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ABSTRACT

The seven High Schools That Work (HSTW) sites making the most progress in raising student achievement between 1990-1993 are changing the high school system and succeeding with a group of students often considered hopeless. They use the HSTW framework of key practices to improve curriculum and instruction. The specific HSTW goal is to close by one-third the gap in reading, mathematics, and science achievement between career-bound students and college preparatory students nationally. District and school leaders support the faculty in challenging students to develop academic and technical knowledge and skills. Teachers work to improve career-bound students' ability to communicate, to solve problems, and to become productive citizens. Leaders and teachers at these schools work together to create an environment in which high standards are upheld and high performance is expected of all students. Teachers make challenging and meaningful assignments and provide extra help as needed. They find that many career-bound students respond to higher standards by working harder to learn more complicated materials. Teachers are also discovering that many parents are eager to become partners with the school in planning their children's high school program of study. These schools use HSTW data to link school and instructional practices to improved student learning. Leaders and teachers at these schools are dissatisfied with the level of student learning and are constantly seeking ways to improve it. Teams of teachers and school leaders, joined in many instances by parents and community representatives, are focusing on needed changes in curriculum and instruction. (YLB)

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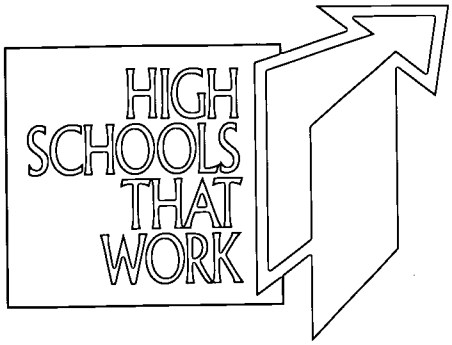

SCHOOL AND CLASSROOM PRACTICES
THAT ADVANCE THE PERFORMANCE
OF CAREER-BOUND HIGH SCHOOL STUDENTS

A REPORT ON IMPROVING STUDENT LEARNING

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Seven Most-Improved *High Schools That Work* Sites Raise Achievement in Reading, Mathematics, and Science

by Gene Bottoms and Pat Mikos

The Southern Regional Education Board's *High Schools That Work* program aims to make high performance count for all high school students. The program's primary goal is to improve the communication, mathematics, science, technical, and problem-solving skills of career-bound youth[1]—the large group of students enrolled in general and vocational studies.

High Schools That Work challenges students to work hard in their high school studies in preparation for the future. Schools in the program improve student performance by blending higher level academic studies and challenging career studies. Each *HSTW* site establishes a five-year goal of producing high school graduates who perform more like college preparatory students. The specific *High Schools That Work* goal is to close by one-third the gap in reading, mathematics, and science achievement between career-bound students and college preparatory students nationally.

Evidence continues to show that schools making major changes in organization, curriculum, and instruction can reach the *HSTW* goal. Schools making progress in preparing career-bound students are changing what and how students are taught, what is expected of them, how parents and the community support the effort, and how teachers work together in pursuing program goals.

This report focuses on seven *High Schools That Work* sites that made the most improvement in raising the achievement of career-bound students in reading, mathematics, and science between 1990 and 1993. It examines changes in practices at these schools and how they differ from practices at *HSTW* sites that did not perform as well on the 1993 tests. The findings are based on the *HSTW* Student Assessment, a series of tests taken by vocational completers[2] at participating schools. These tests are based on examinations included in the National Assessment of Educational Progress (NAEP).

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[1] The *High Schools That Work* program defines career-bound youth as high school students who plan to work, attend a two-year community college or vocational-technical school, participate in an apprenticeship program, or enter the military after high school graduation. Career-bound students are not planning to enter a four-year college or university but may make that decision at some future time.

[2] The *High Schools That Work* program defines a vocational completer as a student who completes at least four credits in an approved vocational area and takes three mathematics and three science courses. At least two of the courses in each category should be equal to the college preparatory level.

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The seven most-improved schools are not necessarily the highest achieving schools in the *HSTW* network. Instead, they are the schools that showed the most improvement in all three areas: reading, mathematics, and science. Student and teacher surveys, transcript information, and site visit reports reveal that these schools were also among those making considerable progress in implementing the *HSTW* Key Practices (see page 26). These practices provide a framework for teachers and administrators at *HSTW* sites as they make improved learning their first priority.

The seven most-improved schools include (in alphabetical order):

- **Central High School in Phenix City, Alabama**
- **Hickman County High School in Centerville, Tennessee;**
- **Hoke County High School in Raeford, North Carolina;**
- **Randolph County Vocational-Technical Center in Elkins, West Virginia;**
- **Sussex County Vocational-Technical School in Georgetown, Delaware;**
- **Swain County High School in Bryson City, North Carolina;**
- **Swansea High School in Swansea, South Carolina.**

Increasing the Achievement of Career-Bound Students

SREB's goal is to narrow by one-third the achievement gap between career-bound students at *High Schools That Work* sites and college preparatory students nationally. This goal includes target achievement scores of 55.1 in reading, 301 in mathematics, and 280.7 in science. Students who reach these goals can read and interpret fairly complex materials, solve multi-step mathematics problems using algebra and geometry concepts, and understand physical science concepts. Between 1990 and 1993, the seven most-improved schools closed the gap between their career-bound students and the *HSTW* goal by 65 percent in reading, 36 percent in mathematics, and 70 percent in science (see Table 1).

