



SREB

Using Rigor, Relevance and Relationships to Improve Student Achievement:

How Some Schools Do It

Southern
Regional
Education
Board

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2004 OUTSTANDING PRACTICES

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Stealing Best Practices from High Schools Making Good Progress in Raising Student Achievement

By Gene Bottoms

Many of the 1,000 schools implementing the *High Schools That Work (HSTW)* improvement model nationwide are making good progress in raising student achievement. The progress is evident in their rising scores on the biennial *HSTW* Assessment, on state assessments and in their students' and teachers' descriptions of high school learning experiences.

This publication focuses on 26 schools that have implemented more deeply one or more of the *HSTW* Key Practices and conditions — teaching a rigorous academic curriculum, raising expectations in academic and career/technical studies, making instruction relevant to students' lives, using research-based teaching strategies, helping students meet elevated expectations, and providing leadership and professional development to sustain improvement.

These schools were selected on the basis of their mean scores on the *HSTW* Assessment in 2000 and 2002 and on responses from students to the 2002 *HSTW* Student Survey. The *HSTW* Teacher Survey shed light on leadership practices that make a difference for faculty and students. The results placed all of these schools on lists of the top 50 schools under various indicators of progress.

The schools range in size from small rural schools to large urban high schools and from low-minority to majority-minority high schools. Most are comprehensive high schools, but some are career/technical centers or academies where students focus on a particular career field. Some are veterans of *HSTW* while others joined the program during the past five years.

The common thread is that all of these schools teach challenging academic studies and quality career/technical studies. They are not the only ones doing good things in preparing students to meet the demands of postsecondary education and a career, but they do provide important keys to help other schools reach their improvement goals.

Four major themes emerged from the efforts of these schools:

Teaching all students a rigorous academic core

All students must have access to challenging academic courses. The *High Schools That Work*-recommended academic core for career-oriented students calls for:

- **Four credits in college-preparatory/honors English;**
- **Four mathematics credits, including Algebra I, geometry, Algebra II and above¹;**

¹ To get 85 percent of students meeting the *High Schools That Work* performance goal, the *HSTW* board in fall 2002 modified the recommended mathematics curriculum to include four years of mathematics, including at least Algebra I, geometry and Algebra II.

- **Three science credits at the college-preparatory level (four credits in a school with a block schedule)²;**
- **Three years of social studies; and**
- **Mathematics in the senior year.**

Providing a rigorous English/language arts curriculum and emphasizing reading and writing for learning across the curriculum — Schools that make reading and writing a way of life are the ones reaping rewards in improved student achievement. These schools use reading and writing strategies in all classrooms, not just in English/language arts. In doing so, they deepen students' use of language and their understanding of academic and technical concepts and vocabulary. These schools believe that students learn academic and technical subjects by reading, comprehending, analyzing, writing and talking about the content of the field. The best way to master the content of a subject-matter field is to master the language of the field. Students in these schools use reading, writing and speaking as keys to unlock learning in all of their courses.

Reading and writing have become integral parts of students' lives at school and at home as a result of the schoolwide emphasis on literacy at **Heritage Hills High School** in Indiana and **Galax High School** in Virginia. Teachers at **Carolina High School and Academy** in South Carolina have been trained to emphasize vocabulary and writing across the curriculum.

Improving the mathematics curriculum, instruction and student achievement — Most schools featured in this publication have either adopted the *HSTW*-recommended mathematics curriculum or are encouraging it strongly for all students. Their students achieve at a high level in mathematics and use mathematics as a tool for greater learning in science classes, career/technical classes and all other subjects.

All teachers at **South Cobb High School** in Georgia incorporate problem-solving activities into the daily curriculum and keep records of how students are doing in learning mathematics concepts in their classrooms. Students at **Buford High School** in Georgia write about mathematics problems and orally defend their solutions. **Grady High School** in Georgia toughened its mathematics curriculum and created a support system with many opportunities for students to receive tutoring. Mathematics teachers at **South Laurel High School** in Kentucky use unit mapping to ensure that all students are taught identical concepts at the same high level.

Improving the science curriculum, instruction and achievement — Schools in this category are teaching the *HSTW*-recommended science curriculum in an engaging way that motivates students to learn. They are emphasizing reading and mathematics in science classes, linking science to real life, getting students to write and talk about their laboratory findings, and showing how science forms the basis for many career/technical fields.

² *HSTW* asks schools to require students to complete three science credits, including at least two high-level science courses such as chemistry, physics, anatomy and physiology, and college-preparatory biology. *HSTW* recommends a fourth year of science for schools using a block schedule.

Minuteman Regional High School in Massachusetts requires students to complete a science-based senior project that demonstrates what they have learned in four years at the school. **Barnwell High School** in South Carolina places a major emphasis on project-based learning in science classes.

Making learning relevant and meaningful to students

These schools differ dramatically from schools where vocational instruction is geared to entry-level jobs. Career-oriented students in these schools take more academic courses taught at a high level than do students at many other schools. They also take more high-quality career/technical courses designed to prepare students for broad career fields and postsecondary studies. Students have many opportunities to observe professionals who draw on academic knowledge and skills to complete challenging work and to move up the career ladder.

Teaching quality career/technical studies — Students at these schools complete four or more courses in a broad career field. They become technically literate by using mathematics frequently, reading technical books and career-related articles, using computers, doing senior projects, and meeting standards on written exams.

