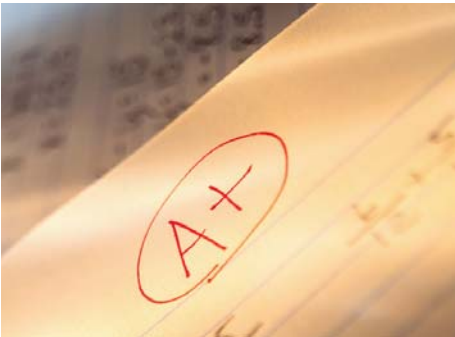


Best Practices in Math and Science in Texas Public High Schools



By Jamie Story | *November 2007*



EXECUTIVE SUMMARY

Cluster math and science performance among Texas and United States students has highlighted the need for reform in math and science education. Fortunately, a number of Texas high schools are shining examples of places where students are achieving success in math and science. The goal of this paper is to help other school districts and campuses learn from these examples by offering a best-practices model for student achievement in math and science.

Using standardized test and college entrance exam data from the Texas Education Agency (TEA), we identified 51 schools that have demonstrated significant gains in math and science. We surveyed, interviewed, and visited these schools, gathering data and anecdotes about teacher characteristics, school schedules, parental involvement, and numerous other variables. We supplemented this information with statewide data from the TEA, and compared the high-selected schools with Texas public schools as a whole.

Various patterns, or best practices, emerged. Our findings include the following:

- School choice—through options such as magnet schools—appears to have a positive effect on student motivation and parental involvement.
- Best practice schools spend less money per student, but a larger percentage of resources on instruction and school leadership.
- The identified schools have larger math and science classes than the state average, thus allowing them to pay higher teacher salaries and potentially mitigating the teacher shortages found in other public schools.
- The vast majority of science teachers in best practice schools have a degree in the sciences, and these schools attract teachers from industries such as accounting, engineering, and higher education.
- A large portion of best practice schools provide stipends to attract math and science teachers, and several of the schools offer incentive pay on an individual teacher basis.
- Best practice schools target TAKS preparation on low-performing students, thus minimizing its impact in the classroom.
- Several of the highest-performing schools utilize a block schedule, which may be especially conducive to some math and science classes.
- Best practice schools encourage parental involvement through frequent communication from teachers and even online access to students' grades.

Based on these findings, we propose the following recommendations to educators and policymakers:

- Create schools of choice, perhaps focusing on math, science, and related fields, that allow students and parents flexibility within school districts.
- Remove barriers that discourage industry experts from entering the teaching field.
- Focus financial resources on instruction.
- Consider raising class sizes in order to increase teacher salaries and decrease teacher shortages in math and science.
- Utilize stipends and incentive pay with the goal of increasing the supply of quality math and science teachers.
- Minimize TAKS infringement on classroom time by focusing TAKS preparation on low-performing students and outside of the regular classroom.
- Consider offering incentives for successful participation in Advanced Placement (AP) or International Baccalaureate (IB) tests.
- Utilize student data, especially value-added data, for activities such as student and teacher goal-setting, curriculum modification, and teacher evaluations.
- Engage parents with frequent communication from teachers; consider implementing a real-time, online grade-checking program for parents and students.

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Special thanks to Beau Tyler for his invaluable help in surveying, interviewing, and visiting the schools.

Best Practices in Math and Science in Texas Public High Schools

by Jamie Story, Education Policy Analyst

INTRODUCTION

By every available measure, United States students perform behind the rest of the world in math and science. When comparing the U.S. to countries that participated in three international assessments—the 4th and 8th grade Trends in International Mathematics and Science Study (TIMSS), and the Programme for International Student Assessment (PISA) at 15 years of age—the U.S. performed consistently poorly at all grade levels. Out of 12 industrialized countries taking part in the three tests, the U.S. finished 8th, 9th, and 9th, respectively.¹ In addition, most countries not only outperform the U.S., but do so while spending far fewer dollars per student. For example, Korea spends half what the U.S. does per student, yet far outperforms us in math and science.²

American performance in math and science certainly gives cause for alarm, but where do Texas students stand? Unfortunately, the picture is not much better for Texas. On the most recent National Assessment of Educational Progress (NAEP) reports, 35 percent of Texas 8th-graders exhibited proficiency in math, and 23 percent in science—exceeding the national proficiency level in math (31%) but falling below it in science (27%).³ Math and science shortcomings are more apparent for Texas college-bound students. In 2007, Texas students posted the 13th-lowest score in the nation on the math section of the SAT, gaining only two points on the national average over the past 10 years.⁴ ACT reports that only 41 percent of ACT-tested students in Texas are ready for college-level algebra, and only 24 percent are ready for college-level biology.⁵

While overall math and science performance in Texas is lackluster, students in several high schools are achieving great success in math and science. As policymakers aim to improve math and science performance throughout the state, these schools should serve as a model for best practices in math and science education.

To identify and evaluate these models for best practices, our research encompassed four main components. First, we identified candidate high schools for the best practice study as described in the Appendix. We then surveyed the math and science coordinators at these schools as the first step in assessing their best practices. Once we received completed surveys, we arranged phone and in-person interviews with the math and science coordinators, and in some cases the administrators, of these schools. Finally, we supplemented this largely qualitative data with quantitative data from the Texas Education Agency.

A number of patterns, or best practices, surfaced. These best practices should be considered by policy makers, school leadership, and classroom teachers as they strive to continue improving the status of math and science instruction in Texas.

SELECTION OF BEST PRACTICE CAMPUSES

Our identification of best practices was limited to public high schools, primarily because of the greater amount of math and science data available at the high school level compared to the elementary or secondary level. In order to identify candidates for in an in-depth study of best practices, we employed campus-level math results for SAT, ACT, Advanced Placement (AP) and Texas Assessment of Knowledge and Skills (TAKS) tests, science results for AP and TAKS tests and the composite ACT test score. We combined these data with demographic data from the Academic Excellence Information System, available on the Texas Education Agency (TEA) website. Regressions for each year, test and subgroup of students controlled for prior year results, percent of students with Limited English Proficiency, percent of economically disadvantaged students, and the geographic area of the school district. Campuses were therefore compared with similar campuses—for example, all central city campuses with high poverty levels. The value added to student academic performance was computed by comparing actual results with expected results based on the regressions.

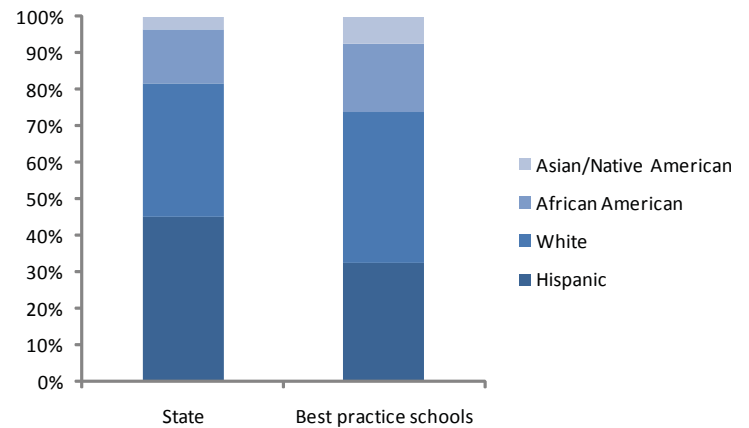
The primary qualification for selection as a “best practice” high school was a high level of value added, or student growth. However, to succeed in a technical career, students must have an adequate educational background in math and science. Best practices should result in not only student gains, but in high student skill levels. For that reason, we considered the absolute performance of schools in addition to their value added. A more detailed explanation of this methodology is found in the Appendix.

Ultimately, we identified 51 candidates (33 in math and 40 in science, with 22 campuses appearing on both lists). Table 3 in the Appendix shows the selected campuses, the number of times the campus achieved a top 25 performance listing, whether the campus was a value-added math or science qualifier, and selected demographic characteristics for the campus.

It is helpful to examine the population characteristics of these schools in comparison to Texas public school enrollment as a whole. The candidates for best practices have similar demographics to all Texas public schools, with larger white and African American populations and a smaller Hispanic population. The selected schools have a smaller, but still significant, population of economically disadvantaged students (36 percent versus 56 percent for the state as a

whole). [Figure 1] Although no charter schools appeared in the list (due most likely to their smaller size), seven of the 51 are schools of choice, such as magnet schools, and 10 additional schools incorporate some degree of choice, meaning some students are assigned to the schools and others participate in a campus magnet program.

