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Math and Science Reform Agenda

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RECOMMENDATIONS

- Reform teacher certification.
- Make teacher pay more competitive.
- Evaluate and reward teacher excellence.
- Ensure rigorous math and science courses, exams, and graduation requirements.
- Increase student access to non-traditional math and science programs.
- Replicate best practices of high-performing schools.

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Stagnant SAT and ACT scores, low math and science performance in international comparisons, and embarrassingly high numbers of high school graduates needing remedial help in college plague public schools in Texas and in states across the country. Such rankings and records are usually accompanied by increases in education funding, yet these increases have not been accompanied by commensurate increases in performance.

For two years, researchers at the Texas Public Policy Foundation have examined the math and science skills deficit in Texas public schools and published a series of papers and commentaries on that topic. Our research has identified the shortfalls in math and science education, pointed to solutions such as an improved curriculum and more streamlined paths to the teaching field, and culminated in a major research paper examining the best practices of schools with high student achievement in math and science.

The following recommendations are the complete results of our research.

REFORM TEACHER CERTIFICATION

Create a true alternative certification program for qualified professionals with college degrees and significant industry experience.

A streamlined alternative certification process is a common-sense way to reduce the effect of unnecessary certification barriers that keep qualified math and science teachers from getting into the classroom sooner. Individuals with college degrees, extensive subject matter knowledge in math and science, and relevant work experience could test out of content and some teaching requirements, and only take those courses, if any, that a district decides are needed to ensure they are effective in the classroom. Research finds that "Alternative Certification Isn't Alternative" and that some alternative certification programs require too much coursework.[1] Reducing the amount of courses required and providing intensive mentoring and professional development while the teacher is actually teaching can reduce the cost and timeframe needed to complete alternative certification programs, which benefits both aspiring teachers and students.

Give principals the flexibility to waive certain state certification requirements without penalty, especially in shortage areas like math and science.

Since the demand for certified math and science teachers outweighs the supply, schools assign teachers certified in other fields to teach subjects for which they may have little or no training. This is called out-of-field teaching and is defined as either lacking certification or lacking a college major or minor in the assigned teaching field. In 2006, 14.3 percent of math teachers, 28 percent of science teachers, and 52.2 percent of computer science teachers taught out-of-field in Texas classrooms.[2]

State certification rules limit the flexibility of principals to put the most qualified math or science teachers in the classroom. To reduce out-of-field teaching in shortage areas like math and science, principals should be able to select teachers by considering teaching ability, outstanding accomplishments, work history, and education level—not just arbitrary

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certification requirements. Principals need the flexibility to exercise independent judgment and hire those individuals they believe will best serve their school and students regardless of their certification status. Schools could provide intensive professional development and mentoring to assist new teachers in the transition.

MAKE TEACHER PAY MORE COMPETITIVE

State lawmakers should abolish the rigid statewide minimum salary schedule.

Most school districts structure teacher pay around the state's minimum salary schedule, although they typically pay above the minimum. These salary schedules base compensation on degrees attained and the number of years teaching—both of which have little to no effect on student achievement.[3] By allocating pay based on characteristics that do not contribute to greater student learning, the salary schedule rewards mediocrity instead of excellence. Texas lawmakers should abolish the state minimum salary schedule, thereby discouraging school districts from using it to determine compensation.

School officials should pay teachers using a market-based system rather than an inflexible pay scale.

Even with the state minimum salary schedule in place, school officials have enough flexibility in their budgets to increase pay for teachers who are in higher demand—i.e. the most effective teachers and those in shortage areas such as math and science. However, most districts ignore the forces of supply and demand and continue basing pay for all teachers on the arbitrary state schedule. When school district administrators use their independent judgment and local need to determine teacher salaries, the best teachers will be rewarded, teacher quality will increase, and student achievement will soar.

To attract and retain teachers in the shortage areas of math and science, school district administrators should compensate these teachers with hiring bonuses and yearly shortage stipends.

Potential teachers with strong math and science skills can often make more money in the private sector. For example, the average starting teacher salary in Texas last year was $34,505 and will most likely hit a ceiling of $65,000 or $70,000 for teachers in the highest paying districts with over 20 years of experience.[4] That same individual with excellent math and science skills and a science or technical degree makes an average salary of $73,312, with even higher salaries possible based on skills, job responsibilities, and the market.[5]

Additional compensation based on market demand can address the lack of competitive pay for math and science teachers. Some Texas school districts are already using hiring bonuses or shortage stipends to attract and retain quality math and science teachers. During the 2006-07 school year, approximately 20 percent of school districts (205 school districts) paid math teachers shortage stipends and 15 percent (156 school districts) paid science teachers shortage stipends.[6] Furthermore, about 8 percent of school districts (81 school districts) paid 3,887 new teachers a hiring bonus.[7] The average hiring bonus was $2,049 with bonuses ranging from $250 to $10,000.[8]

EVALUATE AND REWARD TEACHER EXCELLENCE

School districts should measure the quality of math and science teachers every year with an annual evaluation.