Table 1
Progress of the Seven Most-Improved Schools Toward *HSTW* Goals in Reading, Mathematics, and Science Between 1990 and 1993

HSTW Student Assessment Scores

	Reading	Mathematics	Science
HSTW Goal	55.5	301.0	280.7
1993 Score	54.0	291.7	273.7
1990 Score	51.2	286.5	257.0
Percent Improvement toward goal	65 %	36 %	70 %

Note: Scores are taken from the *HSTW* Student Assessment administered to vocational completers at the seven schools in 1990 and 1993. The assessment is based on the National Assessment of Educational Progress (NAEP). The differences in scores between 1990 and 1993 are statistically significant.

In 1990, career-bound seniors at the seven schools scored higher in reading, but lower in mathematics and science, than the student average at all *HSTW* sites. By 1993, however, students at these seven schools scored significantly higher than students at other *HSTW* sites in all three areas: reading, mathematics, and science (see Table 2).

Progress at these seven schools is even more impressive considering the socioeconomic background of the students. (In education, low performance in reading, mathematics, and science is routinely associated with having large numbers of students from minority and low-income families.) These schools made tremendous gains with the type of students that too many high schools use as an excuse for not improving.

Table 2

Comparison of Average Achievement Scores of Students at the Seven Most-Improved Schools and at All *HSTW* Sites in 1993

	Reading Score	Mathematics Score	Science Score
All *HSTW* Sites	50.8	281.4	253.6
Seven Most-Improved Schools	54.0	291.7	273.7
HSTW Goal	55.5	301.0	280.7

Note: The differences in average achievement are statistically significant at the .01 level for mathematics and science and at the .05 level for reading.

Students at the most-improved schools often came from families with low levels of income and education. Parents of these students completed fewer years of formal education than parents of students at other *HSTW* sites. These schools also had a much higher percent of minority students in comparison to all *HSTW* sites. In both 1990 and 1993, these schools had at least 10 percent more minority students (see Table 3). The most-improved schools are demonstrating that students can achieve if teachers, counselors, students, and parents make it their business to improve teaching and learning.

Table 3

Comparison of Demographic Characteristics of Students at All *HSTW* Sites and at the Seven Most-Improved Sites

	All *HSTW* Sites		Most-Improved *HSTW* Sites	
	1990	1993	1990	1993
Race/Ethnicity				
White	72%	69%	61%	59% *
Minority	24%	31%	38%	41% *
Parental Education				
College	21%	23%	20%	19%
> High School	23%	26%	23%	25%
High School	39%	36%	38%	37%
< High School	13%	13%	15%	18%

Note: Racial/ethnic minorities include African-Americans, Hispanics, Native Americans, and Asians.

* The percent of minority students is weighted to reflect changes in the sample size for the most-improved sites between 1990 and 1993.

The seven most-improved schools vary in location, size, student characteristics, and types of programs offered. One school belongs to the nation's 10th largest school district, four schools have fewer than 1,000 students, two have between 1,000 and 1,500, and one has over 1,500. Five of the seven sites are racially and ethnically diverse, enrolling a minority student population of 24 to 56 percent. Five of the schools are comprehensive high schools, one is a technical high school, and the seventh is a high school working with an area vocational center.

All of the schools have active advisory committees and offer in-depth vocational studies. Even though they are different, they have all made progress in carrying out the *HSTW* key practices. Student and teacher surveys, transcript reports, and site visit reports reveal that these schools are continuously changing school and classroom practices.

School and Classroom Practices Improve Student Learning

How did these schools improve the learning of career-bound students? A comparison of data from 1990 and 1993 reveals that these schools made progress by:

- Providing a support system for academic and vocational teachers in implementing improved school and instructional practices;
- Expecting more from their students, including getting more career-bound students to complete an upgraded academic core and a career major;
- Making learning meaningful by integrating academic and vocational studies;
- Setting high standards and getting students to work hard to meet them, including providing a system of extra help and time;
- Getting students to complete challenging and engaging classroom assignments;
- Creating a guidance and advisement system that involves teachers and parents in helping students plan and pursue a challenging and focused program of study.

In the following pages, we will examine these successful strategies and will provide examples of how the seven most-improved schools are using them to raise student achievement.

Successful High Schools Provide a Support System for Implementing Improved School and Instructional Practices

System and school leaders at the seven most-improved schools played a vital leadership role in creating and supporting change. They focused the entire school on the vision of *High Schools That Work* and created an environment for positive change by using resources to support teachers in making changes. Their actions included:

- Participating with their teachers in staff development conferences and visits to other schools;
- Meeting with teachers to devise ways to put new information to work at school and in the classroom;
- Examining student achievement data and agreeing that students could learn more;
- Organizing teacher study teams, giving them time to address identified problems, and providing them with resources for implementing solutions;
- Involving a steadily increasing number of teachers in the improvement effort;
- Giving teachers new applied learning materials;
- Giving teachers time to plan together;
- Providing opportunities for teachers to visit other schools and classrooms.

Leaders at these schools promoted the concept of continuous improvement by regularly assessing what was and was not working and by introducing new ways to raise student achievement.

The following examples are but two of the ways system and school leaders supported teachers in making changes at these schools:

- A group of three administrators and 12 teachers at Sussex Technical High School in Delaware made the initial recommendation to increase high school graduation requirements in the district. The plan was approved by the faculty at a three-day retreat and by the local school board a few weeks later. Sussex also discarded the traditional 50-minute class schedule in favor of a new odd/even schedule with large blocks of time. This gives teachers more time to develop and use innovative instructional methods such as hands-on learning activities, long-term projects, and integrated lessons.
- Randolph County Vocational-Technical Center in West Virginia introduced a number of staff development opportunities to help teachers improve student learning. The center engaged a specialist to assist vocational teachers in incorporating more mathematics and reading into their courses, and several vocational teachers enrolled in a technical mathematics course at the University of West Virginia. The center sponsors a summer academy during which academic and vocational teachers develop ways to motivate students and involve them in higher-level learning. Teachers have time at faculty meetings to share their successful strategies.