Figure 1: Demographic Makeup



Sources: TEA AEIS data, author's calculations

IDENTIFICATION OF BEST PRACTICES

Once these 51 candidates for best practices were identified, we emailed surveys to the math and/or science coordinator, as appropriate, at each school. Following up with phone calls, further emails, and even faxes, we were eventually able to obtain 12 math surveys and 14 science surveys. We also probed further into the math and science departments by conducting 10 interviews by phone or during on-site visits.

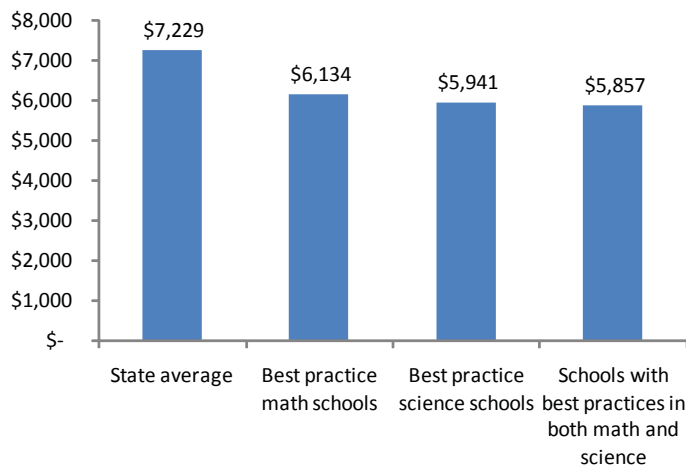
Because survey participation rates were not as high as anticipated, we supplemented the survey and interview results with campus data as available on the Texas Education Agency (TEA) website. In this way, we are able to report on some of the practices of all 51 identified campuses—not just the ones who participated in the surveys and/or interviews. We also used this data to compare metrics from the selected high schools to state averages in such areas as per-student spending, class size, and teacher experience. It should be noted that these metrics are based on all 51 schools identified through our statistical analysis, not just the ones we interviewed or visited in order to confirm their best practices. The following charts and descriptions summarize our findings.

Spending

Despite research demonstrating that school spending is not positively related to increases in student achievement,⁶ lawmakers continue to increase per-student funding far more rapidly than inflation. Since 1960, per-student spending in Texas has tripled in real terms,⁷ yet test scores have fallen over the past three decades.⁸ This study provides a unique opportunity to assess what some of the most effective high schools in the state are spending per student.

According to our results, the selected math and science high schools are spending far less than the state average on operating expenditures per student. While the typical Texas public school spends more than \$7,229 per student, the schools making our list for math and/or science performance spend only \$6,102 per student. This is especially notable since the TEA states that high schools spend more on average than schools educating younger students.⁹ Even more interestingly, if the field is narrowed to only those that made the cut in both math and science, spending drops to a mere \$5,857 per student. [Figure 2] In other words, the 22 high schools we identified as being among the best in the state in both math and science improvement spend 19 percent less per student than Texas public schools as a whole.

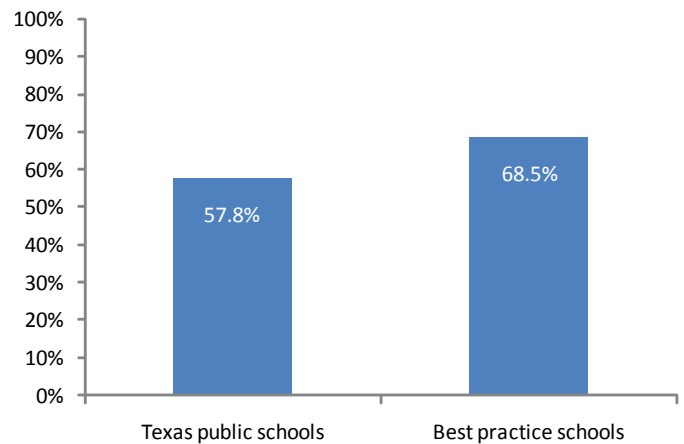
Figure 2: Operating Expenditures per Student



Sources: TEA AEIS data, author's calculations

How can schools spend less and still get better results? The answer lies in the way funds are spent. Research shows that although total spending has no effect on student achievement, instructional spending can have an impact.¹⁰ For the selected schools, the portion of operating expenditures devoted to instruction is more than 68 percent. For the state, this number is 10 points lower at only 58 percent. [Figure 3]

Figure 3: Instruction as Percentage of Operating Expenditures

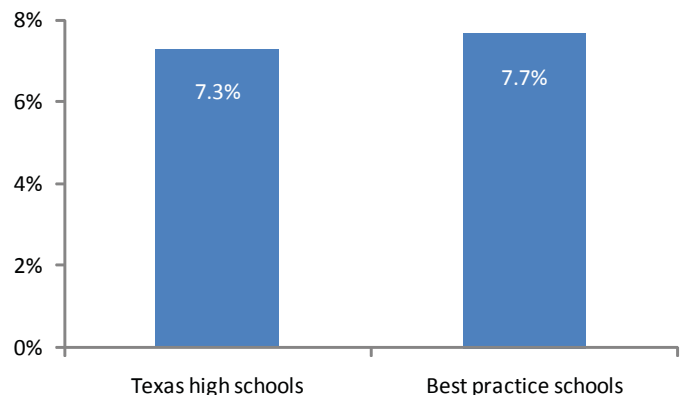


Sources: TEA AEIS data, author's calculations

By devoting a greater percentage of expenditures to instruction, these schools get better results using fewer taxpayer dollars.

Another interesting figure is the percentage of funds spent on school leadership. The Texas public school average is 5.6 percent, but the average among our sample is 7.7 percent. Part of this difference could be explained if it is common for high schools to spend more than elementary and middle schools on school leadership. Unfortunately, the TEA does not produce spending reports by type of school. However, our attempts to estimate this figure using the best available (albeit highly unreliable) data from the TEA puts average high school leadership spending across the state at 7.3 percent—still lower than at the schools we identified. [Figure 4] Clearly, school leadership is a priority for these best practice high schools.

Figure 4: School Leadership as Percentage of Operating Expenditures



Sources: TEA AEIS data, author's calculations

Kerr High School Profile

By Beau Tyler, Research Assistant

Imagine a room with one hundred teenagers sitting at round tables seemingly having a good time. Very few of them are paying attention to a teacher. It looks like utter chaos, but as far as learning goes . . . it works like a charm.

Opened in 1994, Kerr High School in Houston is a young school with a different approach to education. Kerr has about 800 students in an area where most schools have two or three thousand. This contributes to the sense of community the school has developed. Teachers and students seem to know each other to a large degree and have familiar yet professional interactions.

Kerr is not a magnet school, meaning it does not specialize in a field such as math or science. It is, however, a decidedly unique school. The students do not spend every day in what most would consider a traditional classroom; rather, they go to different “academic centers” such as a Math Center or Science Center, among others,¹ that focus on the various areas of study. Each of the centers includes students enrolled in different courses—for example biology, chemistry, and physics in the Science Center, all at the same time. The typical center contains 100 freshmen, sophomores, juniors and seniors led by three teachers who each specialize in a particular course.

They sit at round tables in a large room with a bank of computers against the wall, while teachers are available to answer questions and help the students as necessary.

School Facts:

- ***Operating expenditures per student: \$4,797 (State average: \$7,229)***
- ***Percent of funds spent on instruction: 75.1% (State average: 57.8%)***
- ***Average science class size: N/A***
- ***Science teachers’ average experience: 12.2 years***
- ***Percent of science teachers with prior industry experience: 80%***
- ***Stipends to attract science teachers? No***
- ***Schedule: Accelerated Block***
- ***TAKS benchmarks per year: 0***

The Chair of the Science Department, Clarissa Caro, and the other science teachers have led their students to great success and achievement, which is largely credited to another major difference in their approach to education. Besides the nontraditional classroom environment, students at Kerr work at their own pace through what is known as a personal activity kit or “PAK.” These PAKs list the readings and provide assignments and labs for the students. Although there is a due date, the schedule is much more flexible because it allows students who want to move faster to do so. Some students finish their coursework weeks ahead of time and hence have the ability to learn even more. Many students even become eligible for early graduation with some college credit.

Kerr is a public school but children do have to apply, making it a school of choice. Students have to meet certain parameters. They must maintain a C average in middle school and not have excessive behavioral problems—a relatively low threshold that ensures Kerr is not taking only the best and brightest students. What is different is that regardless of a student’s history, they will be expected to be self-motivated. Kerr places the responsibility of learning on the child. Kerr’s teachers do not act as authority figures who dictate what will be done every day; instead, they serve as guides and mentors.