Teachers should be evaluated annually on their performance in the classroom, using objective measures such as teacher qualifications, subject matter expertise, peer evaluations, student achievement and improvement, discipline management, and overall effectiveness in the classroom. A Tennessee study finds that students with strong teachers for three consecutive years achieve 50 percent more than students with weak teachers. The study also finds that students with strong teachers erase the achievement gap associated with race, ethnicity and income within three to five years.[9] School districts need to know the quality of the service they are paying for when employing a teacher. Without reliable data on effectiveness, test scores, and student gains, school districts cannot reward excellence. Through rigorous teacher evaluations, schools and teachers will be empowered to make necessary improvements.

To keep excellent teachers in the classroom, school districts should reward them accordingly.

Another way to attract excellent teachers, including quality math and science teachers, is to reward excellence. School districts can measure the quality of instruction and give bonuses to teachers who excel in the classroom. Texas has a state-funded teacher incentive program that is locally designed at the district or

campus level. The program aims to reward classroom teachers for improving student achievement (as demonstrated with objective, quantifiable measures) and for contributing to improving overall student performance by collaborating with school faculty. School districts that participate in the program are encouraged to give awards between $3,000 and $10,000. Some school districts are designing their own incentive pay programs, separate from the state program. During the 2006-07 school year, roughly 9 percent of school districts (90 school districts) had some type of locally-devised performance pay program.[10]

ENSURE RIGOROUS MATH AND SCIENCE COURSES, EXAMS, AND GRADUATION REQUIREMENTS

Encourage math, science, and career and technology education (CTE) teachers to work together to integrate academics into revised TEKS, add rigor to career and technology courses, and develop new advanced CTE courses.

To give students the best opportunity to achieve their goals and succeed in life, schools must equip them with a good foundation of marketable skills. Core academic and Career and Technical Education (CTE) teachers have an opportunity to work together in the TEKS (Texas Essential Knowledge and Skills) rewrite mandated by HB 3485 to increase academic rigor in CTE courses. They can also work together to design an advanced CTE course that will count as a student's fourth math or science credit. As employers continue demanding higher skill levels from new workers to perform highly technical jobs, our education system must respond with courses that teach these higher level skills.

Encourage students to take math and science courses every year in high school.

Research produced by the Department of Education indicates the likelihood of attaining a college degree is increased by 50 percent when students complete just one course for which Algebra II is a prerequisite.[11] Also, students who completed at least three core science classes score at least 2.8 points higher on the ACT than students who complete only two lab-based sciences.[12] In 2006, the Texas Legislature added a fourth year of math and science to the Recommended High School Program, which is the default high school curriculum, in an effort to boost student expectations in math and science. School officials should work to ensure that as many students as possible graduate under the Recommended program. In addition, school officials and parents should encourage high school seniors to take math and science their senior year, even if they have already met the four math and four science course requirements, so they do not lose a year of math and science instruction.

Ensure all math and science exams are rigorous and well-designed to test the mastery of skills, not just content.

Tests with fewer multiple choice questions and more open-ended questions can encourage teachers to emphasize the knowledge and skills in the curriculum over test-taking strategies. Texas students must be prepared for higher education, the workforce, and life—not just prepared to take a particular standardized test.

Ensure that a high school diploma equals post-secondary readiness in math and science.

Issuing diplomas to students who are not prepared for college-level work hurts students and institutions of higher education. The practice forces colleges to teach the same skills and content again at a high cost to both students and taxpayers. Last year, 35 percent of all freshmen at Texas public higher education institutions had to enroll in at least one remedial education course because they were unprepared for college-level work in math, reading, or writing.[13] Roughly 47 percent of remedial education courses are in math.[14] When high schools issue diplomas without actually requiring that their students be college-ready or work-ready, they harm students and devalue everyone's diploma.

In addition to the direct costs of teaching and administering remedial education courses, there are many indirect costs to students, families, and the economy. The Alliance for Excellent Education estimates the nation loses $3.7 billion a year as a result of remedial education. Their estimate includes $1.4 billion to provide remedial education on college campuses and a $2.3 billion loss to the economy from lost earnings.[15] Dr. Christopher Hammons puts the figure even higher; he estimates that Texas alone loses over $13.6 billion a year in lower earning potential, poor productivity of workers, increased spending on social programs, and direct costs of remediation.[16]

INCREASE STUDENT ACCESS TO NON-TRADITIONAL MATH AND SCIENCE PROGRAMS

Encourage and provide incentives for schools to offer a variety of rigorous math and science courses and electives or to start a math or science magnet program.

