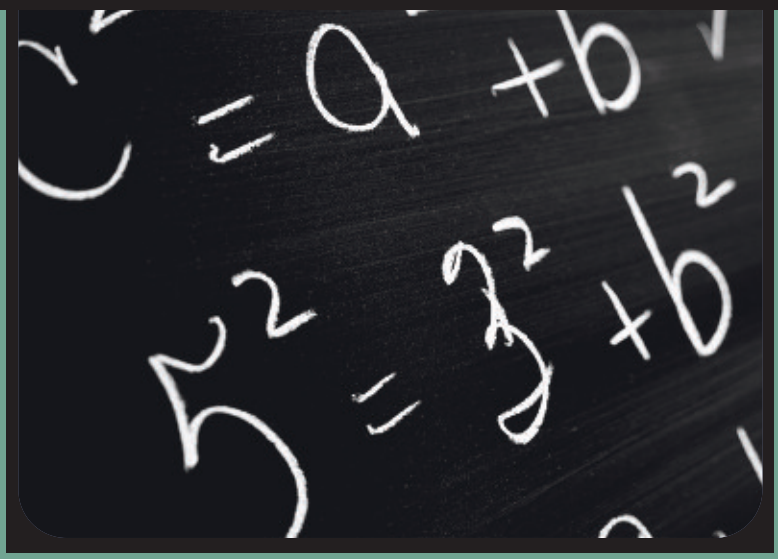
Getting and Keeping the Teachers We Need In the Places We Need Them:

Teacher Recruitment, Retention, and Assignment



The Briefing Paper Series on Mathematical Literacy

Improving the mathematics skills of our citizenry has been a major concern for educators, policy makers, and the general public since long before Sputnik ushered in "new math." With the most recent decade of education reform and the advent of "new-new math," advances in mathematics research and education have led to both fruitful exchanges of ideas and challenging debates. Never before has it been so clear that mathematical literacy is vital for our nation's economic growth, security, and civic progress. And never has the call to bring *all* children to high levels of mathematical literacy been sounded so forcefully. Yet, though our culture, our country, and our schools by and large expect all adults to be able to read, we do *not* expect all adults to be proficient in mathematics. (How often does someone utter, "I was never good at math," only to be met with nods of understanding and compassion?) By and large, Americans accept the kinds of results that come from the widespread belief that not all children can learn mathematics beyond "arithmetic."

Believing that all children *can* learn mathematics, and, indeed, that they must, the Council of Chief State School Officers and Texas Instruments Incorporated, have joined together in a partnership to respond to the clarity of purpose and urgency of mission felt in the states today around mathematics education. This partnership will investigate the influences on mathematics education and develop recommendations for effective state actions to lead to improved student performance in mathematics. This paper is the introduction to a series of papers designed to analyze the imperatives and opportunities in several critical areas of mathematics education. The papers will explore the depth and type of mathematical knowledge that students will need to be successful in today's society; how that depth and type of mathematical knowledge is best taught and what this implies for schools and classrooms; and the conditions that need to be established to create this kind of teaching and learning in every classroom. Specific topics that will be addressed by this series include

- The Imperative of Mathematical Literacy
- Standards, Curriculum, Instruction, and Assessment
- Teacher Preparation and Professional Development
- Teacher Recruitment, Assignment, and Retention
- Opportunities for Support and Partnerships

In the first paper of this series, we made the case for why all students need to be literate in mathematics. In order to raise student achievement to needed levels, we must have a very different kind of teaching and learning in our mathematics classrooms. High quality standards, curriculum, instruction, and assessment—the focus of the second paper—is one set of tools necessary to improving mathematics achievement. The third paper looks at what it will take to have a high quality teacher in every classroom by focusing on teacher preparation and professional development. This paper expands that subject by addressing teacher recruitment, retention, and assignment.

 For this edition, the recommended citation would be: Lusi, Susan Follett, and Circe Stumbo, (2005), *Getting and Keeping the Teachers We Need In the Places We Need Them: Teacher Recruitment, Retention, And Assignment*, (Council of Chief State School Officers and Texas Instruments:Washington, DC).