Sussex Technical High School in Delaware is a full-time technical high school that offers four industry-based clusters, requires 10 credits in a concentration, and integrates academic knowledge and skills into a challenging curriculum. Many courses allow students to receive postsecondary credits at colleges and universities. Each teacher at **Columbiana County Career and Technical Center** in Ohio records students' accomplishments on an "I can" list of the major academic, technical and employability competencies of the career field. Teams of academic and career teachers spend time with employers each summer to observe firsthand the needs and operations of business and industry. **Woodford County High School** in Kentucky integrates academic and career/technical studies in many ways, ranging from a complete class (Integrated Agribiology) to individual units linking subjects such as geometry and drafting, biology and medical terminology, mathematics and animal science, and physics and agriculture. The senior project at **McNairy Central High School** in Tennessee has raised the bar for all students, not just seniors. Students in grades nine through 11 develop their writing, research and presentation skills in anticipation of the big event in grade 12. At **Hanna-Westside Extension Campus** in South Carolina, five teachers work with other teachers in integrating academic content into career/technical classes.

Providing work-based learning — These schools use work-site learning as a way to advance school-based academic and technical learning. Veteran workers take students under their wings, showing them how to do the work and how to develop the workplace habits and customer relations skills that are so vital to success in business and industry.

The work-based learning program at **York County School of Technology** in Pennsylvania is tightly structured and closely monitored to ensure that academic learning is connected to on-the-job learning. Students at **Queen Anne's County High School** in Maryland complete rigorous assignments linking school- and work-based learning. Employers help the work experience coordinator develop formal training plans and assign highly qualified employees to carry out the plans with students in the workplace. If students fall behind, the work experience coordinator and the employer devise special strategies to help them catch up.

Helping students make wise choices about further education and a career — A strong guidance and advisement system helps students set realistic goals, take challenging courses at every grade level, and complete a planned program of academic and career/technical studies. Such systems involve teachers and parents in guiding students toward success in high school and the future.

Students at **Orangeburg-Wilkinson High School** in South Carolina and **Owen Valley High School** in Indiana receive intensive guidance services from counselors and teacher advisers. The programs at both schools begin before students enter high school and continue through the senior year as students take rigorous courses and make plans for further education and careers. Orangeburg-Wilkinson's ninth-graders have mentors (adults from the community) who meet with the students at least once a month to talk about grades, attendance, behavior and future plans.

Providing support and personal relationships for students

These schools are not just spouting rhetoric when they say they truly believe every student deserves to learn at a high level. More teachers in more classrooms at these schools expect students to achieve and are willing to go the extra mile to help students meet high course standards.

Raising standards and providing extra help — When schools raise standards, they often find that they need to step up their extra-help activities to enable students to keep pace with rising requirements. Students need to know that teachers are available to provide extra help before, during and after school. Good programs show connections between extra help and gains in student achievement.

Wheeler High School in Indiana pushes its students to exceed state requirements for graduation and provides multiple opportunities for students to receive extra help from teachers and college students. At **Springdale High School** in Arkansas, mastery learning is a competency-based program that gives struggling students multiple opportunities to learn algebra and geometry. **Swain County High School** in North Carolina has made real gains in achievement with students who participate in the after-school program, compared with those who do not take part.

Improving transition from the middle grades to high school — If students have weak academic skills when they enter the ninth grade, they are more apt to lose interest in school and even drop out before graduating. High schools increasingly are taking the initiative to identify and provide special catch-up courses for incoming freshmen who are unprepared for challenging high school studies. Also, schools have recognized the need to teach many at-risk students how to study and how to manage their time in pursuit of their goals.

Southwest Guilford High School in North Carolina conducts a three-day summer program, holds a freshman back-to-school event and houses ninth-graders in a special area of the school building to give incoming students a jump-start on high school success. **Wheeler High School** in Indiana enrolls students who may have trouble passing English and mathematics in high school in a skills remediation class taught in a double block with the academic courses. **Swain County High School** in North Carolina expanded its ninth-grade transition program to include a four-week summer class for students who may need help

adjusting to the high school curriculum. Students earn one high school credit by participating in the summer program and completing follow-up activities during the school year. **James Madison High School** in Texas conducts a summer bridge program for students from the feeder middle grades school who risk failing in the first year of high school. In addition to working on reading, writing and mathematics skills, students receive an orientation to the school's high standards.

Making the senior year count — Schools do students a favor when they forbid slacking off in the 12th grade. A rigorous senior year ensures that graduates are ready for the demands of postsecondary education and a career.

Students in the two-year **Academy for the Arts, Science and Technology** in South Carolina are required to take English, mathematics and science in the 12th grade, regardless of whether they have completed required academic courses before they enter the academy. The percentage of students at **Orangeburg-Wilkinson High School** in South Carolina taking mathematics as seniors increased from 67 percent to 83 percent between 2000 and 2002; the percentage taking science in their senior year rose from 29 percent in 2000 to 64 percent in 2002. These gains underscore the importance of having a comprehensive guidance program and assigning every student to a teacher adviser. All students at **McNairy Central High School** in Tennessee take mathematics or science in their senior year. Dual enrollment in high school and college courses is an option that allows students to see the level of knowledge and skills they will need in postsecondary education. The dual enrollment program at **Owen Valley High School** in Indiana is credited with motivating students to take higher level mathematics and science courses.

Half of the career/technical programs at **United Technical Center** in West Virginia have articulation agreements with postsecondary institutions. These agreements enable students to earn credits from one or more colleges. A local community college gives seniors at **Buford High School** in Georgia a sample entrance exam to alert them to postsecondary mathematics requirements.

Providing leadership and faculty support for continuous improvement

Successful school leaders do not simply ask teachers to do a better job in meeting the school's goals and objectives. They make it possible for all teachers — career/technical and academic — to learn how to teach more effectively and to deepen their knowledge of a subject area. Good schools focus on continuous improvement. They do not just reach a plateau and stop. They make needed changes and then keep moving forward to the next level.