Successful Schools Expect More from Their Students

The seven most-improved schools raised career-bound students' expectations by getting more of them to complete an upgraded academic core and a challenging career major. These schools succeeded in enrolling more students in the *HSTW* recommended curriculum which calls for:

- At least four English credits in courses with content equal to that of college preparatory English;
- At least three credits each in mathematics and science, with two credits in each subject from courses with content equal to that of college prep mathematics and science courses. The program of study should include science in the 11th or 12th grade and mathematics in the senior year;
- At least four credits in a planned vocational major;
- At least two credits in related vocational or technical fields, including one-half credit in a basic computer course.

Schools making the most progress in raising student achievement are not simply erasing the general track. Instead, they are replacing it with a solid academic core and a challenging career major. Their efforts are based on the belief that most students can master essential content from the college preparatory program of study.

Between 1990 and 1993, the seven most-improved schools significantly increased the percent of students completing college preparatory-level courses (see Table 4). The rate of completion increased five percent in English, 11 percent in mathematics, and 10 percent in science. Even though more career-bound students in 1990 than in 1993 took more rigorous course work, these schools were able to substantially increase students' reading and science achievement and maintain their mathematics achievement. The most-improved schools raised performance standards in English and mathematics during the three-year period and got more career-bound students to meet them. As a result, the average scores of students completing SREB's recommended English, mathematics, and science curriculum equaled or exceeded the *HSTW* achievement goals in those areas.

New *HSTW* sites[3] did not enroll as many career-bound students in high-level English, mathematics, and science courses, and their students' scores were lower than those of students at the most-improved schools (see Table 4). Eight percent more students at these schools completed an upgraded mathematics core, and 17 percent more completed an upgraded science core.

One most-improved school serves as a good example of a school that met the SREB goal of enrolling more career-bound students in an upgraded academic core while maintaining or increasing student achievement (see Table 5). The percent of students who took SREB's recommended core of advanced courses at this school increased from 78 percent to 89 percent in English, from 39 percent to 51 percent in mathematics, and from 30 percent to 51 percent in science.

[3] New *HSTW* sites are schools that participated in the *HSTW* Student Assessment for the first time in 1993.

Table 4

Comparison of Percent and Average Scores of Vocational Completers Completing SREB's Recommended Curriculum at New *HSTW* Sites in 1993 and at Most-Improved Schools in 1990 and 1993

Students Completing SREB's Recommended Curriculum	New Sites	Most-Improved Sites		
	1993	1990	1993	SREB Goal
English				
Percent	67%	64%	69%	–
Score	52.3	53.7	56.1	55.5
Math				
Percent	39%	36%	47%	–
Score	294.1	302.8	300.7	301.0
Science				
Percent	30%	37%	47%	–
Score	268.2	281.6	286.4	280.7
Vocational Majors				
Percent	70%	63%	67%	90%

Some vocational educators may say, "Yes, these students take more mathematics and science courses, but they do it at the expense of vocational courses." This is not true. Career-bound students attending the seven most-improved schools complete challenging academic courses as well as a vocational major.

In 1990, career-bound students at these schools averaged six vocational credits. By 1993, the number had increased to 6.6 credits. The percent of students who completed four credits in a planned career major increased from 63 percent to 67 percent without affecting the number of academic credits completed. In fact, career-bound students at these schools averaged 24.5 credits in 1993, an increase of almost one full credit over the 23.6 credits earned by career-bound students in 1990.

Comparing a most-improved school and a new *HSTW* site demonstrates the benefits of blending high-level academic and challenging career studies (see Table 6). The two schools in this example are similar in size (approximately 1,300 students each) and demographics. The most-improved school has 48 percent minority students, while the new site has 52 percent. But the similarity ends there. Major differences in achievement exist between students at the most-improved school and at the new school. The gaps are over five points in reading, almost 14 points in mathematics, and over 30 points in science.

Table 5

Comparison of Percent and Average Scores of Students Completing SREB's Recommended Curriculum in English, Mathematics, and Science at a Most-Improved School in 1990 and 1993

	Percent of Students Completing a Core of Advanced Courses		*HSTW* Student Assessment Scores	
	1990	1993	1990	1993
English	78%	89%	55.2	57.5
Mathematics	39%	51%	303.0	302.6
Science	30%	51%	294.2	294.7

Why did one school outperform the other? The reason may lie in the level of academic courses and the depth and focus of vocational courses taken. Ninety-seven percent of career-bound students at the most-improved school completed a challenging, in-depth career major, compared to only 51 percent at the new site (see Table 7). Students at the new site earned an average of six vocational credits, including a number of unrelated low-level courses. In comparison, students at the most-improved school earned an average of eight vocational credits. Students at the most-improved school have access to a guidance and advisement system that helps them choose and pursue a solid program of career studies.

Each school classified about 130 seniors as vocational completers (completing four or more courses in a vocational major) in 1993. No students at the new site (compared to 15 percent at the most-improved site) completed SREB's recommended academic and voca-

Table 6

Comparison of Average Student Achievement Scores in 1993 at Two *HSTW* Sites with Similar Demographics

	Percent Minority	Reading Score	Mathematics Score	Science Score
Students at a Most-Improved Site	48%	52.7	290.3	264.0
Students at a New *HSTW* Site	52%	47.7	276.4	233.7

Note: The difference in reading scores is statistically significant at the .05 level. The differences in mathematics and science scores are significant at the .01 level.