Questions about this paper or the series may be directed to:
Michael DiMaggio
Council of Chief State School Officers
One Massachusetts Avenue, NW Suite 700
Washington, DC 20001.

Getting and Keeping the Teachers We Need In the Places We Need Them: Teacher Recruitment, Retention, and Assignment

Recruiting People with Mathematics Degrees into Teaching

This nation needs more qualified mathematics teachers. While the total number of mathematics teachers in public high schools increased by 22,000 to a total of 134,000 from 1990 to 2000, the percentage of those teachers certified to teach mathematics declined from 90% to 86% over the same time period. In our middle schools, the numbers are worse: The number of middle school mathematics teachers rose by 44,000 from 1994 to 2000 to a total of 124,000 mathematics teachers, but only 66% of them were certified in mathematics.[1]

Addressing the shortage of teachers in mathematics will require addressing a number of issues at different points in the pipeline:

> According to a 2000 report from the National Commission on Mathematics and Science Teaching, we will need to hire about 240,000 math and science teachers during the coming decade. If we assume that half of these positions are in mathematics that would translate into the need for 120,000 math teachers. But if we also assume that present graduation trends continue, we will award bachelor's degrees to about 120,000 mathematics majors over the same time period. Thus, every mathematics graduate would have to go into teaching in order to meet the demand for math teachers.
>
> But most mathematics graduates do not, of course, go on to become teachers. Indeed, in the 1990s, only 29% of recent graduates with a bachelor's degree in mathematical sciences went into teaching in either K–12 or post secondary.[2]


$ax^2 + bx + c$
$\frac{b}{2a}$
$\pm\sqrt{b^2}$
$-b \pm \sqrt{b^2 - 4ac}$

Added to the challenge of attracting more people with mathematics majors or minors into teaching at the outset, many school systems have disproportionate difficulty recruiting teachers of mathematics. Many of these are the schools and systems where we need qualified mathematics teachers the most: Thirty-five percent of mathematics classes in high poverty schools were taught by teachers lacking a major or minor in the content area in the 1999-2000 school year, compared to 23.4% of classes in schools with low concentrations of poverty.[3] A study by Richard Ingersoll found similar patterns: on average, 27% of mathematics teachers lacked a major or minor in their field at low-poverty schools, but the proportion rose to 43% in high-poverty schools. And in some states, students in high-poverty schools may be as much as four times more likely to have teachers without a major in the discipline they teach than students at wealthier schools.[4]

Similar discrepancies were seen in high minority schools, with 32.9% of mathematics classes taught by someone without a mathematics major or minor, compared to 23.1% in low minority schools.[5] Isolated, rural schools also have trouble attracting teachers, and schools identified as in need of improvement may also find it increasingly difficult to attract and retain staff, particularly as teachers themselves are held accountable for results.

> "The average starting salary for mathematics majors with bachelor's degrees is $46,466. In comparison, beginning teachers earn an average $27,989 per year. The average annual salary for teachers overall is $41,820—less than starting salaries for mathematics majors in nonacademic fields."[7]
>
> Haycock, Kati (2002, Summer). Still At Risk. Thinking K-16. 6(1). (Washington, DC: The Education Trust). pp. 8-9.

Proposed solutions to the short supply of mathematics teachers also span the production pipeline: The Education Trust recommends increasing the numbers of students studying mathematics at all levels, starting with making the college preparatory mathematics curriculum the curriculum for all students. They further suggest looking for new sources of mathematics teachers, such as programs that attract mid-career professionals from other fields, and that higher education set clear goals for increasing the number of mathematics majors.[6]

Incentives for joining the teaching profession also need to change. Salaries for mathematics teachers are not competitive with salaries offered to mathematics majors in other fields. "The average starting salary for mathematics majors with bachelor's degrees is $46,466. In comparison, beginning teachers earn an average $27,989 per year. The average annual salary for teachers *overall* is $41,820—less than starting salaries for mathematics majors in nonacademic fields."[7] Some have argued recently that there is no longer such a big differential in teacher pay and that much of the difference is made up when benefits packages are taken into consideration. However, a recent study done by the Economic Policy Institute, using several types of analyses, concluded that teachers earn significantly less than comparable workers and that their wage disadvantage has grown considerably over the past 10 years.[8] Given the lucrative careers on average that mathematics majors can expect, it is clear that teacher salaries provide little incentive for mathematics majors to enter the field.