Associate Principal Robin Parkinson admits, “It is not for everybody.” And she is probably right. But for those students who are self-motivated—or who can become self-motivated given the proper environment—this apparent chaos is just what they need. Because upon further examination, it is not disorganized and inefficient—rather, it is made more efficient by allowing more choice while demanding responsibility.

¹ *Business Center, Computer Science and Webmastering Center, English Center, Foreign Language Center, Journalism Center, Math Center, Social Studies Center, Speech Center, Fitness, Health and Nutrition Center, Special Education Center.*

Finally, we hypothesized that Career and Technology Education (CTE) spending could have an impact on a school's math and science scores. Again, this figure was difficult to estimate since the TEA does not report figures specific to high schools, but clearly that is where the bulk of CTE spending takes place. According to our estimates, Texas high schools spend an average of \$951 on CTE for every student enrolled in CTE. Our sample of math and/or science schools spends less at \$875, according to TEA data. However, schools making both the math and science lists spend an average of \$972 per student on CTE—slightly more than the state average.

Best practice high schools also have slightly lower participation rates in CTE. Across Texas, 61 percent of high school students participated in one or more CTE courses in 2005–06. However, only 58 percent of students in best practice high schools participated in CTE. Without further research on participation rates and courses offered, the data is not sufficiently conclusive to make CTE best practice recommendations in this paper.

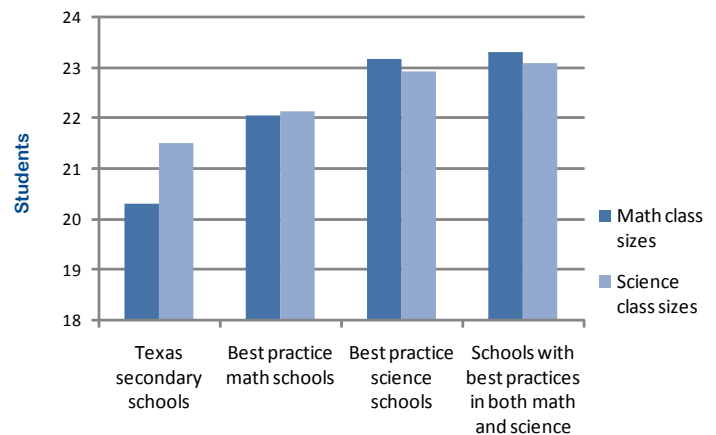
Class Size

For many, the debate about the effect of class size on student achievement has yet to be resolved. While some studies find benefits from smaller classes for specific groups or grade levels, others conclude that class size reduction is an expensive reform for which scientific evidence gives “weak to nonexistent” support.¹¹ In any debate over class size, it is vital to recognize that smaller classes require more teachers—which, in shortage areas such as math and science, may be difficult to secure.

One of the most noteworthy patterns displayed by both the best practice math and science schools is that they have larger class sizes than the state averages in math and science. While the average Texas high school math class contains 20.3 students, the average math class size in our sample of best practice math schools is 22—almost 9 percent higher. In science, the state average is 21.5 while best practice schools have 23.5 in a class—about 7 percent more than the typical Texas high school science classroom. [Figure 5] Even more interestingly, schools performing well in both math and science have larger class sizes than those selected in only one of the two subjects.

While it is possible that students perform better in larger classes, a more plausible explanation for this pattern is that

Figure 5: Math and Science Class Sizes



Sources: TEA AEIS data, author's calculations

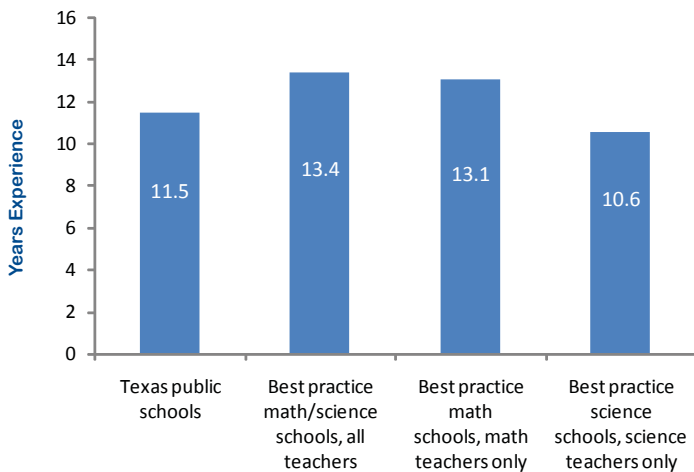
best practice schools place more of an emphasis on hiring the best math and science teachers than maintaining smaller class sizes. When choosing between hiring an additional teacher when only a mediocre one can be found, or having slightly larger class sizes but an outstanding teaching faculty, these schools may default to the latter. While the debate on class size is still running, there is no question that the most important school-related factor in student achievement is teacher quality.¹² Best practice math and science schools seem to recognize this fact and establish class size policy accordingly.

Teacher Experience

Overall, the selected math and science schools have teachers who are more experienced than the average Texas teacher. Average teacher experience in our math and/or science schools is 13.3 years, compared to a state average of 11.5 years. Similarly, teachers in these schools have taught in the same district an average of 8.8 years, compared to the state average of 7.6 years.

Our survey asked about teacher experience specifically within the math and science departments, since the TEA only collects teacher experience data for all academic subjects combined. Among respondents, the average experience of math teachers was 13.1 years and of science teachers was 10.6 years. [Figure 6] While these figures may not be quite as reliable as campus-level data from the TEA due to the small sample size, they suggest that the math departments in top math schools have approximately the same amount of experience as their colleagues in other departments, while science teachers in high-performing campuses have less ex-

Figure 6: Average Teacher Experience



Sources: TEA AEIS data, best practices survey results, author's calculations

performance. The top performing science program, Kerr High School, has average teacher experience of 12.2 years, and its science department coordinator cited low turnover as one of the reasons for the program's success.

In assessing the significance of these findings, it is important to look at the evidence on teacher experience. Research indicates that teacher experience has only a marginal effect on student achievement after the first few years of teaching. In other words, once a teacher has two to three years of experience, additional experience in and of itself does not have an effect on student achievement.¹³ In fact, some evidence indicates that teacher effectiveness actually decreases after 20 to 22 years of teaching.¹⁴ So while one may look at this data—high teaching experience in the best practice math programs, and moderately high experience in the best practice science programs—as a cause of the high student achievement in these schools, prior research suggests that it may actually be a result of other variables rather than a cause of high student achievement. In fact, when asked if there is an ideal length of experience for good teachers, one math coordinator remarked, “I think it totally varies.”

So what causes teachers in high-performing schools to stay in the field for longer? Unfortunately, the scope of this research cannot serve to pinpoint an answer. However, it is likely that many of the inputs leading to improved student achievement—such as an emphasis on school leadership and higher parental involvement—also serve to improve working conditions for teachers. While lower teacher turnover may not be the cause of these schools' success, it is likely

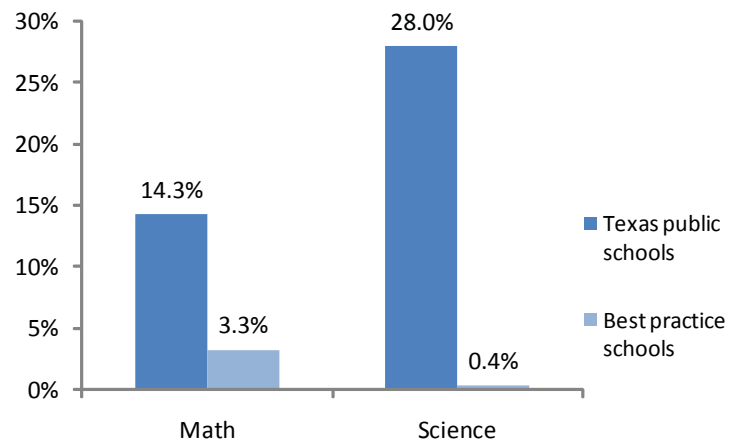
a side benefit of some of the other positive factors that are contributing to higher student achievement.

Teacher Background

As part of the survey process, we asked each department head about teacher background, including certification, educational attainment, and industry experience. While there is not statewide data to serve as a comparison on all of the responses, this data helps to provide a complete picture of the teaching faculty in best practice high schools.