Table 7
Comparison of Course-Taking Patterns at Two *HSTW* Sites with Similar Demographics

	New *HSTW* Site	Most-Improved Site
Percent of students who:		
Completed a career major	51%	97%
Met the SREB recommended curriculum	0%	15%
Took college preparatory level English courses	0%	50%
Took college preparatory level mathematics courses	1%	35%
Took college preparatory level science courses	3%	32%

tional curriculum. The contrast in course-taking patterns at the two schools is dramatic. Only a few students at the new site, compared to from one-third to one-half at the most-improved site, took college preparatory English, mathematics, and science.

Experience with the *High Schools That Work* program is helping SREB build a strong case for the role of high expectations and rigorous course work in raising the achievement of career-bound students. Two most-improved schools provide examples of ways to raise students' expectations and performance:

- Sussex Technical High School in Delaware redesigned and refocused its vocational courses to keep pace with the demands of business and industry for better-skilled employees. (The new curriculum includes an upgraded academic core.) Beginning in ninth grade, all students take an Introduction to Technology course. The course includes six labs in which students examine the technology and career paths of six broad occupational fields. Each student selects a field, such as construction or office technology, to study in grades 10 through 12. In addition to a two-period technical specialization, all students in grades 10 through 12 enroll in two semester-length related technical courses per year.

- Career-bound students at Central High School in Alabama complete a challenging program of study consisting of a sequence of mathematics, science, language arts, and vocational courses. The program includes three years of mathematics, two of which are equivalent to Algebra I or higher, and three years of science, including two courses at the lab science level. Vocational teachers work with mathematics, science, and English teachers to help students make connections between complex academic concepts and real-life situations.

Successful Schools Make Learning Meaningful by Integrating Academic and Vocational Studies

The seven most-improved schools expanded their efforts to integrate academic and vocational studies. These sites answered the question, "Why do I need this?" by enabling career-bound students in advanced level courses to apply academic content and skills to work-related problems and tasks. *High Schools That Work* is based on the belief that students understand and retain academic concepts more readily if they use them in completing projects for their vocational courses.

HSTW student survey data and technical assistance reports reveal that the most-improved schools made their vocational courses more challenging and placed greater emphasis on getting students to use academic content and skills in vocational studies. More students at these schools in 1993 than in 1990 reported that their vocational teachers often stressed reading, mathematics, and science (see Table 8). Vocational labs at these schools are places where students can apply their reading, mathematics, and science skills.

Table 8

Percent of Students at the Seven Most-Improved Schools Who Said Their Vocational Teachers Often Stressed Reading, Mathematics, and Science Concepts

	1990	1993
Students said vocational teachers often stressed:		
Reading	46%	55%
Mathematics	54%	64%
Science	26%	39%

More students in these schools read technical materials, solve mathematics problems related to their vocational studies, and complete projects assigned jointly by their vocational and academic teachers. A much higher percent of students at the most-improved schools, compared to students at new *HSTW* sites, said their vocational teachers often stress reading, writing, mathematics, and science (see Table 9).

The vocational curriculum's potential for advancing the academic achievement of career-bound youth is often underrated. Vocational teachers who concentrate on vocational skills only, while expecting others to teach academic skills, are short-changing their students.

Table 9

Percent of Students at New and at Most-Improved *HSTW* Sites in 1993 Who Said Vocational Teachers Emphasized Academic Content and Skills

	New *HSTW* Sites	Most-Improved Sites
Students said vocational teachers often stressed:		
Reading	42%	55%
Writing	39%	50%
Mathematics	50%	64%
Science	23%	39%

Academic teachers at the most-improved schools use applied learning strategies to teach mathematics, science, and English to career-bound students. (In applied learning, students practice using academic concepts in a real-world context.) All seven schools use applied learning materials developed by the Center for Occupational Research and Development (CORD) in Waco, Texas as stand-alone courses or as part of regular college preparatory mathematics and science courses.

Table 10

Percent of Students at New and at Most-Improved *HSTW* Sites in 1993 Who Said Their Teachers Related Academic Content to Real-World Applications

	New *HSTW* Sites	Most-Improved Sites
Students reported that:		
Teachers related academic content to the real world;	67%	75%
Students used mathematics to solve work-related problems more than twice a year;	43%	51%
Teachers related science to the real world weekly.	70%	78%

CORD's Applied Math course includes the algebra, geometry, trigonometry, and statistics concepts most needed in the modern workplace. Principles of Technology (applied physics) and Applied Biology-Chemistry put college preparatory-level science concepts into a work-related context. Some schools offer ChemCom, an applied chemistry course developed by the American Chemical Society. In addition, some schools improve their language arts courses with instructional strategies from the Applied Communication curriculum developed by the Agency for Instructional Technology (AIT).

According to the 1993 *HSTW* Student Survey, more students at the most-improved schools than at new *HSTW* sites believe their mathematics, science, and English teachers relate academic content to real-world situations (see Table 10).

Reports indicate that system and school leaders at the most-improved schools are providing time for academic and vocational teachers to meet together to develop integrated teaching strategies. During the school year and the summer, teachers at these schools develop projects that students complete for credit in academic as well as vocational classes.

Most-improved schools use a variety of integration approaches. The following examples are representative of this group of schools:

- Integrated learning at Hoke County High School in North Carolina began with a core group of teachers that grew to include over 90 percent of the faculty. Teachers developed a curriculum alignment guidebook that identified shared objectives across academic and vocational studies. They also participated in a school contest aimed at creating integrated learning projects. In one four-week project, the textiles teacher links his class with the English department and the community. Students interview and write reports on classroom guest speakers. An English teacher grades the reports for writing skills, and the textiles teacher grades them for content. In another project, students solve mathematics problems related to the textiles industry.