Until larger numbers of professionals who wish to teach are also highly skilled in mathematics, other financial incentives such as loan forgiveness and providing scholarships in exchange for a certain number of years of teaching can help to make the profession more attractive. These incentives can be targeted to mathematics and other high need teaching areas, and may also be targeted to high need schools and districts.

Other recommendations include

- the development of partnerships between schools, communities and universities to target specific needs, share the costs of preparing teachers, and facilitate their placement and ongoing professional development;
- the search for recruits in nontraditional sources such as mid-career professionals, retired military personnel and undergraduates switching majors; and
- the push for greater evaluation and reporting on programs that are successful in recruiting and preparing mathematics teachers.[9] Additionally, teacher supports such as high quality induction and professional development programs also attract teachers to the districts that have them.[10]

Recruitment efforts, no matter how strong, will not on their own solve the problem of getting high quality mathematics teachers into our classrooms, particularly in our large, urban school districts. In a study of four urban school districts, Levin and Quinn found that recruitment efforts were actually quite good—generating many more applicants than available positions in each case. However, the lengthy hiring timelines and poor hiring processes of these districts caused a number of the applicants to withdraw and accept other positions, even when the urban district was originally the applicant's first choice in many cases. The districts lost between 30 and 58 percent of eligible applicants before they started hiring. The late hiring timelines of these districts were primarily driven by vacancy notification requirements that meant the districts did not learn people were leaving the system sometimes until the summer, by teacher union transfer and seniority requirements, and by late budget timelines and inadequate forecasting that left districts uncertain as to how many positions they needed and could afford to fill. Of particular concern is the fact that the candidates who were lost to other districts tended to be of higher quality—higher

GPAs, held a degree in the field, and had taken significant education coursework—*and* they tended to want to teach in critical shortage areas such as mathematics. The percentage of withdrawers who had applied to teach in a critical shortage area ranged from 57 to 69 percent.[11] This is not surprising since these teachers are in the most demand nationwide.

Keeping Teachers Once We Get Them: *Retention*

Even once good teachers are hired, it is not a given that they will stay in the profession: 14% of new teachers leave by the end of their first year of teaching; 33% leave within three years; and almost 50 percent of teachers leave within their first five years. Again, poorer schools are affected the most with teacher attrition rates that are approximately 50% higher than in wealthier schools.[12]

High levels of teacher attrition are detrimental to student achievement for at least two reasons: first, because it takes 3–7 years for new teachers to become fully competent professionals; and second, because schools with high rates of turnover never become the kinds of cohesive learning communities that can lead to the greatest levels of instructional improvement.[13] While low salaries may initially be thought of as the issue driving people out of the teaching profession, the most commonly cited factors for leaving are a lack of support and poor working conditions.

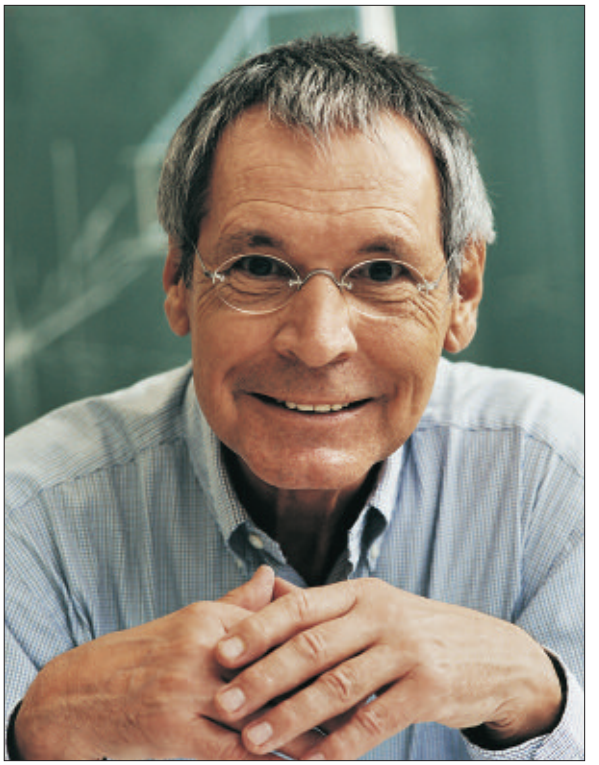
While there will always be (and should be) some level of attrition among the ranks of new teachers, the current level of flux is undesirable. Induction programs that introduce teachers to the school and support their entry in the profession have been shown to reduce teacher attrition, but there is currently tremendous variability in the quality and substance of induction programs. "Comprehensive induction programs" have been shown to cut teacher attrition rates in half, according to the Alliance for Excellent Education, and should be provided in all school settings.[14] Comprehensive induction programs have multiple components including