In the selected math programs, 55 percent of teachers have their bachelor's degree in mathematics. Only 3.3 percent are teaching out-of-field, compared to a state average of 14.3 percent.¹⁵ [Figure 7] Eighteen percent have prior industry experience in fields such as business, accounting, engineering, and the oil and gas industry.

Figure 7: Percentage of Out-of-Field Teachers



Sources: TEA data, best practices survey results, author's calculations

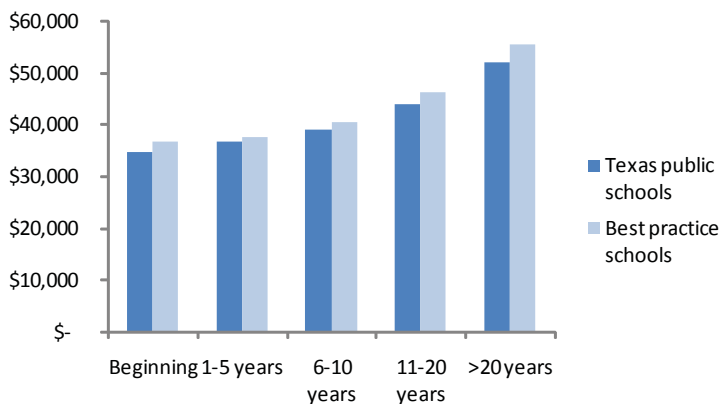
The science results are even more illustrative. Eighty-three percent of science teachers in best practice schools have their bachelor's degree in the sciences. Less than one percent are teaching out-of-field, compared to a state average of 28 percent among those teaching science.¹⁶ [Figure 7] Thirty percent have prior industry experience. At Kerr High School alone, science teachers have backgrounds such as radiology, forestry, law enforcement, higher education, and engineering. Science department head Clarissa Caro attributes this to an Alief ISD program that enables industry experts to quickly become certified and enter the classroom.

The high incidence of teachers in best practice schools with prior industry experience is not surprising, because research indicates that a teacher's subject area knowledge is a good predictor of student success.¹⁷ Individuals who have worked in a math- or science-related field in the private sector have demonstrated knowledge in that field. That knowledge, combined with real-life experience, may give these teachers—and their students—an advantage in the classroom.

Teacher Pay

Another notable difference between our list of best practice schools and Texas high schools as a whole is in teacher pay. The schools we identified pay their teachers \$44,876 on average, compared to the Texas average of \$41,744 in 2005–06. However, since the selected math and science schools have more experienced teachers and pay is generally related to years of experience, it is important to compare salaries for teachers with the same number of years teaching. Using this method, the selected math and science schools still pay their teachers more at every level of experience—from beginning teachers to those with more than 20 years of experience. [Figure 8]

Figure 8: Average Teacher Salary by Experience Level



Sources: TEA AELS data, author's calculations

At the state level, across-the-board pay raises have not had a discernable impact on teacher quality, since they reward both effective and ineffective teachers. From 1994 to 2004, Texas teacher salaries increased almost 25 percent in real terms;¹⁸ over the same period, SAT scores have increased by only one point.¹⁹ However, at the campus level it is quite possible that higher pay is one factor contributing to the lower teacher turnover in best practice math and science

high schools. And in combination with the higher than-average instructional spending in these schools, it sends the message that principals value teaching above all else.

Particularly noteworthy is the fact that these schools pay teachers more despite spending far less than the state average in operating expenditures per student. These schools can accomplish this in part due to slightly larger class sizes. If a school raises class sizes by 10 percent, it can increase teacher salaries by 10 percent without any overall increase in costs. Leadership personnel in the schools we identified have decided that this is a worthwhile tradeoff, and the schools' low faculty turnover suggests that teachers agree.

Another aspect of teacher compensation is differentiated pay. Nearly 40 percent of respondents say their schools offer stipends to attract math and science teachers. In addition, six of the 23 schools implement some form of incentive pay, with five of those including an individual teacher component. For example, Creekview High School in Carrollton piloted a program in which three members of the math department and three members of the science department were tasked with giving intensive instruction to low-performing minority students in order to boost their TAKS scores. Teachers received a bonus for each student who passed the TAKS, and nine out of 13 students passed. It is unclear whether the program will be continued or expanded in the future.

Post-Secondary Preparation

The high school curriculum is the best predictor of whether or not a student will receive a bachelor's degree, and is a better indicator of post-secondary success than socioeconomic status, standardized test scores, or even high school GPA.²⁰ Unfortunately, analyses of the Texas curriculum by independent national organizations have been less than stellar. For instance, the Thomas B. Fordham Institute gave the Texas science standards an "F" and the math standards a "C."²¹ High-performing public schools, therefore, have some work to do to get the state-provided curriculum up to their higher expectations.

Department heads were asked if their curriculum is developed at the campus or district level. Only 15 percent responded that the curriculum is developed *solely* at the campus level, but another 15 percent indicated that the campus is at least *somewhat* involved in curriculum development. Twenty-four out of 26 agreed that the curriculum

Health Careers High School in San Antonio

By Beau Tyler, Research Assistant

San Antonio is deep in the heart of Texas. Deep in the heart of San Antonio is the South Texas Medical Center and Health Careers High School.

Ranked exemplary by the Texas Education Agency, Health Careers High School (HCHS) accepts students from all districts with the de facto requirement that they be able to find their own means of transportation if they reside outside the bus routes. Prospective students must meet certain minimum requirements such as an overall average of at least a “C” in middle school, which according to Principal Jackie Horras, a majority of middle school students have accomplished. Students fill out an application and are considered based on attendance, discipline records, and test scores. But this is not to say that the requirements are excessively rigid. Horras explains, “If they have a discipline record we still consider them. We check for consistency, the severity, and those kinds of things. If they did not pass TAKS in previous years they are not taken out. Are their grades and test scores reflective of each other? Did they just have a bad test day?” If students meet these requirements their names are put in a lottery for acceptance. Last year HCHS had 870 applicants for its freshman class, but it can only accept about 250 students per year.

School Facts:

- ***Operating expenditures per student: \$5,443 (State average: \$7,229)***
- ***Percent of funds spent on instruction: 64.1% (State average: 57.8%)***
- ***Average math class size: 22.4 students (State average: 20.3)***
- ***Math teachers’ average experience: 20 years***
- ***Percent of math teachers with prior industry experience: 40%***
- ***Stipends to attract math teachers? Yes***
- ***Schedule: A/B Block***
- ***TAKS benchmarks per year: 1***

High standards, such as 100 percent of 11th-graders passing the math portion of the TAKS, are a driving force at Health Careers High School. Students are expected to work hard and the teachers and administrators, with the involvement of parents, are there to support them. Students are very concerned about achievement. HCHS uses an electronic trigger system that notifies parents and students about falling grades. The trigger is initially set by the school but students may reset the trigger to receive emails and text messages notifying them whenever their grades drop below any levels they choose.

Beverly McCarthy, the Math Department Coordinator, does not take all the credit for the high math scores. She credits the administration for their support and her fellow teachers for their dedication as well. HCHS has very low turnover and the average math teacher has about 17 years of experience. Asked why this is so, McCarthy explains, “I feel like the administration is there to really help me do the best job I can do. At other schools there may be an ‘us against them’ mentality. And here they go out of their way to help us do what we need to.” The students, who take math all four years, deserve quite a bit of credit too. In addition to morning, afternoon, lunch, and even Saturday tutorials with teachers, math students tutor each other in the halls, in the classrooms and everywhere in between. “They are competitive, but they want each other to be successful as well. And when you explain math to someone else, it really helps you understand it yourself,” says McCarthy.

Health Careers High School is not trying to be a factory for neurosurgeons. Students are exposed to a wide variety of roles in the health care industry, but regardless of whatever interests they have, students are given the goal of mastering mathematics. HCHS has raised the bar not only for its students but for every public school in Texas.

as written prepares students for college, with another stating that only the pre-AP curriculum does, but “that is okay because not everyone has to go to college to be successful.” However, Beverly McCarthy from Health Careers High School in San Antonio made it clear that medical school is not the ultimate goal for every student: “The idea of the school is that there are lots of different medical careers. We are not only teaching for brain surgeons. We want to prepare for the whole range of careers.”

In a similar question, individuals were asked if their school’s graduates are prepared for math or science in college. Of math respondents, six stated that they are prepared, while four stated that it depends on what courses students have taken. One math department head wrote that there is “too much emphasis on calculators. Number sense and operations are lacking.” Another remarked that “It depends on the student. If they just get by with Algebra II, they’re going to find math in college really hard I think. But if they go through Pre-Calculus I think they would be ready.” Among science respondents, 10 agreed that students are prepared for college, three admitted that it depends on which students and whether or not they’ve taken an Advanced Placement (AP) curriculum, and one responded that students are not prepared.

