



Policy Perspective

Texas' Math and Science Crisis: Declining Math and Science Skills Hurt Students and their Employability

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RECOMMENDATIONS

- Ensure schools understand that their fundamental mission is to teach the basics in reading, writing, history, math, and science—and to teach them well.
- Encourage schools to offer a variety of rigorous math and science courses.
- Encourage math, science, and career and technology education teachers to work together to integrate academics into revised TEKS.
- Encourage and provide incentives for schools to specialize in an area and strive to be the best in that area.

As America's economy continues to change, more jobs require a higher level of skills. Students need a firm grasp of reading, writing, math, and science skills to meet the market's demand for highly-skilled workers. Despite this demand, too few public high school and college graduates have the necessary knowledge and skills needed to fulfill the requirements.

As Kurt Summers, President and General Manager of Austin Generator Service explains, "In our business, our need for basic math and science is critical. Our inability to find workers with these skills is limiting our ability to grow and I only expect it to get worse."¹ Why is the demand not being met?

INADEQUATE MATH AND SCIENCE PREPARATION

One reason for the shortage of students with sufficient math and science skills is inadequate preparation in school. For example, a total of 65,027 freshman students at Texas public higher education institutions took remedial^{*} math courses during the fall of 2003.² This data makes obvious the fact that too many students are graduating from high school without the knowledge necessary to be successful in college-level math courses. As a result, some higher education institutions provide remedial education classes to incoming freshman to adequately prepare them for college coursework. The Texas Legislature appropriated approximately \$206 million

for the instructional cost of developmental/remedial education for 2006–2007.³

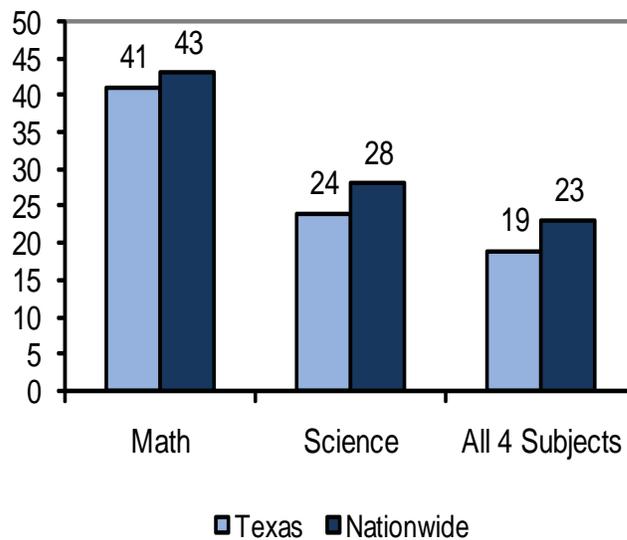
The inadequate math and science education students receive in Texas and across the nation is reflected by poor ACT scores. ACT, a national college entrance testing company, uses student ACT scores to determine college-readiness. Texas students scored an average of 20.5 on the ACT and U.S. students scored an average of 21.2 out of 36.⁴ Texas' math ACT scores suggest that in 2007 only 41 percent of Texas high school graduates, and only 43 percent of graduates nationwide, were adequately prepared for college-level algebra.⁵ In science, ACT's college readiness scores[†] suggest that only 24 percent of Texas high school graduates were adequately prepared for college-level biology and only 28 percent of graduates were prepared nationwide.⁶ This data indicates that many students—both in Texas and nationally—are not equipped with the skills needed to major in math or science and are not prepared to graduate with a math or science degree.

According to the Organization for Economic Co-Operation and Development (OECD), U.S. 15 year-olds ranked 21st out of students from 28 countries in math and ranked 16th in science.⁷ This statistic reveals why many U.S. students are not prepared to obtain a scientific or technical degree and why so many Texas community college (50 percent) and university freshmen (22 percent) enroll in at least one developmental education course.⁸

^{*} These are also called developmental courses. The total included 53,057 students at community colleges, 9,047 students at four-year universities, and 2,923 students at Texas state technical colleges.

[†] ACT data suggests that students have a 50 percent chance of scoring a B and a 75 percent chance of scoring a C in the corresponding college-level course if they achieve a certain college readiness score based off of their ACT test results.