- high quality mentoring from a carefully selected teacher who observes the novice teacher, provides feedback, demonstrates effective teaching methods, and helps the novice analyze student work and achievement data;
- common planning time for teachers to plan and debrief lessons and student progress;
- ongoing professional development to expand content and teaching knowledge;
- an external network of teachers that provides a community of colleagues for collaboration and support; and
- standards-based evaluation to determine whether or not a novice teacher should remain and move forward in the teaching profession.[15]

The Northeast Regional Resource Center quotes Murnane, Singer, and Willett in its recent report saying, "research suggests that teachers make marked gains in effectiveness during their first years in the classroom. Consequently, reducing the frequency with which children are taught by a successive stream of novice teachers may be one step toward improving educational quality."[16] Because there is already a shortage of mathematics teachers, trying to retain the ones we have in the profession through comprehensive induction and other approaches to improving working conditions of teachers needs to be a top priority.

Putting Teachers in the Classrooms Where They Are Most Needed: *Teacher Assignment*

If we are able to hire the teachers we need *and* retain them in the profession, there is still no guarantee that we can assign our most competent teachers to teach our most needy students. Recently, increasing attention has been paid to "hard-to-staff schools." Hard-to-staff schools tend to be inner-city schools serving large numbers of poor students and also rural schools that are in economically depressed and/or isolated areas of the country. "[These] schools . . . have a particularly difficult time finding and retaining adequately trained teachers who are effective with their student populations [and commonly have] a high percentage of relatively new teachers because more experienced teachers, whose seniority gives them greater choice over their teaching assignment, tend to go elsewhere."[17] These schools often tend to have the lowest student achievement.



As it now stands, quality teachers are not equitably distributed. According to Education Trust, "the critical importance of good teachers has especially profound implications for poor and minority youngsters. For no matter how quality is defined, these youngsters come up on the short end . . . the very youngsters who are most dependent on their teachers for content knowledge are systematically taught by teachers with the least content knowledge."[18] Attracting and assigning teachers to "hard to staff schools" is no easy task. Numerous contractual rules determine the assignment of teachers to schools and then to the classes they teach within that school. Many of these assignment processes are driven by seniority. When seniority is the overriding determinant of where teachers will teach within a given district, students tend to be poorly served, as the more experienced teachers often choose higher end courses and schools. This leads to poor practices such as having high numbers of beginning teachers in the poorest schools in a district and assigning novice teachers to teach the classes of students who are hardest to teach and need the most instructional expertise.[19]

Conclusion

Improving the quality of our nation's mathematics teachers will require a multi-part effort:

- We need to encourage more students to seek degrees in mathematics and then to choose to teach;
- we need high quality preparation programs that will prepare new teachers for the demands of today's classrooms and academic expectations for students;
- we need professional development that helps teachers improve their practice on the job so that student achievement also improves;
- we need to recruit new teachers to high need districts and then provide them with the supports they need to stay in the profession; and we need to assign our strongest teachers to our neediest students.

By undertaking coordinated and proactive action to recruit, retain, and assign mathematics teachers, the nation's education system will be much more likely to serve the needs of our students and our society in the 21st century.

Endnotes

1 Milbourne, L.A. (2002). *Finding mathematics teachers.* (Columbus, OH: ERIC Clearinghouse for Science Mathematics and Environmental Education). (ERIC Document Reproduction Service No. ED478713).