Best practice schools tend to have a rigorous curriculum and high expectations for their students. At Westside High School in Houston ISD, math coordinator Cedric French has created a Calculus III course for students who have completed Calculus AB and BC but want to continue pursuing math. At Debakey High School, students are required to take calculus. Math coordinator Anil Desai remarked, “The knowledge that they will have to take calculus begins the freshman year and that helps them prepare for it and be ready . . . In 9th and 10th grade it is difficult those two years to get them caught up because they come from all over and all started from different places, but we get them all caught up and ready to take the AP Calculus test.” The results? Ninety-nine percent of Debakey’s graduates also graduate from college, according to Desai.

School culture appears to be an important determinant of student success. Individuals were asked if they perceive their school to have a “college-bound culture.” Fourteen replied “yes,” nine replied “mostly,” and two replied “somewhat.” Two-thirds of the schools of choice replied “yes”—a

higher rate than the respondents in general. Veronica Vera explained how the Silva Health Magnet faculty upholds a college-bound culture: “When we speak to the kids, we speak to them like adults, and we tell them, ‘when you go to college, this is going to happen.’ None of this, ‘If you go to college.’ It’s *when* you go to college.” And Beverly McCarthy of Health Careers High School attributes much of her school’s success to the culture: “There is a real atmosphere of success—of academic excellence. It was apparent when I came that everyone on campus is concerned about the kids’ achievement.”

Interventions for Low-performing Students

One survey question read: “What interventions are in place for low-performing students?” While the question did not specify low-performing on the TAKS, several respondents explained how they prepare lower level students for the TAKS. Among both math and science coordinators, before-school, after-school, or lunch tutorials were cited as the most common intervention. Other interventions included special TAKS preparation classes and remedial “ramp-up” classes, particularly in math. Two schools make use of peer tutoring, and others pull low-performing students out of the classroom for special instruction from time to time. Several departments host review sessions prior to the TAKS for those students who need it. Other interventions included online review materials, Saturday “credit recovery,” guided study hall, student incentives, individualized plans for success, and graduation “coaches.”

Teachers at high-performing schools go above and beyond when it comes to working with struggling students. McCarthy of Health Careers stated, “The math teachers here are awfully good at not giving up, even if the kid has.”

Westside High School’s Carolyn Klein says that it is vital to find out why students have given up: “We try to find out why. Find out what can be changed. We ask them, ‘What do you want to do? How can we get you there?’ You know, it’s important to find that out.”

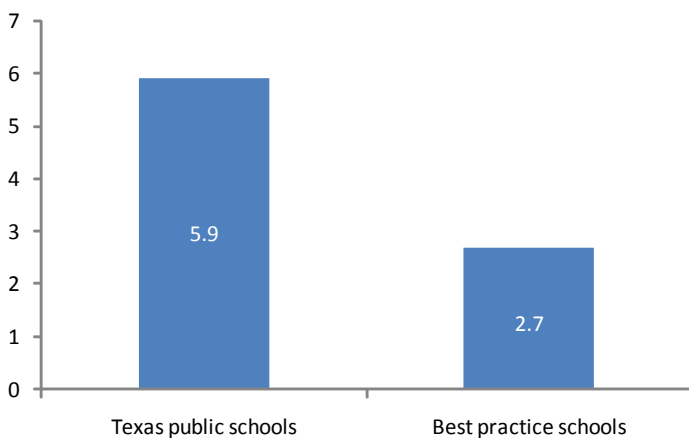
Standardized Test Preparation

A common complaint from educators is the prevalence of TAKS preparation in the classroom, or “testing mania” as some like to call it. In a Texas Federation of Teachers member survey, more than half of teachers said they spend more than 50 percent of their time preparing for and giving stan-

standardized tests. Eighty-seven percent said that the TAKS test has resulted in significant loss of instructional time.²²

In our sample of some of the most effective math and science schools in Texas, however, this does not seem to be the case. Math and science coordinators at the best practice schools report benchmarking their students for the TAKS an average of 2.7 times per year. Kerr High school does not give a benchmark test; instead, its teachers pull data from the previous year's tests and identify students who will need interventions based on prior scores. In comparison, 41 percent of teachers responding to the TFT survey said they benchmark every 6 weeks. In addition, 8 percent reported benchmarking every month, and 6 percent every week—for an average of almost 6 times per year. [Figure 9]

Figure 9: Number of TAKS Benchmarks per Year



Sources: TFT Survey on the Impact of TAKS (2005), best practices survey results, author's calculations

TAKS preparation in the best practice schools seems to be focused on low-performing students, with most teachers saying that class time is not heavily affected by TAKS prep. Clarissa Caro at Kerr High School asked, “Why would I want to pull (the high-performing kids) out and waste their time for a tutorial they don’t need? We help where help is needed.” She continued, “We feel that we structured our TEKS (Texas Essential Knowledge and Skills) well enough to include all of the information. If they did the work, we know when they are done with the course whether or not they are going to do well on the TAKS.”

Relative to public school teachers in general, math and science coordinators in best practice schools seem content

with the amount of TAKS preparation. Fifteen responded that the amount of time they devote to the TAKS is “just right,” while 10 believe it is “too much.” Three of the latter respondents qualified their answer, saying it is either unavoidable or necessary.

The schools from which respondents did express unhappiness with excessive TAKS preparation have not always emphasized the TAKS. One math coordinator said, “Up to last year, [TAKS prep] was little to nothing. It was simply the curriculum and what they got from the curriculum and the courses that they took. But last year was probably the first year that we actually devoted time to doing TAKS problems.” This was largely due to a change in leadership at the district level.

In addition to TAKS scores, we also selected schools based on SAT/ACT and AP/IB participation and improvement. So we wanted to know what, if anything, schools are doing to encourage participation and excellence on these tests. Seventeen of 23 schools offer SAT and/or ACT prep classes, with most of those offered for credit during the school day.

For those in Advanced Placement courses, schools offer a variety of incentives for students to take the tests. Of the math departments, three offer final exam exemptions for students who take the test, four pay the exam fees, and one offers subsidies on top of what the state provides. Cooper High School in Abilene offers final exam exemption, payment of half the fee (with the other half refunded if the student passes), and a student reward of \$100 per test passed. In science AP classes, students at four schools are exempted from final exams, five schools pay their students’ test fees, one pays the fees for low-income students, and two subsidize the fees for low-income students.

Jenna Gates, science department chair at Berkner High School in Richardson, emphasizes high expectations for her AP students. She stated, “I stress 100 percent participation for the AP exam from the first day of class.”

School Schedule

The high-performing schools we identified have a variety of class schedules ranging from the traditional 7- or 8-period day, to “block schedules,” to a hybrid of both. Block schedules can take the form of A/B schedules, where students alternate their classes every day, or accelerated schedules, where students complete an entire year of material in a se-

mester. The former implies that students have math every other day, where the latter means a student may have math one semester but not the other.

Of the math schools, four have a block schedule, with half being A/B and half accelerated. Six best practice math schools have a traditional schedule, and another has a hybrid (three days of traditional short classes, two days of long classes). Looking at the science schools, three use the block schedule, nine follow a traditional schedule, and two utilize a hybrid of the two. Interestingly, three of the top four math respondents and two of the top three science respondents utilize a block or mostly block schedule. One math coordinator who teaches under a block schedule said, “Some courses are really geared for the accelerated schedule. Geometry works well. Algebra II is hard-pressed because of all the TEKS they have to cover. One of the big pluses is that you see your students for a long period of time so you can do more activities.” Another math coordinator believes that an A/B schedule “prepares them more for college because in college you don’t have the same classes every day.”

In science, a block schedule might be particularly helpful because it allows ample time for complicated labs that may not be possible within a traditional 45-minute class period. And at Kerr High School, the accelerated block schedule makes it more common for students to take two science or two math classes in a year.

Use of Student Data

A common trait of successful organizations is their ability to collect, analyze, and learn from data. Successful schools are no exception. When asked how they use student performance data, math and science coordinators gave a wide variety of answers—from goal-setting, to advising class choices, to creating campus improvement plans. “Goal-setting for TAKS” was the most common response, followed by goal-setting for teachers, departments, and the campus. Several respondents stated that data analysis helps them to modify the curriculum, and several also stated that it helps them to identify students’ strengths and weaknesses. Other uses included teacher evaluations, determining students’ learning styles, evaluating programs, and making sure kids are on track to graduate. According to science department chair Jennifer Bernabo, Plano East Senior High School uses data to identify successful teachers so that they can share best practices with other teachers.