ACT College Readiness



Source: ACT

TalkingPoint:

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SCHOOL SPECIALIZATION (MAGNETS)

A possible explanation for students' inability to excel in mathematics and science is the lack of rigor and focus in teaching basic math and science 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 curriculum such as math and science.*

Admission requirements into magnet programs vary by school district and program. Selective programs determine eligibility by grades, test scores, conduct, essays, letters of recommendation from their teachers, specific testing, and auditions for students apply-

ing to performing and visual arts programs. Open enrollment magnets with large numbers of qualified applicants sometimes use a lottery system to randomly choose students for the program. Transportation is usually provided by the school district to the magnet school.

Dallas ISD has seven elementary magnets, one elementary/middle school magnet, seven middle school magnets, one middle/high school magnet, and two high school magnets.⁹ Dallas ISD's School of Science and Engineering at the Yvonne Ewell Townview Magnet Center, offers a fast-track program for math. This intensive course structure provides 90 minutes of Calculus each day, opportunities for daily tutoring sessions before or after school, two-hour tutoring sessions after school during February, March, and April, and three Saturday Advanced Place-

*The number of magnet schools in Texas is not available as the definition varies by school district and the Texas Education Agency does not collect data on magnets.

ment (AP) prep sessions in the spring.¹⁰ The result of this preparation is a tremendous enrollment in AP classes and an impressive pass rate to accompany it. In 2004, 99 students were enrolled in AP Calculus classes and 50 of those students earned a grade of 3 or higher on the AP Calculus BC Exam. Students graduating from the Science and Engineering campus at the Yvonne Ewell Townview Center will be attending prestigious colleges such as MIT, Notre Dame, Cornell, the University of Texas at Austin, and Texas A&M University.

Houston ISD has over 119 magnet programs at various elementary, middle schools, and high schools ranging from communications, landscape design and architecture, and world languages to music and fine arts.¹¹ HISD has a math, science and/or technology magnet program at 13 different elementary schools and a math and science magnet program at six different middle schools.¹² The magnet curriculum offers students the opportunity for “in-depth, process oriented study in math and science in conjunction with a strong academic program.” In addition to developing laboratory skills through active, “hands-on” experimentation in a variety of science courses, students can participate in math, science, and computer science fairs and clubs.¹³ HISD offers high school students several math and science magnet choices including: Engineering Professions; Math, Science, and Technology; Meteorology and Space Sciences; and the Milby Science Institute (biology, chemistry, and physics).¹⁴ Testing is required for entrance into the Engineering Professions magnet.

Students in San Antonio ISD can choose between four magnet middle schools and eight magnet high schools. The curriculum at San Antonio’s magnets range from multilingual, American heritage, media production, and

health professions to international banking and business. The Science, Engineering, and Technology Magnet program is designed for students desiring a college degree in science, engineering, or technology fields. The curriculum “incorporates coursework in technology systems, computer applications, and advanced science and mathematics.” The magnet high school has state-of-the-art technology labs and offers a limited number of summer internships to exemplary junior or senior level students.¹⁵

Tyler ISD has four magnet programs (three at the elementary school level and one at the middle school level).¹⁶ Of the four, two are focused on math and science. The Moore Math, Science, Technology (MST) Magnet School for students in middle school uses a block scheduling rotation to allow students to take eight courses each year (students take four 90 minute courses on day A and four separate 90 minute courses on day B). It offers many math and science courses including Advanced Math (covering 6th, 7th, and portions of 8th grade TEKS), Algebra I, Geometry, Astronomy, Global Environmental Science and Integrated Physics, and Chemistry.* Since its opening in 1999, student interest and demand has caused student enrollment to increase from 600 students to a capped enrollment of 750 students (250 students per grade level).¹⁷ The school has received many accolades including the Nationally Recognized School of Excellence award.¹⁸

Wichita Falls ISD offers students an advanced math, science, and technology magnet curriculum at the elementary, junior high, and high school level. Together these three schools call themselves “Schools of Choice” and offer advanced curriculum to students in grades 4-12. The math and science elementary magnet was the first magnet school

TalkingPoint:

Since the opening of Tyler’s Moore Math, Science, Technology Magnet middle school, enrollment has increased from 600 students to a capped enrollment of 750 students due to increased student interest and demand.