Destrehan High School in Louisiana is organized so that teachers will be able to participate fully in making decisions about curriculum and instruction. The school schedule includes time for teachers to meet in study groups twice a month to do research, receive professional development and make plans to integrate proven practices into their daily lessons. Every staff member at **United Technical Center** in West Virginia is involved in planning, making decisions and setting goals for the center. Every instructor serves on a focus team. A faculty senate meets monthly to review school practices. After returning from staff development workshops and conferences, teachers report on what they learned and begin to incorporate new strategies into daily lesson plans and instruction.

Putting These Practices to Work in Your School, District and State

The examples in this publication are intended to motivate school, district and state leaders to examine where they are and where they want to be in preparing high school students for education and future careers. The following recommendations represent actions that can be taken to strengthen curriculum, instruction and student learning.

Actions for Schools

- Create a common understanding among teachers about what students need to learn, what constitutes good teaching, and what kinds of assessments and student work meet course standards at the level necessary for students to continue their education without having to take remedial courses and to pass employers' qualifying exams for good jobs.
- Provide generous assistance to help incoming and current students complete challenging programs of study.
- Link with postsecondary institutions and employers to ensure that students are taking the right academic and career/technical courses throughout high school and are receiving the right experiences to ensure success after graduation.

Actions for Districts

- Raise curriculum and instructional standards and conduct frequent audits to determine if teachers' assessments and exams, and students' work are meeting the intellectual levels necessary for success in postsecondary studies and in good jobs.
- Provide professional development to help teachers inject research-based strategies into their instruction to develop students as independent learners.

Actions for States

- Set high curriculum and instructional standards and hold all schools accountable for making steady progress in preparing students to pursue postsecondary studies without remedial courses and to pass employers' certification exams.
- Collect, analyze and disseminate data designed to assist schools in their quest for higher achievement.
- Set academic and career/technical standards for graduation that will challenge students to achieve at higher levels and will make learning relevant to their lives.

How to Use This Publication

If you see something in this publication that you want to consider incorporating into your school improvement plan, do not hesitate to contact school leaders for more information. You will find phone and fax numbers, and e-mail addresses for the many school leaders and teachers who helped us tell the stories about their schools.

A frank dialog between educational professionals is one of the best ways to gain insights about practices that could work at your own school. Remember, none of these schools is perfect but all of them are good — and getting better — as they strive to raise standards, improve teachers' assignments and assessments, use best-teaching practices, and teach students how to become independent learners.

Gene Bottoms is senior vice president of the Southern Regional Education Board and founding director of the High Schools That Work national school improvement initiative.

The information in this publication was gathered in telephone interviews with leaders and teachers at schools that were selected through written reports provided to SREB. The fact that a school is included in the publication does not mean that an SREB representative visited the school to collect information, although SREB staff did observe in many of the schools. The schools furnished the data cited in the publication and neither SREB nor a third party has reviewed the data sources.

Teaching All Students a Rigorous Academic Core

Teachers bring science to life as students take more courses and complete more projects

Ninety percent of students at this high school in a small South Carolina community take four years of science, even though the school and the state require only three. New science courses, laboratory experiences in all courses, and hands-on science projects at every grade level are strategies leading to higher student achievement. Students taking the High Schools That Work (HSTW) Assessment in 2002 had a mean science score of 303, which exceeded the HSTW science performance goal.

The quality of the science curriculum and the dedication of science teachers at Barnwell High School in South Carolina are ensuring that more students learn the scientific principles that show up on tests and in real life. The curriculum includes high level science courses, new courses to meet students' specific needs, a three-year science project, lots of laboratory work and a heavy emphasis on hands-on learning.

Located in a small community of fewer than 10,000 people, Barnwell High School enrolls 833 students in grades nine through 12. Five full-time and three part-time science teachers help students become investigators who ask the right questions and find the right answers.

Three science credits are required for graduation, but counselors routinely encourage all students to take four science courses. As a result, 90 percent of students complete a science course each year of high school.

Barnwell High School showed an impressive gain in science achievement on the *High Schools That Work* Assessment between 2000 and 2002. Students' mean score rose from 293 to 303 (over goal). One-fourth of the students taking the *HSTW* Assessment were African-American.

Upgrading the science curriculum

Several events prompted the school to upgrade its science department:

- **The state revised its science standards.** South Carolina has been revising and upgrading curriculum standards for science over the past few years. It now has a definitive set of standards for each high school science course. The standards are rigorous and specific in terms of content. The standards are reflected in end-of-course tests in biology and physical science. South Carolina also plans to add science to the graduation exam that students must pass to receive a high school diploma.

- **The school had a high failure rate in grade nine.** Four years ago, Barnwell High School started closely tracking the freshman retention rate. The investigation showed that a growing number of ninth-graders were failing mathematics and science. School leaders decided that the science failures were related to students' low level mathematics skills, lack of problem-solving techniques and poor reasoning skills. The decision was made to offer a ninth-grade science course that covered the standards while meeting the special academic needs of students.
- **The state required students to take three science courses for graduation.** South Carolina increased from two to three the number of required science credits.

“We began immediately to improve our science program by aligning the curriculum to match state standards,” said Lisa Wyndham, who teaches physical science and physics. In doing so, the teachers developed a list of classroom activities that they believed would enable students to meet each standard. They used a software program to identify standards that were not being covered so that needed adjustments could be made in curriculum and instruction.

Two new courses were added. The first new course, Integrated Science is designed for students whose mathematics skills need a boost before they can tackle mathematics-related science courses and the second, ChemTech is for students who need chemistry for their career pathways.