Madelon McCall of Waco’s Midway High School considers the use of data one of her department’s best practices: “The most productive practice involves the careful examination of all student data (both at the district and classroom level) to identify at-risk students and TEKS that are not mastered by all students.”

Karen White, the math coordinator at Lewisville High School stated, “I’ll spend a week during the summer looking at data on our students. Every school in Texas has trouble with objective four, and so do we—but why?”

Forty percent of the respondents indicated that their department makes use of value-added data. Uses include evaluating current and new programs, evaluating scores on district content tests, planning programs for at-risk students, performing reading diagnostics, analyzing objective mastery by each student, and influencing re-teaching and curriculum structure. One respondent indicated that his school is using value-added methodology for the first time this school year, while another remarked that her school is just beginning to use value-added data at the classroom level.

Parental Involvement

All of the educators we interviewed are pleased with the level of parental involvement at their schools, especially considering that high school parents are typically less involved than parents of younger students. However, Berkner High School’s Jenna Gates stated that parental involvement is not as high among students in regular classes as it is among pre-AP and AP students. Almost all of the schools send progress reports home at least every three weeks. Parents may get email updates even more frequently.

New technology now allows even the busiest of parents to stay involved in their children’s education. Math department chair Pamela Calder remarked that every teacher at Houston’s Memorial High School has a website for use by parents and students within the school website. Several of the schools we interviewed enable parents to review their students’ progress online from a home computer, in real-time. For example, parents at Creekview High School in Carrollton can log on to “Parent Connect” to check students’ grades, tardiness, absences, and even behavior. Karen White at Lewisville High School remarked that their online grade system means she often gets concerned or apologetic phone calls from parents before she is able to send a note home.

Health Careers High School in San Antonio has gone a step further. According to principal Jackie Horras, “Parents can set a trigger for text messages so that if a child’s grades fall below a certain grade or there is an absence, they can get a text message or a phone message.” Student can do the same. Horras continued, “I went to some of the kids that I knew were in the top of the 11th grade and they had set their triggers to email themselves if their grade had fallen below a 97.”

The math department at Silva Health Magnet ensures that parents are not only contacted when students are having a problem. Veronica Vera stated, “Now, we call parents, not only when there are problems. We call them to say, ‘Hey, your child did really well today.’ In a positive way. And the kids appreciate that.”

In our sample, the schools of choice seemed to have the greatest parental involvement. When asked about the effect of people from outside of the district choosing to attend Debakey at a cost to them, Anil Desai remarked, “Yes, the parents have extra reason to make sure their child does well.”

Discipline

When interviewed, most of the math and science coordinators reported little to no problem with discipline at their schools. At least three teachers attributed this to supportive administrators who uphold the policies and decisions of each classroom teacher. Karen White at Lewisville High School remarked that students know what lies ahead if they have to visit the principal’s office, and that helps keep them in line. Waco Midway’s Madelon McCall stated, “Teachers manage most of the discipline problems within the classroom.”

Discipline seems to be even less of a problem at the schools of choice. Part of this is because students know that at any time they can be removed of the privilege to attend that school. According to Clarissa Caro at Kerr High School: “We don’t have the behavior problems here. Because it is a choice, if they become a behavior problem they are sent back to their old school.” Principal Jackie Horras agreed, saying, “The students are here to learn. They’re not here just because somebody made them, because the state says you have to be in school. They’re here because they want to learn, and they made the choice to come here.”

Another reason given for better student discipline is the rigor of the curriculum at some choice schools. For example, Horras said, “Our kids’ goals keep them focused and that keeps the distractions down.”

Other Best Practices

While the entire survey was designed to identify best practices in math and science instruction, educators were also asked an open-ended question: “What practices of your teachers, campus, and/or district have most contributed to your school excelling in math/science?” Teachers gave more than a dozen responses.

Combining the math and science results, the most common responses were teacher collaboration and dedicated/excellent teachers. Other responses given by multiple coordinators included tutorials, high expectations and rigor, informed parents, and the existence of a college-bound culture. Three science coordinators named an emphasis on labs as a best practice. Madelon McCall of Midway credited “an excellent mentoring system for new teachers, both to the profession and to the school.”

Karla Lowerre, science department chair at Houston’s Memorial High School, echoed the thoughts of several respondents: “Administrative support is key. It is necessary to make a school work.”

Carolyn Klein, science coordinator at Westside: “...what is important is that we found the time during the day for all teachers to meet with their curriculum team. Other professionals are given the time to do so. It makes it so that novice teachers can sit down with experienced teachers and get that experience handed to them in some small way.” At Westside High School, the schedule is arranged to allow curriculum teams to collaborate once a week.

Robin Parkinson of Kerr High School mentioned the school’s advisory period as a best practice during her interview: “And then, once they are here they are in advisory with the same teacher for all four years. So, we keep track of all their work and assignments come through the advisory and get handed back through the advisory.”

BEST PRACTICE SUMMARY

Several patterns emerged when studying the best practice high schools in math and science.

School choice:

Seven of the 51 high schools are schools of choice, such as magnet schools. These schools reported that school choice results in higher parental involvement, fewer discipline problems, and greater student motivation. Ten additional schools incorporate some form of choice, meaning that a portion of their student body participates in a magnet program.

School spending:

- Best practice candidate schools spend 16 percent less per-student than the Texas average.
- They spend a greater percentage of their funds on instruction.
- They spend a greater percentage of funds on school leadership.

Class size:

The identified schools have larger math and science classes than the state average, thus allowing them to pay higher teacher salaries and potentially mitigating the teacher shortages found in other public schools.

Teacher background:

- Best practice science schools have almost no out-of-field science teachers.
- In best practice science schools, the vast majority of science teachers have their bachelor's degrees in the sciences.
- Best practice math and science schools attract math and science teachers who have previously worked in industries such as accounting, engineering, and higher education.

Teacher pay:

- On average, teachers in the identified schools are paid more than typical Texas teachers. This is in part enabled by larger class sizes, and also because top schools devote a larger portion of funds to instruction.
- Forty percent of the departments give stipends to attract math and/or science teachers, and one-fourth

employ an incentive pay structure on an individual teacher basis.

Post-secondary preparation:

- At the majority of the best practice high schools, the curriculum is developed at the district level. Almost all respondents believe that the curriculum is designed to prepare students for college.
- Most respondents believe that graduates are prepared for college, but others believe that only some students, such as those enrolled in AP coursework, are prepared.
- All respondents believe that their school has a college-bound culture, although some believe it could be better.

Interventions for low-performing students:

The most common interventions are tutorials, special classes, and review sessions.

Test preparation:

- TAKS
 - Best practice high schools benchmark fewer than three times per year.
 - Overall, most teachers in best practice schools believe that TAKS preparation is “just right,” with some of those who believe it’s “too much” also acknowledging that it is unavoidable.
 - Best practice schools seem to focus TAKS preparation on low-performing students, which minimizes the impact in the classroom.
- SAT/ACT: Most best practice high schools offer SAT and/or ACT preparation classes during the school day.
- AP: Schools offer incentives to take the AP test such as exempting students from the final exam and paying the exam fees for students.

School schedules:

Best practice high school schedules are mixed, with some following A/B or accelerated schedules, and others following a traditional 7- or 8-period schedule. However, most of the highest-performing schools follow a block schedule with longer class periods.

Student data:

- Educators use student data for goal-setting, curriculum modification, identifying students' strengths and weaknesses, teacher evaluations, and making sure that students are on track for graduation.
- Forty percent of the best practice schools utilize value-added data.

Parental involvement:

- Overall, parental involvement is high in top schools.
- Reasons for high parental involvement include frequent communication with parents through progress reports, online grade-checking systems, and even text message or email notification systems.
- Schools of choice report an especially high level of parental involvement.

Discipline:

Most respondents reported that discipline is not a major concern at their schools. Reasons included supportive school administrators, a rigorous curriculum that gives students little time to lose focus, and the alternative of returning back to traditional schools in the case of schools of choice.