* Algebra I, Geometry, and Integrated Chemistry and Physics are all offered for high school credit.

TalkingPoint:

Waco's Rapoport Academy has seen tremendous success with their advanced math and science curriculum, including remarkable reading and math TAKS scores for their economically disadvantaged students.

to open in the district in 1989. Since then the other two schools have opened and student test scores at the three magnet schools have increased dramatically.¹⁹ Jan Banner, Grants and Magnet Schools Director at Wichita Falls ISD, says their math and science magnets have had a positive effect on the district as a whole. "The elevated rigor* in the magnet curriculum has improved the math curriculum everywhere in the district because parents at other schools insist on the same level of rigor for their children."²⁰

In addition to magnets within public ISDs, charter schools also show success with an advanced and specialized math and science curriculum. Rapoport Academy—a charter school in Waco, Texas—serves mostly economically disadvantaged students and yet has seen tremendous success. The charter school opened in 1998 in an economically depressed area of Waco in response to extremely low TAAS scores[†] among poor and minority students.²¹ The Rapoport Academy received a second charter and opened up a high school in 2006 with a TSTEM designation. The 6-12 grade curriculum is integrated and focused on the real world in science, technology, engineering, and math.²² The 2007 TAKS scores show a 100 percent proficiency in reading and 85 percent proficiency in math.²³

Some math and science magnets are excellent and receiving national attention as evidenced by two Texas math and science magnet high schools[‡] making *Newsweek's* "America's Top 100 High Schools" list.²⁴ 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. By observing and mirroring magnet

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

The secret to the success rate at some magnet schools is the intense focus they put on specific subjects. In Mississippi, the Velma Jackson Magnet High School attributes its student achievement gains to higher student expectations and professional development sessions that help teachers create more effective lesson plans. By implementing systematic planning, creative use of resources, increased attention to curriculum development, and instructional strategies the school has improved dramatically. The result is a school in which 97 percent of the Class of 2004 went on to postsecondary education and every student is expected to pass state exams.²⁵

CAREER & TECHNICAL EDUCATION

Another way to increase rigor in math and science courses is to integrate academics into math and science career and technology education courses. Career and technology education (CTE) courses can be an excellent way for students to learn and apply technical skills, yet many courses are not fully integrated with math and science academic courses. According to the Career and Technology Association of Texas, there is no focused effort or reward system for academic and career and technology education instructors to team teach or review subject matter to support instruction across curriculum areas.²⁶ With the forthcoming rewriting of the career and technology education TEKS (Texas Essential Knowledge and Skills) as a result of HB 3485, now is an excellent time for math and science teachers to work with career and technology educa-

* They teach Algebra I in the 7th grade for high school credit.

[†] Only 30 percent of 3rd graders and 10 percent of 5th graders were passing the TAAS test.

[‡] The two schools are the Science/Engineering Magnet in Dallas, Texas and the Science Academy of South Texas in Mercedes, Texas.

tion teachers to integrate curriculum and increase rigor. In addition, state law provides a new option for students under the “four-by-four” math and science requirements. HB 3485 allows students to take a rigorous and advanced CTE course that counts as their fourth year of math or science credit after Algebra II or physics. Few courses exist that meet these criteria, a situation that should be corrected.

If students are effectively taught math and science in their K-12 education and have good foundational skills in math and science, they may be more likely to pursue challenging math and science courses and to major in math or science in their postsecondary education, which can significantly increase their earnings.

EARNING AND LEARNING

Education Increases Earnings

As the cost of living rises, many people are looking for a way to increase their earning power. Traditional wisdom says that the key to increasing individual earning potential is

to become more specialized by getting more education. In fact, research indicates that college graduates will make up to \$1.2 million more in total salary over their lifetime than those who do not have a college degree.²⁷

While increasing educational attainment often enables an increase in salary, the amount of the increase is dependent upon the education received. Students who graduate from high school earn an average of \$23,513. An Associate degree will bump an individual's salary up to \$30,849 and a Bachelor degree increases average earnings to \$44,132. For individuals looking to maximize their income, it is also significant to note that the average person in a scientific or technical service earns \$73,312.²⁸