2 Haycock, Kati. (2002, Summer). Still At Risk. *Thinking K-16, 6*(1),(Washington, DC: The Education Trust). pp. 3-23.

3 Haycock, Kati. (2002, Summer). p. 15. cited in *Schools and Staffing Survey 1999-2000*, calculations by Richard Ingersoll for the Education Trust.

4 Allen, Michael. (2002). *Focusing policy on high quality teachers for hard-to-staff schools.* (Denver, CO: Education Commission of the States).

5 Haycock, Kati. (2002, Summer). p. 15. cited in *Schools and Staffing Survey 1999-2000*, calculations by Richard Ingersoll for the Education Trust.

6 Haycock, Kati. (2002, Summer). p. 20.

7 Haycock, Kati. (2002, Summer). pp. 8-9.

8 Allegretto, S.A., Corcoran, S.P., & Mischel, L. (2004). *How does teacher pay compare? Methodological challenges and answers.* (Washington, DC: Economic Policy Institute).

9 Milbourne, L.A. (2002).

10 Northeast Regional Resource Center, Learning Innovations at WestEd & University of the State of New York, The New York State Education Department. (2004, November). *Keeping quality teachers: The art of retaining general and special education teachers.* (Albany, NY).

11 Levin, J. & Quinn, M. (2003). *Missed opportunities: How we keep high-quality teachers out of urban classrooms.* (New York, NY: The New Teacher Project).

12 Alliance for Excellent Education. (2004). *Tapping the potential: Retaining and developing new high-quality teachers.* Washington, DC.

13 Alliance for Excellent Education. (2004).

14 Alliance for Excellent Education. (2004).

15 Alliance for Excellent Education. (2004).

16 Northeast Regional Resource Center, et al. (2004, November).

17 Allen, M. (2002). *Focusing policy on high quality teachers for hard-to-staff schools.* (Denver, CO: Education Commission of the States).

18 The Education Trust. (2002). p. 7.

19 The Education Trust. (1998). Good teaching matters...a lot. *Thinking K-16, 3*(2).

Acknowledgements

In an effort to explore new ways of improving mathematics education in middle and high schools, the Council of Chief State School Officers and Texas Instruments formed a Technology Research and Development Advisory Committee ("R&D Committee") in the spring of 2004. This R&D Committee, consisting of state deputy superintendents or commissioners, district superintendents, and CCSSO staff, met in April 2004 to examine ways in which business and education can work together to build models that will enhance mathematical literacy. The idea for a series of short briefing papers on the core components of mathematics education was born out of that first R&D Committee meeting.

While the analysis and suggestions in this briefing paper are informed by the best collective thinking of that group of teachers, administrators, policy makers, product developers, and researchers, the primary authors of this paper are Circe Stumbo and Susan Follett Lusi. Jamie Poolos is the paper's editor. The authors wish to thank the many reviewers of the original drafts of this paper, including Lisa Brady-Gill and Richard Schaar of Texas Instruments Incorporated Michael DiMaggio and Rolf Blank of the Council of Chief State School Officers, and Patricia I. Wright.

These papers do not necessarily represent the positions of the Council of Chief State School Officers, Texas Instruments Incorporated reviewers of the draft papers, or members of the R&D Committee. Any errors, omissions, or misinterpretations present in this paper are the sole responsibility of the authors.

The Council of Chief State School Officers (CCSSO) is a nonpartisan, nationwide, nonprofit organization of public officials who head departments of elementary and secondary education in the states, the District of Columbia, the Department of Defense Education Activity, and five U.S. extra-state jurisdictions. CCSSO provides leadership, advocacy, and technical assistance on major educational issues. The Council seeks member consensus on major educational issues and expresses their views to civic and professional organizations, federal agencies, Congress, and the public.

Educational and Productivity Solutions, a business of Texas Instruments, is an education technology leader. For nearly 20 years, we have worked closely with leading educators in the design of our educational technology, training programs and support materials that enrich the math and science classroom learning experience worldwide. Our mission—provide essential tools that help teachers create an engaging learning experience leading to higher student achievement in math and science. Our vision—all students inspired to achieve their potential and become the innovators of tommorrow.