CONCLUSION

While the math and science best practice high schools in Texas are as diverse as the state itself, a closer look at these schools reveals striking similarities. By surveying, interviewing, and visiting some of the most effective high schools in Texas, we gained insight into the workings of these schools, and created a list of some of the best practices that make these schools great. One of the most notable characteristics

of all of the best practices we observed is that they can be implemented at the campus or district level. In other words, these practices can be replicated across the state with no changes to current state statute. With this in mind, the following recommendations are among the most actionable for campuses and districts:

- Create schools of choice, perhaps focusing on math, science, and related fields, that allow students and parents flexibility within school districts;
- Remove barriers that discourage industry experts from entering the teaching field;
- Focus financial resources on instruction;
- Consider raising class sizes in order to increase teacher salaries and decrease teacher shortages in math and science;
- Utilize stipends and incentive pay with the goal of increasing the supply of quality math and science teachers;
- Minimize TAKS infringement on classroom time by focusing TAKS preparation on low-performing students and outside of the regular classroom;
- Consider offering incentives for successful participation in Advanced Placement (AP) tests;
- Utilize student data, especially value-added data, for activities such as student and teacher goal-setting, curriculum modification, and teacher evaluations; and
- Engage parents with frequent communication from teachers; consider implementing a real-time, online grade-viewing program for parents and students. ★

ENDNOTES

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APPENDIX: EXPLANATION OF CAMPUS SELECTION PROCESS

The purpose of our statistical analysis is to identify candidates for inclusion in the best practices study. Confirmation of best practices requires follow up surveys, interviews, and on site visits to determine that educational activities used at the campus result in improved student performance.

We believe that effective educational practices are those which consistently increase student academic performance. To qualify for the more in-depth study each campus must demonstrate student gains on math and science tests as well as consistently high test scores compared to campuses serving the same student subgroups. Because we also focus on increasing math and science participation for all students, we compute measures for each racial/ethnic group and for economically disadvantaged students. We use seven different tests for up to four years for these five student groups; in all we calculate 80 indicators of student success. Using the process described below we identify 51 campuses for inclusion in the best practices analysis.

All of the public high schools in Texas are candidates for the study. We use the TEA definition of high school, schools serving students in grades 7 or above and at least one grade 9 through 12. **Table 1** shows the number of Texas public high schools and the number of students by grade level. The best practices candidate pool includes 1,687 campuses, serving 1.2 million students. More than 91 percent of these students attend the 1,164 campuses with a traditional 9-12 grade configuration.

Table 1
Texas Public High Schools

<i>Grade Span</i>	<i>Students</i>	<i>Campuses</i>
07 - 10	419	16
07 - 11	655	34
07 - 12	28,040	178
08 - 10	88	16
08 - 11	2,001	20
08 - 12	3,729	34
09 - 09	18,645	49
09 - 10	13,037	23
09 - 11	10,218	25
09 - 12	1,119,479	1,164
10 - 10	22	19
10 - 11	32	10
10 - 12	16,471	46
11 - 11	192	11
11 - 12	10,559	26
12 - 12	194	16
	1,223,781	1,687

VALUE-ADDED ANALYSIS

The first step for identifying campuses for inclusion in the study uses data for ACT, SAT, AP math, TAKS math, AP science, TAKS science and ACT composite scores by student subgroup, shown in **Table 2**.

We combined these data with demographic data from the Academic Excellence Information System.

Regressions for each year, test and subgroup of students control for prior year results, percent of students with Limited English Proficiency, percent of economically disadvantaged students, percent of students taking the test, and the geographic area of the school district. Campuses are therefore compared with similar campuses, for example, all central city campuses with high poverty levels. The value added to student academic performance is computed by comparing actual results with expected results based on the regressions.

We assign a percent rank to each campus based on overall test rankings across all the tests administered by the campus. Because we do not know how many students were tested at each campus, we require that at least 20 percent of students at the campus are in the subgroup and that the campus adjusted gains ranked among the top 25 campuses on at least one of the tests. Based on the regressions, 87 campuses qualify in math and 86 in science. Fifty campuses made both lists; it appears that most campuses that increase student skills in math, based on these measures, also increase science skills.

CONSISTENT HIGH PERFORMANCE

To succeed in a technical career, students must have an adequate educational background in math and science. Best practices should result in not only student gains, but in high student skill levels.

To identify adequate student performance among schools, we consider the current year campus scores for each of the years, tests and subgroups. We first created lists of the top 25 campuses with at least 100 students with a minimum of 20 percent of these students in the ranked group: 413 campuses are on these lists. We then calculate the average percentage rank for each of these campuses across all of the tests and rank the campuses from highest to lowest combined rank.

SELECTED CAMPUSES

To make the final list and be eligible for further consideration, a campus has to qualify as both high value-added and high performing. Combining the value-added and the high performing lists, we have 51 candidates. **Table 3** shows the selected campuses, the number of times the campus achieved a top 25 performance list, whether the campus was a value-added math or science qualifier, and selected demographic characteristics for the campus.

Table 2
Number of Campuses by Measure, Group and Year

Measure	Group	2003	2004	2005	2006
ACT Composite	African American	297	303		
	Economic Disadvantage	497	535		
	Hispanic	460	486		
	Asian American	84	82		
	White	807	807		
ACT Math	African American	297	303		
	Economic Disadvantage	497	535		
	Hispanic	460	486		
	Asian American	84	82		
	White	807	807		
AP Math	African American	27	34		
	Economic Disadvantage	104	124		
	Hispanic	129	145		
	Asian American	94	96		
	White	298	319		
AP Science	African American	13	12		
	Economic Disadvantage	68	76		
	Hispanic	76	83		
	Asian American	75	78		
	White	252	259		
SAT Math	African American	332	342		
	Economic Disadvantage	472	515		
	Hispanic	468	491		
	Asian American	167	181		
	White	729	742		
TAKS Math	African American		632	634	642
	Economic Disadvantage		1,176	1,208	1,215
	Hispanic		994	1,014	1,046
	Asian American		234	236	249
	White		1,088	1,109	1,110
TAKS Science	African American		581	582	604
	Economic Disadvantage		1,111	1,144	1,172
	Hispanic		933	956	999
	Asian American		217	223	237
	White		1,024	1,042	1,059
Total		9,597	17,917	10,153	10,339