Specialized Training and Education Increases Earnings

Further analysis indicates that the training and skills a student learns has a greater impact on earnings than simply the type of degree obtained. The table below shows the highest paying majors one year after gradu-

Salary Related to Education Attainment



Source: Texas Workforce Commission

ation for Associate and Bachelor degrees. Five of the top-10 highest paying majors were Associate of Applied Science degrees (technical degrees) with an average salary of \$38,644. Those with liberal arts Bachelor degrees ranked

15th, earning \$27,415 one year after graduation. With the exception of liberal arts, all of these careers require strong reading, math, and science skills. ★

Highest Paying Majors, 1 Year Post-Graduation: Bachelor & Associate Degrees Only

Career	Degree	Salary
1. Health Professions/Clinical Sciences	Bachelor Degree	\$47,306
2. Engineering	Bachelor Degree	\$45,278
3. Health Professionals/Clinical Sciences	Associate of Applied Science	\$44,230
4. Construction Trades	Associate of Applied Science	\$40,120
5. Engineering Technologies/Technicians	Bachelor Degree	\$39,677
6. Science Technologies/Technicians	Associate of Applied Science	\$37,968
7. Architectural & Related Services	Associate of Applied Science	\$36,737
8. Precision Production	Associate of Applied Science	\$34,167
9. Computer & Information Sciences	Bachelor Degree	\$33,267
10. Business, Management, & Marketing	Bachelor Degree	\$30,851
11. Mathematics & Statistics	Bachelor Degree	\$30,160
15. Liberal Arts	Bachelor Degree	\$27,415

Source: Texas Workforce Commission/LMCI.

*Average earnings for entire graduating cohort, not for individual graduates.

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- Encourage math, science, and career and technology education teachers to work together to integrate academics into revised TEKS, add rigor to career and technology courses and develop new advanced CTE courses that can count towards a student's fourth year of math or science credit.
- Encourage and provide incentives for schools to specialize in an area and strive to be the best in that area.

ENDNOTES

- ¹ Phone interview with Kurt Summers, President and General Manager of Austin Generator Service on September 7, 2007.
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- ³ Texas Legislative Budget Board, "The cost of developmental education in Texas," The University of Texas at Austin, The Charles A. Dana Center. (Mar. 2007), http://www.lbb.state.tx.us/Higher_Education/Cost_Developmental_Ed_TX_0407.pdf.
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- ⁷ "How to Increase American Competitiveness," *Education Notebook* (9 June 2006).
- ⁸ Texas Legislative Budget Board, "The cost of developmental education in Texas," The University of Texas at Austin, The Charles A. Dana Center. (Mar. 2007), http://www.lbb.state.tx.us/Higher_Education/Cost_Developmental_Ed_TX_0407.pdf.
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- ¹⁴ Houston Independent School District High School Magnet Programs, http://www.houstonisd.org/Magnet_Eng/Images/HSMagnetBrochure.pdf accessed by author on September 13, 2007.
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About the Author

Brooke Dollens Terry is an education policy analyst at the Texas Public Policy Foundation's Center for Education Policy.

Before joining the Foundation, she worked at the Texas Workforce Commission in government relations and as a policy analyst for Commissioner Diane Rath. At the Workforce Commission, Brooke researched and analyzed child care, welfare, foster care, food stamps, and a host of other workforce policy issues.

Prior to working in state government, Brooke worked in Washington D.C. for U.S. Senator Phil Gramm for two and a half years analyzing federal legislation and policy in the areas of banking, housing, education, welfare, judiciary, and social issues. Upon Senator Gramm's retirement, Brooke worked for U.S. Senators John Cornyn and Richard Lugar as a legislative assistant.

During college, Brooke interned in U.S. Senator Kay Bailey Hutchison's press office in Washington D.C., and in then-Governor George W. Bush's criminal justice division in Austin. Brooke graduated cum laude from Baylor University with a Bachelor of Arts in Political Science. During her time at Baylor University, Brooke was actively involved with Baylor Ambassadors, student government, and Pi Beta Phi.

A fifth generation Texan, Brooke grew up in Houston and now resides in Austin with her husband.

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