Integrated Science is designed to help low-achieving ninth-graders find success in high school science. This course allows students to complete an additional year of mathematics before taking physical science. “This approach has made a substantial difference in students’ science success,” Wyndham said. She and two other members of the science department teach the course — one quarter per teacher in his or her best science area. Students receive hands-on instruction in interesting ways that cover the mathematics and literacy skills necessary to make good grades in science.

ChemTech (chemistry) was added to meet the demands of growing numbers of students majoring in health care and cosmetology — two career areas that require chemistry. Students in this class have weekly real-world laboratory experiences.

Other new courses include Biology II and Forensics. Physics for Technology is offered each year as a possible fourth science course. Many students are encouraged to take chemistry and biology in grade 10 to prepare for Advanced Placement science courses and a possible fifth science credit.

Laboratory experiences

Teachers plan laboratory activities for students in all science courses. As a result, students complete at least one practical application or investigative activity per unit. “This allows students to see the relevance of what they are learning and to expand on what they have learned,” Wyndham said.

Teachers work together to build on students’ laboratory experiences in subsequent science classes. They ask students to do a laboratory in physical science and a similar but more in-depth laboratory in chemistry. In one example, students use a manipulative known as a “molecule

maker” — a puzzle for making compounds — in physical science (where they learn to form compounds) and in chemistry (where they continue to study compounds by using polyatomic ions). In another example, students in a physical science laboratory collect data and construct a heat curve showing changes in temperature over time. They melt ice and add heat until the water boils for five minutes. In chemistry, students continue this study by calculating the constants of the heat of fusion or of vaporization.

Writing in science classes

Science teachers make individual writing assignments throughout their classes and include short-answer or essay questions on all tests.

Students in *physical science* complete at least one formal laboratory report each quarter. Teachers lead students step-by-step through a report in the first quarter but expect the students to become increasingly responsible for their reports as the year progresses.

Environmental science students write position papers on real-world environmental issues. They conduct research and find evidence to support a position. Then they write reports to outline the problem and present their views about how to solve the problem.

Hands-on science projects

Project-based learning is the norm in all science classes at Barnwell High School. The projects become increasingly difficult as students move through the science curriculum.

- **Physical science in the ninth grade** — Students learn the concepts of force and gravity in making tabletop “spaghetti bridges.” The object of the assignment is to build the lightest bridge that will hold the greatest amount of weight. Students are graded on the design and strength of the bridge. In another graded project, students build model rockets to illustrate Newton’s Third Law of Motion.
- **Biology in the 10th grade** — Students research an assigned topic and summarize it in pamphlets that they produce on a computer in the business department. They are each graded on the pamphlet’s content and design.
- **Chemistry in the 11th grade** — Students are given a list of scientists associated with the atomic theory and are asked to do research and obtain information on each scientist. Each student writes a report, creates a visual aid and makes an oral presentation on one of the scientists.
- **Physics in the 12th grade** — Students build miniature roller coasters that can take marbles for a ride. They do research on the development of roller coasters as amusement park rides and find information on physics-related concepts such as potential energy, speed and centripetal force. Physics students also build catapults that can launch ping-pong balls into a target area. The catapults must be adjustable for a variety of target ranges. The purpose of the assignment is to teach two-dimensional motion — in both the vertical and horizontal planes; e.g., a football thrown across a field, a golf ball hit off a tee.

Advancing students' science skills over three consecutive years

Wyndham and two other science teachers (biology and chemistry) have developed a project that advances students' science skills over a three-year period (grades nine through 11). Emphasis is placed on the scientific method in the ninth grade, the research component of the scientific method in the 10th grade and completion of an independent science fair project in the 11th grade. "During the ninth and 10th grades, we try to build a solid foundation of scientific skills so that students can produce a successful project in the 11th grade," Wyndham said.

The project involves about half of the students at Barnwell High School, including many career/technical students. Here is what students do at each grade level:

Ninth grade — Students identify an independent variable, a dependent variable, constants and controls in all laboratories completed in class. They practice writing problems, hypotheses, procedures and conclusions. They also organize data in charts, and practice data analysis and interpretation.

10th grade — Students learn how to use scientific journals and articles to do research. They write several short papers that require research using a variety of scientific resources and the Internet.

11th grade — Students write proposals for projects, complete their projects, keep journals throughout the investigative process, construct visual displays and present their projects orally to the class.

Teachers working together

Teachers in the science department work with teachers from other disciplines to incorporate experiences that promote deeper learning. For example, science teachers insist that their students use English department guidelines in writing science reports. They also ask all teachers to emphasize mathematics in their classrooms to help build the mathematics skills that are essential in science studies.

One Algebra II teacher assigned students to complete projects based on the trigonometric concepts of sine, cosine and tangent. These concepts are studied in physics when students cover vectors and two-dimensional problems. Ninth-grade mathematics teachers have added a unit on graphing — a concept emphasized in physical science.

The high school works closely with the Barnwell County Career Center, which students can begin attending in the ninth grade. Science teachers visit the center to observe the career classes and to learn what the students need in the way of scientific concepts. Meetings are held between the career center faculty and the high school science department faculty to discuss common problems, successful practices and revision of unsuccessful approaches. One example of working together is the teaming of a chemistry teacher and a health professions teacher.

Continuous improvement

Science teachers meet for a week each summer to review the curriculum for all science courses and to update them as needed to meet standards. They revise the resource book that contains suggested activities for certain standards.