- At Swain County High School in North Carolina, a group of academic and vocational teachers combined applied academic courses with vocational courses. They designed teaching units, established labs, ordered materials, and used team teaching to blend Applied Biology-Chemistry with health occupations, Applied Math with auto technology, and Applied Communication with business studies.

Successful Schools Set High Standards and Get Students to Work Hard

Schools making the most progress in *High Schools That Work* motivate students by establishing higher standards and getting students to work harder and longer to meet them. At most American high schools, time is fixed and standards are flexible. *HSTW*'s most-improved schools reverse the process by setting high standards and providing extra time and help for students to meet them.

Some *HSTW* sites make Algebra I available to all students but teach it at several levels of difficulty. This is evident in a comparison of mathematics courses taken at a most-improved school and at a *HSTW* site with a similar student population (see Table 11). Although 50 percent of career-bound students at each school took three years of mathematics (including two years at the level of Algebra I or higher), their mathematics achievement varied greatly. Students at the lower achieving school averaged 281.8 in mathematics achievement, a score 20 points below the *HSTW* goal and over 27 points less than the average score at the most-improved school.

What made the difference? The higher achieving school holds all students to high standards, but the lower achieving school offers at least three levels of Algebra I and geometry. Many schools routinely place career-bound students in classes with low standards. As a result, many students take courses that have the right labels but lack the needed content.

Table 11
Comparison of Mathematics Achievement by Students of Similar Socioeconomic Backgrounds Who Took Advanced Mathematics Courses at a Most-Improved School and at a Similar *HSTW* Site

	Most-Improved School	Similar *HSTW* Site
Percent of Students Who Completed Advanced Mathematics	50%	50%
HSTW Student Assessment Mathematics Score	308.9	281.8
SREB Mathematics Goal	301.0	301.0

Most-improved schools expect more of their students than do new *HSTW* sites (see Table 12). Significantly more students at these schools said most of their courses were challenging and exciting. Students reported that their teachers and counselors encouraged them to enroll in mathematics and science and that they took mathematics and science in the senior year.

Table 12
Comparison of Student Experiences with Courses at New and at Most-Improved *HSTW* Sites

	New *HSTW* Sites	Most-Improved Sites
Percent of students reporting that:		
Most courses were challenging and exciting;	54%	70%
They were encouraged to take mathematics and science;	46%	67%
They took mathematics in the senior year;	40%	50%
They took science in the senior year.	30%	37%

Making the effort to enroll more career-bound students in higher level courses is an effective strategy at most-improved schools. In 1993, a larger percent of career-bound students at these schools reported:

- Taking four years of mathematics and science;
- Taking Algebra II, geometry, Applied Mathematics, and chemistry.

Not only did more of them take advanced academic courses taught at a higher level, but career-bound students at these schools significantly outperformed students from other *HSTW* sites on the same mathematics and science tests (see Table 13). This refutes the argument that test scores will decline if more career-bound students take more challenging courses.

Successful schools enroll more students in challenging academic courses and teach those courses to higher standards. Students from the seven most-improved schools who completed selected academic courses had significantly higher mathematics and science achievement scores than did students from all *HSTW* sites in 1993 (see Table 13).

The lesson to other high schools is to enroll more career-bound students in higher level mathematics and science courses such as Algebra II and lab chemistry and to teach them to high standards as a way to improve student achievement.

Homework is one strategy used by most-improved schools to get students to work harder and longer to meet high standards. Fifty-six percent of students from most-improved schools average an hour or more of homework a day, compared to only 40 percent at new *HSTW* sites. Fifty-one percent of students report completing weekly homework assignments from their vocational teachers, compared to 34 percent of students from new *HSTW* sites. Teachers at most-improved schools not only get students to do more homework, but they

Table 13

Comparison of Mathematics and Science Course-Taking Patterns of Career-Bound Students at Most-Improved Schools and at All *HSTW* Sites

	Most-Improved Schools		All *HSTW* Sites
	1990	1993	1993
Percent and average achievement scores of students who:			
Took four or more full-year courses in mathematics	32% 294.1	40% 299.1	28% 289.8
Took four or more full-year courses in science	17% 282.4	26% 292.6	15% 267.7
Took Algebra II	38% 299.0	47% 302.8	39% 294.4
Took geometry	41% 301.1	53% 300.9	49% 292.2
Took Applied Mathematics	14% 280.6	23% 288.0	22% 274.4
Took chemistry (lab science)	32% 280.8	39% 288.1	31% 267.2

Note: All differences in average scores between most-improved sites and all sites in 1993 are significant at the .01 level.

assign nontraditional homework such as projects, joint assignments, and classroom presentations.

Schools that make gains in student achievement do more than enroll students in college preparatory level courses, hold them to high standards, and get them to work harder and longer. They give students extra help and time to meet more demanding requirements.

One most-improved school took a number of actions between 1990 and 1993 to expand extra help for students in mathematics courses. Students at this school received extra help from tutors and resource teachers, mathematics and vocational teachers, and family members. These factors helped improve the average mathematics achievement of career-bound students (see Table 14). Successful schools understand that many career-bound students need extra help and time to meet the requirements of higher level mathematics courses.

English and vocational teachers at a school making outstanding gains between 1990 and 1993 accelerated their efforts to get career-bound students to read content materials (see Table 15). More students in 1993 than in 1990 (66 percent compared to 50 percent) reported getting help from their families. Leaders at most-improved schools find ways to involve parents in supporting their children in high school studies.