Table 3
Campuses Selected for the Best Practices Study

<i>Campus</i>	<i>District</i>	<i>Students</i>	<i>Top 25 Count</i>	<i>Math Value-Added</i>	<i>Science Value-Added</i>	<i>Percent LEP</i>	<i>Percent Economic</i>	<i>Percent White</i>	<i>Percent African-American</i>	<i>Percent Hispanic</i>	<i>Percent Asian</i>
DEBAKEY HS FOR HEALTH PROF	Houston ISD	710	42	Yes	Yes	0.0	46.5	6.1	35.8	25.6	32.1
WESTFIELD HS	Spring ISD	4,872	4	Yes	No	4.6	51.2	11.2	51.9	30.1	6.6
DULLES HS	Fort Bend ISD	2,478	19	No	Yes	2.8	14.5	39.9	18.2	10.4	31.4
CYPRESS FALLS HS	Cypress-Fairbanks ISD	3,378	4	Yes	Yes	4.6	19.8	46.3	15.5	26.0	12.1
BELLAIRE HS	Houston ISD	3,456	24	Yes	Yes	6.1	32.3	42.9	13.1	27.5	16.5
THE SCIENCE ACADEMY	South Texas ISD	640	39	Yes	Yes	0.6	36.4	22.2	0.9	65.6	10.9
HEALTH CAREERS HS	Northside ISD	828	38	Yes	Yes	0.1	23.1	33.9	4.8	43.5	17.5
NORTHBROOK HS	Spring Branch ISD	1,956	3	No	Yes	23.3	78.6	6.8	8.5	81.9	2.6
SCHOOL OF SCIENCE & ENG	Dallas ISD	383	30	Yes	No	0.0	44.4	27.7	24.0	43.6	3.9
RICHARDSON HS	Richardson ISD	2,184	9	Yes	Yes	12.3	34.1	39.7	20.9	32.5	6.5
KERR HS	Alief ISD	768	19	No	Yes	0.4	34.4	13.7	15.4	22.8	48.0
BERKNER HS	Richardson ISD	2,929	8	No	Yes	6.4	32.5	41.6	22.3	16.1	19.7
MARSHALL HS	Marshall ISD	1,734	1	Yes	Yes	2.7	44.4	46.6	39.7	12.9	0.7
SUNDOWN HS	Sundown ISD	148	10	Yes	No	2.0	31.1	57.4	0.7	41.9	0.0
JOHNSON HS	Austin ISD	1,666	21	Yes	Yes	8.2	48.9	28.9	29.2	35.1	6.5
DAVID W CARTER HS	Dallas ISD	1,872	2	Yes	No	4.4	55.4	0.5	88.8	10.5	0.1
SAMUEL CLEMENS HS	Schertz-Cibolo-University City ISD	1,726	3	Yes	Yes	1.1	18.4	61.3	12.9	22.9	2.6
EDINBURG NORTH HS	Edinburg CSD	2,184	5	Yes	Yes	14.1	84.8	4.0	0.3	95.5	0.1
WESTLAKE HS	Austin ISD	2,366	11	Yes	Yes	0.5	2.4	85.5	0.5	5.6	7.6
PLANO WEST SENIOR HS	Plano ISD	1,900	11	No	Yes	3.1	8.2	67.5	7.7	6.3	18.2
COOPER HS	Abilene ISD	1,898	1	Yes	No	0.1	38.1	63.6	13.7	20.4	1.9
EISENHOWER HS	Aldine ISD	2,307	3	No	Yes	8.1	60.7	2.9	51.1	41.4	4.5
CREEKVIEW HS	Carrollton-Farmers Branch ISD	2,171	5	Yes	No	4.1	25.0	48.7	10.6	21.8	18.3
MCCALLUM HS	Austin ISD	1,671	3	Yes	No	3.9	34.0	50.5	22.0	26.5	0.8
HIGHLAND PARK HS	Highland Park ISD	1,974	11	No	Yes	0.6	0.0	94.3	0.3	3.4	1.6
NEW BOSTON HS	New Boston ISD	413	7	No	Yes	0.0	30.0	76.3	20.8	1.2	0.2
SILVA HEALTH MAGNET	El Paso ISD	538	14	Yes	Yes	0.0	55.9	10.0	3.2	82.3	4.3
LAMAR HS	Houston ISD	3,072	2	No	Yes	7.1	46.0	42.1	25.4	26.8	5.5
TURNER HS	Carrollton-Farmers Branch ISD	2,014	3	No	Yes	15.3	56.0	22.5	4.8	65.8	6.6
ROBERT G COLE JR-SR HS	Fort Sam Houston ISD	478	8	No	Yes	1.0	27.6	45.8	31.8	17.8	4.0
THE WOODLANDS HS	Conroe ISD	3,819	5	No	Yes	1.2	3.4	84.9	2.8	8.7	3.1
MIDLAND HS	Midland ISD	2,010	8	Yes	Yes	4.0	30.9	48.8	8.7	41.1	0.6
MAYDE CREEK HS	Katy ISD	2,718	13	Yes	No	6.7	32.1	44.3	14.1	36.0	5.5
PLAINS HS	Plains ISD	121	5	No	Yes	9.1	58.7	42.1	0.0	57.9	0.0
HENDERSON HS	Henderson ISD	1,029	1	No	Yes	3.2	40.9	60.5	23.2	15.5	0.6
LIBERTY-EYLAU HS	Liberty-Eylau ISD	686	2	No	Yes	0.3	48.0	49.6	48.3	1.3	0.6
B.T. WASHINGTON HS	Houston ISD	1,155	9	Yes	Yes	2.6	73.2	2.3	80.2	16.8	0.7
KLEIN HS	Klein ISD	3,440	5	No	Yes	1.9	9.0	71.7	8.2	12.0	7.9

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<i>Campus</i>	<i>District</i>	<i>Students</i>	<i>Top 25 Count</i>	<i>Math Value-Added</i>	<i>Science Value-Added</i>	<i>Percent LEP</i>	<i>Percent Economic</i>	<i>Percent White</i>	<i>Percent African-American</i>	<i>Percent Hispanic</i>	<i>Percent Asian</i>
WESTSIDE HS	Houston ISD	3,047	15	Yes	Yes	4.3	43.4	33.2	31.7	25.6	9.3
WOODROW WILSON HS	Dallas ISD	1,456	3	No	Yes	19.7	55.7	18.7	12.6	66.4	1.1
MEMORIAL HS	Spring Branch ISD	2,297	14	Yes	Yes	4.4	11.7	73.3	1.3	14.4	10.9
EASTWOOD HS	Ysleta ISD	2,238	4	Yes	Yes	4.4	47.2	17.2	2.6	79.4	0.7
TAHOKA HS	Tahoka ISD	216	4	Yes	No	3.2	59.3	36.1	5.6	56.9	1.4
MADISON HS	North East ISD	3,129	8	Yes	Yes	0.9	26.9	45.1	11.4	40.4	2.7
MEMORIAL HS	McAllen ISD	1,955	2	Yes	No	19.6	65.3	9.5	0.6	88.0	1.9
JAY HS	Northside ISD	2,720	1	Yes	No	5.3	69.5	12.5	8.3	77.7	1.4
LEWISVILLE HS	Lewisville ISD	2,470	3	Yes	No	12.2	29.8	47.4	16.0	28.8	7.2
ROOSEVELT HS	North East ISD	2,423	5	Yes	Yes	3.4	53.5	25.2	26.0	44.8	3.7
MIDWAY HS	Midway ISD	1,928	2	No	Yes	0.5	12.7	76.5	8.6	11.0	3.5
PLANO EAST SR HS	Plano ISD	2,598	5	Yes	Yes	7.6	22.3	55.1	13.8	17.0	13.8
AUSTIN HS	Austin ISD	2,150	4	No	Yes	3.8	26.8	56.1	6.2	36.3	1.1

IMPROVING THE STUDY

The schools considered in this study are, by no means, the only candidates for best practices. The selection of candidate campuses was based on the data available at the time of the study and on the methodology that ranks campuses using value added gains and higher scores by student group and the test measures. Other approaches and using more detailed data would produce different, and more refined, sets of candidates that could add valuable insight into educational practices.

We have found that campus inclusion is quite sensitive to the choices of selection criteria. For example, we initially restricted the high scoring list to campuses that had at least 20 percent of students who were economically disadvantaged, inadvertently taking this measure from the assembled ACT files. This resulted in selection of 39 campuses. The 51 campuses in **Table 3** include the initial 39 campuses and 12 that were added when we no longer required campuses to have 20 percent economically disadvantaged students.

There are two principal methods that we would like to pursue to improve and enlarge the selection and analysis of best practices campuses: 1) Using other selection methods, and 2) Using individual student data, more years of data and student-teacher links.

Other Selection Methods

Except for excluding campuses with fewer than 20 percent of students, we have not experimented with alternative inclusion criteria. Changing other parameters, such as the percent of each subgroup required for the value added measure, restricting the high scores to some upper percentage of campuses, and removing all percentage restrictions might add information to select additional campuses.

Other models may also yield additional information for identification of best practice candidates. Perhaps graduation with an advanced diploma could be the dependent variable in regressions that control for each or a combination of test gains and average test scores. Counting or ranking could be done separately by test type or some other combination of tests. Although the selection process used in this study did employ all of the test results, ranking each school based on both value-added measures and campus average scores, we did not have more direct indicators of the results of best practices, such as whether students take the next steps toward careers in mathematics and science.

Improved Data

The principal way to improve selection of candidates for a best practices study would be to use student-level data, combine data across more years, and link students with their teachers.

Because student level scores on the tests were not available for this research, we used average test scores and percent of students in each student group at each campus. Test scores and gains are therefore measured for different cohorts of students, rather than for individual students over time. Individual student data would improve the accuracy of predictions and account for actual student characteristics.

Availability of more years of data would allow us to measure trends in campus improvements. Campuses could be selected using a growth model allowing us to select candidate campuses that show continuing progress in math and science over time.

Research shows that larger education impacts are attributable to teachers than campuses. Student-teacher links would allow the longitudinal study of the effectiveness of individual teachers and would place each student in classrooms with their peers. Identification of best practice classrooms and teachers could yield guidance for improving pedagogy, curriculum, classroom composition, and teacher training and preparation that most affect student gains.

While this study points to important characteristics that are associated with the selected campuses, we encourage other researchers to expand and improve upon its findings.

About the Author

Jamie Story joined the Texas Public Policy Foundation in September 2005 as an education policy analyst within the Center for Education Policy.

She previously served as an associate consultant in the Dallas office of Bain & Company, one of the top strategic management consulting firms in the world, helping many Fortune 500 companies to redefine strategy and realize greater efficiency.

Prior to joining the Foundation, Jamie completed her year of service as Miss Texas 2004, during which she spoke to public school students, educators, government leaders, and civic organizations.

Jamie holds a B.A. in Mathematical Economic Analysis and Sport Management from Rice University, where she spent hundreds of hours studying Title I schools in Houston ISD.

Jamie was born and raised in Bedford, Texas, and now resides in Austin.

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