Schools that want to improve their students' science achievement might want to consider these recommendations from Barnwell High School:

- Review the curriculum each year. Get teachers to look at the standards for prerequisite and subsequent classes.
- Review the course offerings to make sure all students are being taught to high standards.
- Identify problem areas by reviewing passing and retention rates.
- Introduce student assignments and laboratories that incorporate engaging, real-world learning experiences to help students meet standards at the Basic and Proficient levels.
- Have students work toward a science project that cuts across more classes or grade levels.
- Develop exams and scoring guides that determine if students meet standards at the Basic and Proficient levels.

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Getting mathematics curriculum and instruction right: require four years of it

Academic and career/technical teachers work together to help students excel in mathematics at this small Georgia high school where 30 percent of the students are minorities. From the time students enter the ninth grade until they complete the senior year, the school focuses on teaching them to solve challenging mathematics problems and to use mathematics in their daily lives. Career/technical teachers reinforce mathematics in the classroom and work with academic teachers to develop and oversee mathematics projects. Ninety-seven percent of students taking the state graduation test in mathematics for the first time in spring 2003 passed the test, compared to 91 percent for the state of Georgia. Career-oriented students exceeded the High Schools That Work performance goal in mathematics in both 2000 and 2002.

Students at Buford High School in Buford, Georgia, are immersed in mathematics. They are required to take four mathematics courses for graduation, including Algebra I and a senior-year mathematics course. They do an array of mathematics-based projects, write about mathematics problems and become adept at defending their solutions in classes across the curriculum.

On a given day, students can be found measuring the height of the school building, viewing a documentary on space travel or visiting a nearby college to learn the mathematics requirements for postsecondary study.

With an enrollment of 650 students in grades nine through 12, Buford High School is the lone high school in the smallest school system in metro Atlanta. However, both the tax base and the community support are strong. The system has such a good reputation that some parents from outside the area pay tuition for their students to attend Buford High School.

Substantial percentages of students are economically disadvantaged and/or do not speak English. Demographic information shows that 70 percent of students are white, 15 percent African-American, 12 percent Hispanic, and the remaining three percent of mixed heritage.

While Buford High School has raised standards across the curriculum and has required students to take more-demanding courses, it has managed to keep students in school and to increase the graduation rate. (See Table.)

Table
Graduation Rates at Buford High School

Year	Percentage Graduating
2000	81%
2001	76
2002	86

Source: Buford City Schools

Note: The percentages represent students who entered the ninth grade and graduated four years later.

Teaching college-preparatory mathematics to all students

“School leaders and mathematics teachers are unanimous in wanting all students to have a foundation of algebra and other high-level mathematics courses,” according to Patsy Maltbie, head of the mathematics department.

Students with weak mathematics skills are placed in an algebra concepts class in grade nine. Otherwise, all students begin their high school mathematics sequence in college-preparatory Algebra I or higher. All subsequent mathematics courses are based on algebraic concepts.

After Algebra I, career/technical students take Applied Problem Solving, Applied Geometry and/or Applied Algebra. Each course offers a high level of content with emphasis on concrete rather than theoretical uses of mathematics. Applied Algebra and Applied Geometry are challenging courses that include major mathematical topics from Euclidean geometry and Algebra II. Students in Applied Algebra learn right triangle trigonometry, Cramer’s rule for solving systems of equations, graphs of the trigonometry functions and the conics, statistics and probability, and other topics.

“The results have been powerful,” said Bonnie Davis, who teaches mathematics to career-oriented students. Buford High School ranks as one of the top *High Schools That Work* sites in numeracy across the curriculum. Seventy-five percent of career-oriented students met the *HSTW* mathematics goal in 2002; the mean score of students participating in the *HSTW* Assessment rose from 309 in 2000 to 315 in 2002. Both scores are well above the *HSTW* goal of 297.

Buford High School students exceeded the state average for first-time test-takers on the Georgia High School Graduation Test in mathematics in spring 2003. The school’s passing rate was 97 percent, compared to 91 percent for students throughout the state. All 11th-graders statewide must pass the graduation test before they can receive a high school diploma. Buford High School’s pass plus rate was 77 percent, compared to 52 percent for all Georgia students in 2003. Pass plus is a status determined and assigned by the state. To earn pass plus, students must meet a higher standard than needed simply to pass.

Getting ninth-graders off to a successful start

Buford High School has a ninth-grade academy to help freshmen succeed in high school. In a mastery approach to Algebra I, ninth-graders have many opportunities to learn. Struggling students do not receive a failing grade at the end of the first semester. Instead, they are encouraged to meet the criteria in the second semester with the possibility that they will receive passing grades for both semesters if they are successful. Those who still need help must attend summer school.

Some students take double doses of mathematics, including algebra and another class to reinforce what they are learning in algebra. Known as “Freshman Focus,” this program allows students to re-study later in the school day what they failed to grasp in the regular period.

Any student at any grade level who needs extra help can receive free tutoring from a mathematics teacher in an after-school program. The mathematics tutor is available from 3 p.m. to 4 p.m. Mondays and Wednesdays. Students work on assignments, do homework, take tests and generally improve their mathematics skills.

Making mathematics learning relevant

“Our students solve real-world problems and describe orally how they arrived at the solutions,” Maltbie said. “Career-oriented students use databases and spreadsheets in their career/technical classes and use math to complete career/technical assignments.”

Davis assigns projects that allow students to use the mobile computer laboratory for research, to write papers, to view documentaries and movies, and to study the link between mathematics and current events. Two such projects are

America’s space program — Students watch the movie “Apollo 13” and the documentary “Moonshot” featuring the seven original Mercury astronauts. They are assigned to pose five questions that they would like to ask about space travel. The students do their own research and the teacher provides a list of questions for them to consider. Then they write papers (following a rubric of guidelines) on mathematics in the space program.