Table 14
Sources of Extra Help in Mathematics at a Most-Improved School

	1990	1993
Percent of students who received help from:		
Family	48%	58%
Mathematics Teacher	60%	73%
Vocational Teacher	21%	37%
Resource Teacher	3%	11%
Tutor	8%	17%
HSTW Student Assessment Mathematics Score	285.3	291.1

The seven most-improved schools provide a comprehensive system of extra help and time to assist students in meeting higher standards. Students, teachers, and parents at these schools do not accept lower standards. Instead, they constantly improve the extra-help system.

Students at most-improved schools received more help in reading and mathematics from family members, English teachers, mathematics teachers, and vocational teachers than their counterparts at all *HSTW* sites (see Table 16). They also had more access to resource teachers and special tutors. Leaders of improving schools make it possible for teachers to assist students before and after school, on weekends, and during the summer.

Table 15
Comparison of Sources of Extra Help in Reading at a Most-Improved School in 1990 and 1993

	1990	1993
Percent of students who received help from:		
Family	50%	66%
English Teacher	50%	57%
Vocational Teacher	25%	37%
Average *HSTW* Student Assessment reading score	53.8	57.5

Table 16
Comparison of Sources of Extra Help in Reading and Mathematics at the Seven Most-Improved Schools and at All *HSTW* Sites

	All *HSTW* Sites	Most-Improved Schools
Percent of students who received help from:		
Family	41%	48%
English Teacher	39%	50%
Mathematics Teacher	66%	73%
Vocational Teacher	20%	30%
Resource Teacher	9%	15%
Tutor	13%	17%

In setting high standards and getting students to work hard, the most-improved schools used a number of approaches. They include:

- Randolph County Vocational-Technical Center in West Virginia eliminated all low-level mathematics courses. Now, Applied Math I and Algebra I are the lowest levels offered. School leaders also made changes in the curriculum to require students to complete more higher level science courses. Vocational teachers increased their emphasis on reading, writing, mathematics, and science. Also, academic teachers began using vocational laboratories to demonstrate concepts and applications. Students at the center reported spending one to two hours a day on meaningful homework assignments.

- Academic teachers at Hoke County High School in North Carolina use applied instructional techniques and encourage career-bound students to take higher level academic courses. Vocational teachers help students see the need for complex mathematics, science, and language arts skills in business and industry and urge students to obtain them. Students majoring in vocational subjects at this school are required to write something every day. The majority of career-bound students are taking three years of mathematics and science courses at the college preparatory level.

- Agriculture, English, and science teachers at Swain County High School in North Carolina use joint learning projects to get students to exert more effort in mastering complex academic concepts. Using teacher release time, the instructors meet regularly to plan ways to emphasize academic concepts in agriculture classes. Students complete projects related to all three subject areas: agriculture, chemistry, and English. The projects require them to read and discuss technical materials and to prepare written reports that must meet the English teacher's standards. Students receive grades in all three courses.

Successful Schools Get Students to Complete Challenging and Engaging Classroom Assignments

Schools that do the best job of raising career-bound students' achievement give them challenging and engaging classroom assignments. More teachers at these schools understand that students learn more if they are actively engaged in the process. Information from the *High Schools That Work* program reveals that students achieve at a higher level if they are required to simulate and use information, manipulate abstract concepts, perform complex calculations, and solve practical problems. Students also make more gains if they use technology in their studies. The most-improved schools emphasize the use of computers and other technology in mathematics, science, and English courses.

A larger percent of students at the most-improved schools than at new *HSTW* sites said English teachers engaged them in challenging assignments. More students were required to make oral presentations, state and defend opinions, compare ideas, write research papers, and read books outside of class (see Table 17).

The message is clear: One way to improve the reading, writing, and oral communication skills of career-bound youth is to increase the amount of time spent doing challenging assignments. Even though this approach is relatively easy to implement, many high schools allow students to graduate who have never read a variety of books and materials, organized information into well-written reports, or made well-prepared oral presentations.

Table 17

Comparison of Percent of Students Reporting Engaging Instructional Experiences in English Classes at New *HSTW* Sites and at Most-Improved Schools in 1993

	New *HSTW* Sites	Most-Improved *HSTW* Sites
Percent of students who reported that:		
They made more than two oral presentations annually;	32%	39%
Teachers usually asked for their opinions;	31%	41%
Teachers usually asked them to compare ideas;	23%	31%
They wrote research papers twice a year;	19%	23%
They read at least two books yearly outside of class.	21%	26%

More students at most-improved schools than at other *HSTW* sites participated in engaging assignments in mathematics classes. A higher percent of students at the most-improved schools completed more than two major mathematics projects a year, participated in a mathematics lab at least once a month, used mathematics to solve work-related problems, used computers to do mathematics assignments, made oral presentations of completed mathematics projects, and worked in small groups at least once a week (see Table 18). Mathematics teachers at successful schools understand that career-bound students learn more by using mathematics to solve real problems and to complete real tasks. These teachers do not abandon all classroom drills, but they devote more time to preparing students to use mathematics concepts in a variety of real-life situations.