A likely explanation for students' inability to excel in math and science is the lack of rigor and focus on teaching basic math and science skills in many traditional school models. In an attempt to combat the poor performance by many traditional public schools, school districts across the country and within Texas, including Dallas, Houston, San Antonio, Tyler, and Wichita Falls Independent School Districts (ISDs) and various charters, are developing magnet schools and other programs focused on specific curriculums such as math and science. Along with providing students and parents a breadth of options through specialization, magnet schools also layout a framework of reformation and success for low-performing schools. The effect of competition from the math and science magnet schools in Wichita Falls ISD has led to elevated rigor in the entire school district's math and science curriculum.[17]

By observing and mirroring magnet school practices, low-performing schools can specialize and attempt to generate the same results.

Increase school choice by removing regulations on charter schools.

By allowing the expansion of charter schools and decreasing the regulations affecting them, Texans will have more choice and thus more competition in education. The Fort Worth campus of Harmony Science Academy attracted 1,500 applicants for only 350 available spots in its inaugural year.[18] Because state law keeps the supply of charter schools from adjusting to demand, this is not an isolated incident.

The Legislature should relieve charters of the burdensome regulations that thwart their success, most notably the cap that limits their expansion. Not only would this allow more students to attend high-performing charter schools, but the effect of greater parental choice would also improve surrounding public schools. For instance, the substantial charter school population in Houston has spurred increased choice within Houston ISD. The district has responded to competition from charter schools by implementing school choice through open enrollment, district charter schools, and magnet schools, including dozens of math and science-related magnets at the elementary, middle, and high school levels.

REPLICATE BEST PRACTICES OF HIGH-PERFORMING SCHOOLS

In addition to following the previous recommendations, the Foundation's research on best practices points to schools that have distinguished themselves as high-performing in the areas of math and science in the current environment. These schools illustrate the opportunity for innovation and should serve as a model for school districts and campuses needing immediate improvement.

Focus financial resources on instruction.

Research shows that while there is little to no relationship between total per-student spending and student achievement, there is a correlation between higher instructional spending and student achievement.[19] When looking at math and science achievement specifically, high-performing high schools spend less than the state average per student, but devote a larger percentage to instructional spending.[20] School districts should prioritize classroom spending in order to maximize student achievement.

Consider raising class sizes in order to increase teacher salaries and decrease teacher shortages in math and science.

Research shows that teacher quality—not class size—is the most important school-related determinant of student success.[21] In fact, the most successful Texas high schools in math and science have larger class sizes than the state average.[22] Unfortunately, education reformers have spent vast resources on reducing class sizes while all but ignoring teacher quality. Raising class sizes by only two or three students could allow for teacher pay increases of 10 percent or more, while reducing the strain on an already shortage-plagued supply of math and science teachers.

Minimize TAKS infringement on classroom time by focusing TAKS preparation on low-performing students and holding remediation outside of the regular classroom.

Research finds that high-performing high schools focus TAKS preparation on students who need it most and benchmark fewer times each year as compared to Texas schools as a whole.[23]

Consider offering incentives for successful participation in Advanced Placement (AP) and International Baccalaureate (IB) tests.

College credit hours gained through AP and IB tests not only save time and money for students, but also save taxpayer money and increase the likelihood of students graduating from college.[24]

Utilize student data.

High-performing high schools use student data, especially value-added data, for activities such as student and teacher goal-setting, curriculum modification, and teacher evaluations.[25]

Engage parents with frequent communication from teachers.

Teachers in successful high schools typically send home progress reports at least every three weeks, and many schools are implementing real-time, online grade-viewing programs for parents and students.[26]

ENDNOTES

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The following Math & Science publications may be accessed at www.mathandsciencebestpractices.org

Math/Science Best Practices Report
Math/Science Reform Agenda
Texas' Math and Science Crisis: Declining Math and Science Skills Hurt Students and Their Employability
Solving the Math/Science Teacher Shortage
The High Cost of Remedial Education
Rethinking Public School Accountability: Using End-of-Course Exams to Measure and Improve the Quality of High School Education
Career and Technology Education: Systemic Change is Needed to Help America Stay Competitive
Postsecondary Readiness for All Texas Students
21st Century High Schools
Texas, We Have a Problem: The Math/Science Education Deficit and the Need for High School Reform
Testimony to the State Board of Education regarding end-of-course exams
Testimony to the State Board of Education regarding RHSP/DAP graduation requirements

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