Statistical survey — Students work in groups to select a topic, conduct a survey and make written and oral presentations of the results. The topic must be relevant to society and have the teacher’s approval. “This assignment leads to a lot of discussion about which populations to survey and an amazing number of opinions that change after students do the research and hear the presentations,” Davis said. “Since it’s students rather than the teacher doing the presentations, the other students do a better job of listening and questioning the findings.”

Group work begins on day one in Davis’s classes and students quickly learn the importance of working together to solve problems. “They must do it to survive,” she said.

Cooperation is important not only in finding the definitive answers to problems but also in finding non-definitive answers in certain aspects of mathematics such as graph reading and statistics. For problems that can have more than one solution, Davis models the concept of defending your answer or opinion. This heightens students' awareness of the importance of higher-order thinking skills — not simply getting the right answer.

Davis uses several activities to introduce a topic or to summarize what has been learned and how it can be used in real life. After students in Applied Algebra learn how to find the sine, cosine and tangent; use the Pythagorean theorem; and manipulate right triangles, they go outside to make calculations. One group figures the height of a light pole, another group finds the height of the school building, while another measures the shortest distance between two points. The school purchased surveying instruments that have made the learning experience much more effective.

Connecting to college mathematics

To alert students to the mathematics they will need to know in postsecondary studies, Gwinnett Technical College administers its COMPASS entrance exam to students from Buford High School who apply for enrollment. These students are taken to the college and tested as a group. After touring the campus, the students talk with a college counselor one-on-one about test scores, admission levels and individual interests. “I expect this activity to explode in size and to become an unprecedented motivator for students' mathematical studies in the next couple of years,” Davis said.

Maltbie says it was never hard to convince teachers at Buford High School to promote mathematics learning for all students. “As soon as our teachers returned from their first *High Schools That Work* conference, they began to get the whole faculty on board to increase numeracy across the curriculum,” she said.

“Career/technical teachers reinforce mathematics in their classrooms and work with academic teachers to develop and oversee student projects,” Maltbie said. “Our career/tech teachers know how to use math and are more than willing to help students put math to use in career studies. Many times, students don't realize how much math they know until they are required to solve a graphics or an engineering problem.”

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Schoolwide emphasis on literacy helps raise student achievement in all subject areas

Teachers and students focus on reading and writing across the curriculum at this small high school located in an economically depressed suburb of Greenville, South Carolina. All students participating in the High Schools That Work Assessment in 2002 were completing four years of college-preparatory-level English; 78 percent met the HSTW reading performance goal. Tenth-graders taking the state's exit exam for the first time are showing steady improvement in reading. The passing rate for this group of students grew from 65 percent in 2001-2002 to 74 percent in 2002-2003.

Writing across the curriculum has proven to be the right way for students at Carolina High School and Academy in Greenville, South Carolina, to read better, to learn specific subject matter, to think more deeply, and to become better writers and communicators.

All teachers and students are involved in a schoolwide emphasis on literacy that began in the fall of 2001.

Carolina High is one of 14 schools in the Greenville County School District, the largest school district in South Carolina. Approximately 49 percent of the students participate in the free or reduced-price lunch program.

The school's enrollment rose from 450 students in 1997 to 744 students in 2003. One reason for the increase is the school's magnet programs in pre-engineering technology and health-related occupations, which have attracted 100 students from outside the attendance area. The school enrolls 58 percent African-Americans, 39 percent whites, two percent Hispanics and one percent Asians.

"The Center for Performance Assessment says that writing is the best tool for improving student performance in all areas," said Lise Johnson, English teacher at the school. "Our students' scores on exit exams in writing have steadily improved and our career-oriented students' [mean] scores on the *High Schools That Work* reading test rose from 282 in 2000 to 295 in 2002." Both scores exceeded the *HSTW* reading goal.

Tenth-graders taking the state's exit exam for the first time showed dramatic improvement in reading between 2001-2002 and 2002-2003. Their mean score on the exam — the Basic Skills Assessment Program (BSAP) — rose almost nine points from 65 in 2001-2002 to 74 in 2002-2003. The BSAP is standards-based, meaning that it measures how well students have mastered the specific skills required by state standards. The goal is for 100 percent of students to meet the standards on all parts of the exam.

All Carolina High School and Academy seniors participating in the *High Schools That Work* Assessment in 2002 were completing the *HSTW*-recommended curriculum of four college-preparatory-level English courses. Eighty percent of these students met the reading performance goal on the assessment. These results earned the school recognition among *HSTW* sites in raising students' reading achievement.

Challenging English curriculum

Students at Carolina take four years of college-preparatory-level English as mandated by the state of South Carolina. The state requires that Communications for the Workplace — an applied course for juniors and seniors — must be taught to college-preparatory standards.

The school's English department developed the curriculum, which is based on state and national standards. Every English class has a required list of books that students must read during the year and over the summer. Individual teachers choose additional texts. For example, English I students are required to read *Animal Farm* by George Orwell and *Romeo and Juliet* by William Shakespeare. Their summer reading is chosen from a list of six books, including *White Fang* by Jack London and *Great Expectations* by Charles Dickens. The lists become longer and more complex as students move through high school.

All English courses incorporate daily vocabulary lessons, daily oral language skills, Internet activities and writing across the curriculum.

Writing across the curriculum

The schoolwide writing program is based on the Collins Writing Program, a method developed by John Collins in Massachusetts that defines five types of writing assignments and the outcomes expected for each one. The program provides techniques that require students to be intellectual workers in the classroom. It is based on the belief that writing enhances the learning process of any subject at any grade level.