Table 18

Comparison of Percent of Students Reporting Engaging Instructional Experiences in Mathematics Classes at All *HSTW* Sites and at Most-Improved Schools in 1993

	Most-Improved Schools	All *HSTW* Sites
Percent of students who said they:		
Presented a mathematics project in class more than twice a year;	11%	6%
Worked in small groups once a week;	45%	41%
Used a computer to do mathematics assignments more than twice a year;	26%	17%
Completed mathematics projects more than twice a year;	23%	17%
Worked in a mathematics lab once a month.	20%	10%

Science teachers in successful schools involve career-bound students more actively in completing lab projects and in reading, writing, and discussing science principles and concepts. More students at most-improved schools than at new *HSTW* sites said science teachers required them to read books and articles, write reports, and make classroom presentations on completed projects (see Table 19). More students at these schools use equipment such as stethoscopes, electricity meters, and barometers in science labs. These schools demonstrate that the way to improve science instruction is to actively engage students in completing projects and reflecting on what they learned.

Table 19

Comparison of Percent of Students Reporting Engaging Instructional Experiences in Science Classes at New *HSTW* Sites and at Most-Improved Schools in 1993

	New *HSTW* Sites	Most-Improved Schools
Percent of students who said they:		
Made an oral presentation as part of a science project;	33%	41%
Read a book or article on science more than twice annually;	30%	33%
Wrote a science report once a year;	36%	43%
Used a stethoscope;	69%	78%
Worked in science lab weekly;	39%	47%
Used an electricity meter;	43%	48%
Used a barometer.	49%	58%

Teachers at the most-improved schools use a variety of challenging assignments, short- and long-term projects, and other methods to engage students in learning. They include:

- Swansea High School in South Carolina requires senior students in applied communication classes to complete a major interdisciplinary learning project. Each senior selects a research topic in January and spends at least three months exploring the topic, preparing a written report, and developing a product associated with the topic. The students make oral presentations on their projects in a formal, public setting. A committee establishes parameters and provides guidance to the students in completing the projects. The committee includes academic and vocational teachers from the high school and a postsecondary institution and representatives of business and industry.

- Business education students at Central High School in Alabama meet high standards and engage in realistic business experiences. They work on interdisciplinary assignments, complete projects for employers, and write term papers. They also have opportunities to participate in work-based learning at business, professional, and government offices. Challenging assignments require students to use reading, written and oral communication, and mathematics. In one project, students used desktop publishing software to create a brochure, postcard, and business card for a fictitious company. The products were displayed throughout the school and were placed in students' portfolios. Business students also write term papers which are graded by an English teacher for content and a business teacher for format.

Successful High Schools Have a System of Guidance and Advisement

The *High Schools That Work* sites that made the most improvement in raising student achievement offer a guidance and advisement system to help students plan and pursue a challenging program of study. Teachers and parents participate actively in the process by helping students choose courses and understand the importance of a demanding program.

By involving parents early in the planning process, these schools are able to strengthen connections between high school experiences and students' goals for the future. They are also able to raise student achievement. Students who see high school as a bridge to employment and further education, rather than just a place to hang out, are more likely to want to learn. An effective guidance and advisement system is essential in achieving the *HSTW* goals.

These schools are moving toward helping every student plan a four-year program of study developed in consultation with parents, teachers, and counselors. Sixty-seven percent of students at these schools, compared to 52 percent at all *HSTW* sites, said they received help in developing a four-year plan (see Table 20). Seventy-six percent reported that they reviewed their plans with a teacher or counselor annually, compared to 62 percent at all *HSTW* sites. More students at the most-improved schools receive help in developing programs of study by the end of ninth grade. As a result, more career-bound seniors from these schools are planning to pursue some form of education beyond high school.

Table 20
Comparison of Guidance and Advisement Services Reported by Students at New *HSTW* Sites and at Most-Improved Schools in 1993

	New *HSTW* Sites	Most-Improved Schools
Percent of students who said:		
They had help with a four-year plan;	52%	67%
A teacher or counselor reviewed the plan annually;	62%	76%
They received most help by grade 9;	46%	51%
They planned to pursue education after high school.	53%	60%

The most-improved school with the highest achievement enrolls a large proportion of students from low-income families. Yet, 94 percent of students at this school said they received help from a counselor or teacher in developing a four-year plan (see Table 21). Thirty-two percent said their parents participated in an individual planning meeting, compared to only 19 percent at other *HSTW* sites. Ninety-nine percent said they reviewed their plans annually with a counselor or a teacher advisor. To improve student learning, high schools need to develop a guidance and advisement system that involves parents, teachers, and counselors in helping students plan accelerated programs of study.

Table 21

Comparison of Guidance and Advisement Services Reported by Students at a Most-Improved School and at New *HSTW* Sites

	New *HSTW* Sites	Most-Improved School
Percent of students who said:		
A teacher or counselor helped them develop a four-year plan;	39%	94%
They met with their parents and a counselor to plan a program of study;	19%	32%
A teacher or counselor reviewed the plan annually;	62%	99%
They received the most help by grade 9.	46%	79%

Educational and career guidance often begins in middle school. In fact, 79 percent of students at the most-improved schools said they received the most help by grade 9. The intent is not to force students to make narrow choices. Rather, the purpose is to help all students choose a learning pathway that will prepare them for further learning in either a postsecondary or a work setting.

These guidance strategies have been effective at most-improved schools:

- Hickman County High School in Tennessee has a comprehensive educational and career planning program. All students in grades K through 8 spend classroom time each year in career awareness and exploration. Eighth-graders take an interest/aptitude inventory in the fall, and ninth-graders participate in computerized career exploration. Tenth-grade students take a career planning test and spend two days in career exploration. Eleventh-graders complete the Armed Services Vocational Aptitude test in addition to two days of career exploration. All juniors and seniors have an opportunity to talk with representa-

tives of colleges, universities, and vocational/technical schools during the school's annual College Day. During the summer, all incoming ninth-graders and their parents meet with a team of counselors and teachers to discuss career and educational plans and to formulate a tentative four-year program of study. Guidance counselors make appointments in the spring to help all students in grades 9 through 11 update their plans and choose courses for the coming year. The school schedules 30 minutes a day for students to meet with teachers during an advisory period. Each teacher serves as an advisor to a group of approximately 18 students.