Carolina High School's implementation of the writing program was developed by a committee composed of representatives from all departments — led by the assistant principal for instruction. To determine where to focus the most effort, all teachers assigned, collected and evaluated students' writing samples. This enabled the teachers to give input to the department heads, who took the information to the committee for action.

When the plan went into effect, teachers immediately began making frequent writing assignments in their content areas. The intent is to strengthen the writing skills that the committee found lacking in students.

Emphasis on word power

The school's heavy emphasis on vocabulary is another reason for students' success on the *HSTW* Reading Assessment. All classes for juniors and seniors and some classes for ninth- and 10th-graders have daily vocabulary lessons. Students learn five words from the 350-word SAT "hot list" in each class daily for a total of 20 words per day. Because teachers use the same list, students are exposed to the same words over the course of a year.

"Students see the words, hear them pronounced, repeat them aloud and orally, define the words and/or use them in sentences," Johnson said. "This takes less than five minutes per day in each class, but the investment is paying off." Students notice and use the new words in their lives outside of school.

School leaders believe they made the right choice in selecting a narrow focus with the broadest possible impact. "We chose to concentrate on writing because we knew our students needed help in that area and because basic reading, writing and math skills are relevant to all content areas," Johnson said. "We also knew that improvement in writing would lead to improvement in other areas, especially in reading and subject matter retention."

To ensure 100 percent teacher buy-in for the program, the school established a curriculum and instruction committee composed of department heads, administrators and other interested staff members. "This group has been instrumental in consolidating and improving the program," Johnson said.

Classroom observations

"The program's success depends on teacher accountability for implementation," Johnson continued. "Follow-up and frequent formal and informal classroom observations are critical."

A system of peer observation is an integral component of ongoing professional development at the school. This system is designed to encourage collegiality and to support teachers in carrying out programs to raise student achievement. Teachers visit their colleagues' classrooms to witness how they are teaching writing across the curriculum. Afterward, they provide positive written feedback to the teachers they have observed. In doing so, the observing teachers ask themselves, "How will this observation affect what I do in my own classroom?"

Another way to measure the effectiveness of such a program is to require teachers to maintain writing folders for all students. "We monitor the folders closely to ensure that teachers are using the program correctly and that they understand that writing must be an integral part of their courses, not just an add-on," Johnson said. "When teachers make writing assignments that are unrelated to course materials, their students miss out on many of the benefits of writing across the curriculum."

Carolina High School and Academy has found a strong correlation between completing a career major and scoring high on reading tests. The school is home to two specialized academies: health occupations and pre-engineering technologies. While students across the board have benefited from the writing and vocabulary programs, career-oriented students from the academies and other career/technical programs seem to have gained the most from them.

The move from a block schedule to a seven-period day in 2003-2004 is prompting school leaders to sharpen the program's focus and to streamline the paperwork involved in teaching writing across the curriculum. "We intend to keep the program and to continue to improve students' performance in reading and writing," Johnson said.

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Students read and write their way to higher achievement on state and national tests

This small school in a high-unemployment area of Virginia emphasizes reading and writing skills as a way to get ahead in all subject areas. Literacy across the curriculum is paying off in student achievement: fifty-five percent of career/technical students completed a college-preparatory-level English curriculum in 2002; 77 percent of students participating in the 2002 High Schools That Work Assessment met the reading performance goal; 43 percent of students taking the assessment said they had intensive literacy experiences in high school, including reading and writing regularly in all classes.

Reading and writing are essential skills for students completing the literacy-rich curriculum at Galax High School in Galax, Virginia. Teachers in all academic and career/technical classes require students to read and write constantly in learning new content.

"We believe reading is important, whether it's Shakespeare's *Julius Caesar* or a chapter from a technical manual," Principal Robert Carpenter said. Writing takes a front seat, too, whether in English/language arts or a career/technical course.

Galax High School is in the southern divide of the Blue Ridge Mountains, 70 miles south of Roanoke, Virginia, in an area that has the highest (22 percent) unemployment rate in the state. The school enrolls 500 students in grades eight through 12 — with Hispanic students making up almost 15 percent of the total. "We have the fastest growing population of Hispanic students of any school in Virginia," Carpenter said. Forty-five percent of students at the high school are eligible for free or reduced-price lunches.

Literacy across the curriculum is paying off in higher achievement for Galax students. For example:

- Fifty-five percent of career/technical students completed a college-preparatory English/language arts curriculum in 2002.
- Seventy-seven percent of students who participated in the 2002 *High Schools That Work* Assessment met the *HSTW* performance goal in reading. This was an increase of 16 percentage points in four years.
- Forty-three percent of students who took the assessment said they had intensive literacy experiences in high school.

“When the state of Virginia began requiring Standards of Learning exams, we discovered that more than half of our students in the class of 1998 would have been unable to graduate if they had taken the tests,” Carpenter said. This realization motivated the Galax faculty to work harder to build students’ reading and writing skills.

Standards of Learning are criterion-referenced assessments administered to students in grades three, five and eight. They also include end-of-course tests in English 11 (writing plus reading, language and research), Algebra I and II, geometry, earth science, biology, chemistry, world geography, World History I and II, Virginia history and U.S. history. Effective in 2004, Virginia students must earn six verified units of credit in order to graduate from high school. Two verified units will be earned by passing Standards of Learning tests in reading and writing. These tests will be based on the content of English 9 through English 11 and will be given at the end of grade 11. The other four units will come from any of the courses listed above.

Eleventh-graders at Galax achieved a 93 percent passing rate in writing and an 83 percent passing rate in reading, language and research on the Standards of Learning tests in 2003. Juniors must score at least 70 percent to earn a diploma in the 12th grade.