- The guidance counselor at Randolph County Vocational-Technical Center in West Virginia works closely with the high school counselor to make sure students attending the center take an accelerated sequence of mathematics and science courses, including a high-level math or science course during the senior year. Each student keeps a Career and Educational Planning folder which serves as a blueprint for four years of high school study. (The folder can be adapted if students' interests and goals change.) The folder has four sections. Section I is devoted to "Facts About Me," helping students learn about themselves. Section II deals with career clusters and specific jobs within each cluster. Students are encouraged to set several career goals to keep their options open. Section III helps students identify educational requirements for specific jobs. In Section IV, a student's four-year plan is outlined. The plan calls for an understanding of various certificates of achievement offered in the county. The folder enables students to see how changes in their goals and aspirations affect their educational plans. It is reviewed each spring and revised as needed.

- Swain County High School in North Carolina has a multi-faceted program to involve parents and students in formulating four-year plans. Counselors, administrators, and teachers sponsor an open house for eighth-graders and their parents to develop individualized plans; counselors review plans with students twice a year; counselors and administrators publicize the planning process in literature, letters, newspapers, and at school; and teachers use the DISCOVER program in grades 9 through 12 to increase career awareness. The school involves the business community in helping students identify career options.

Summary

The seven *High Schools That Work* sites making the most progress in raising student achievement between 1990 and 1993 are basically changing the high school system. In doing so, they are succeeding with a group of students often considered hopeless.

These most-improved schools have made considerable headway. They are using the *HSTW* framework of key practices to improve curriculum and instruction. District and school leaders are supporting the faculty in challenging students to develop academic and technical knowledge and skills. Teachers are working to improve career-bound students' ability to communicate, to solve problems, and to become productive citizens.

Leaders and teachers at these schools are working together to create an environment in which high standards are upheld and high performance is expected of all students. Teachers are making challenging and meaningful assignments and providing extra help as needed. In doing so, they are finding that many career-bound students respond to higher standards by working harder to learn more complicated materials. Teachers are also discovering that many parents are eager to become partners with the school in planning their children's high school program of study.

These schools use *HSTW* data to continuously link school and instructional practices to improved student learning. Leaders and teachers at these schools are dissatisfied with the level of student learning and are constantly seeking ways to improve it. Teams of teachers and school leaders, joined in many instances by parents and community representatives, are focusing on needed changes in curriculum and instruction.

It is impossible to isolate the exact reason or reasons for success at these most-improved schools. However, it is evident that these schools bought into the goal of raising the achievement of career-bound students and that they implemented a series of key practices for doing so. No one action made the difference. Instead, these schools used a combination of strategies that included:

- Dropping low-level courses and adding higher level ones;
- Strengthening the guidance system and getting parents involved;
- Providing extra help;
- Supporting teachers in working together;
- Getting students to engage in more challenging learning activities.

This collection of approaches resulted in a new system at these schools. The system involves actions by the faculty as well as support from the district office, school board, and school administration. It involves an understanding that school improvement is an important and ongoing undertaking.

The purpose in identifying these most-improved schools is to provide insights into school improvement and to build other schools' confidence as they make needed changes. The *High Schools That Work* approach to change involves vision, commitment, and effort more than it does money. The most-improved schools are demonstrating that student achievement can increase when teachers, administrators, and district leaders share a common vision and when teachers receive support for new classroom practices.

SREB-STATE VOCATIONAL EDUCATION CONSORTIUM
HIGH SCHOOLS THAT WORK PROGRAM

Goals

- To increase the mathematics, science, communication, problem-solving, and technical achievement and the application of learning for career-bound students to the national average of all students.
- To integrate the essential content of traditional college preparatory studies—math, science, and language arts—with vocational and technical studies, by creating conditions that support school leaders and teachers in carrying out certain key practices.

Key Practices

- Setting higher expectations and getting career-bound students to meet them;
- Increasing access to challenging vocational studies, with a major emphasis on using high-level math, science, language arts, and problem-solving competencies in the context of modern business and technical studies;
- Increasing access to academic studies that teach the essential concepts from the college preparatory curriculum through functional and applied strategies that enable students to see the relationship between course content and future roles they may envision for themselves;
- Having students complete a challenging and related program of study, including three courses in mathematics and three in science, with at least two credits in each course equivalent in content to courses offered in the college preparatory program, and having students complete at least four courses in a vocational major and two courses in related areas;
- Providing career-bound students access to a structured system of work-based learning that is planned in collaboration with high-status school-based learning—high school and postsecondary—and that results in an industry-recognized credential and employment in a career pathway;
- Having an organizational structure and schedule that enable academic and vocational teachers to have the time to plan and deliver an integrated curriculum aimed at teaching high-status academic and technical content;
- Having each student actively engaged in the learning process;
- Involving each student and his/her parent in an individualized advisement system aimed at ensuring that each student completes an accelerated and coherent program of academic study with a vocational or academic major;
- Providing a structured system of extra help to enable career-bound students to complete successfully an accelerated program of study that includes high-level academic content and a major;
- Using student assessment and program evaluation information to check and improve the curriculum, instruction, school climate, organization, and management.

High Schools That Work

The *High Schools That Work* program is the nation's largest and fastest growing effort to raise the achievement of career-bound high school students. Created by the Southern Regional Education Board-State Vocational Education Consortium, the program includes over 350 school and school system sites in 19 states.

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