Actions for raising literacy across the curriculum

The school’s English/language arts requirement of four Carnegie units was established by the state of Virginia. However, Galax students seeking an academic major in English must complete creative writing, speech and drama in addition to the four requirements. Students who want to receive an advanced studies diploma must earn honors English credit.

Galax High School has a number of reading and writing requirements that contribute to students’ literacy achievement.

The outside reading requirement — Students read an assigned book outside of class at least monthly and demonstrate that they understand the significance of the main ideas. They write book reports and book reviews and make oral presentations. Sometimes they impersonate characters from the books or make collages about what they have read.

The writing requirement — Students write two papers of one to three pages in each academic and career/technical area every six weeks. English/language arts students write mini-research papers, five-paragraph essays and short stories. Science students do laboratory reports and mini-research papers. Social studies students answer essay questions.

The non-school-related materials requirement — Students spend at least two hours reading non-school-related materials outside of class each week. They read books, newspapers, magazines and Internet information. Students who are employed may prefer to read memos and schedules related to their jobs.

The first version of a paper is rarely a student's best work. Teachers require students to revise essays and other written work to improve quality. Students examine rubrics (scoring guides) and read model essays to learn the characteristics of a successful essay. Then they apply the techniques to their own writing. Students may be asked to write mini-essays on the elements and techniques of a good essay. Through peer editing and teacher-student conferences, they begin to see more clearly how to improve their writing.

As part of weekly writing assignments, students often are asked to write in-depth explanations of what they are studying. In literature, students compare and contrast situations or characters and answer questions that call for critical thinking. In other classes across the curriculum, students are called on to write in-depth laboratory reports, research papers or answers to essay questions.

Students often discuss their reading assignments with other English/language arts students. For example, students in five eighth-grade classes read *Wish You Well*, a novel about rural Virginia written by David Baldacci. Since they were reading the book at the same time, the students were eager to talk about the characters and the action. This resulted in lively discussions in the halls, in other classes and during lunchtime. Because the Baldacci novel is historical fiction, students who were learning about World War II in history classes related parts of the book to their study of the 1940s.

There are abundant opportunities to read in career/technical courses. Students are required to read repair manuals and parts catalogues in **auto mechanics**; safety manuals before they are allowed to work in the shop in **agriculture**; manuals on repairing small appliances in **life management**; and computer manuals in **business** classes.

Teachers make sure their students are skilled in word processing by requiring them to complete assignments and projects on the computer. Most classrooms have computers, but teachers also take students to computer laboratories during regular class time and sign passes for students to work in the laboratories or the library during study hall or class.

“When we open our computer laboratory to the public one night a week, it's rewarding to see students showing their parents how to access the Internet or create a PowerPoint presentation,” Carpenter said.

Galax High School has created an environment that promotes literacy and increases students' reading and writing skills. Here is what the school has done that other schools might want to emulate:

- **Set high expectations for all students.** Galax High School is fortunate to have a faculty that cares about students and believes every student can learn at a higher level. Two master teachers instill the belief that motivating students to learn is an opportunity rather than a task. They promote high standards for students in department meetings, curriculum committee meetings, school board meetings and the faculty workroom.

- **Teach reading and writing across the curriculum.** One of Galax’s goals for the past five years has been to strengthen students’ reading and writing schoolwide. Teachers share their strategies in “pass-arounds” at bi-monthly faculty meetings. The “pass-arounds” are lists of effective techniques that the teachers add to during one meeting and talk about at the next meeting.
- **Integrate lesson plans.** Another goal is to integrate academic and career/technical education. Teachers share their joint lesson plans in faculty meetings.
- **Stress the similarities between school-based learning and everyday life.** Relevance is one of the components of the school’s lesson-plan model. Principal Carpenter constantly reminds his teachers, “If you can’t tell students why they need to learn something, don’t teach it!”
- **Provide incentives.** The school has a formal way to recognize students for gains in achievement. The plan includes academic booster club recognition and awards (including financial awards) given in schoolwide assemblies at the end of six-week marking periods. The final event of the year is a picnic for students who have earned academic letters for making good grades throughout the year. Some 380 students (76 percent of the total enrollment) were invited to the picnic in 2003.
- **Involve parents.** Parents participate in the academic booster club and the entire community supports school improvement.

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High standards, four years of mathematics and teachers who go the extra mile equal mathematics achievement at a big-city high school

Rigorous requirements and a strong support system combine to help students in this Atlanta school excel in mathematics. When a High Schools That Work technical assistance visit revealed that many students were not being challenged sufficiently, the school established a leadership team to find ways to raise standards for all students. Results on the Georgia High School Graduation Test in mathematics are demonstrating that higher expectations can lead to higher achievement.

Henry W. Grady High School in Atlanta, Georgia, has developed a sure-fire formula for raising students' mathematics achievement — require four high-level mathematics courses; tell students what it will take to succeed in a course; and assign dedicated teachers who will provide hands-on instruction and generous extra help.

Most Grady students take Algebra I, Geometry, Algebra II and either Algebra III or Advanced Algebra/Trigonometry. Students who take Algebra I in the middle grades have room in their schedules for Advanced Placement (AP) courses such as AP Statistics or AP Calculus.

According to Erin Davis, chairman of the mathematics department at Grady, at least 70 percent of ninth-graders have had Algebra I in the eighth grade with some middle grades students also taking Geometry. “The middle schools encourage students to take the mathematics courses that will prepare them for high-level courses in high school,” she said.

A big-city school of excellence

Located in Atlanta's midtown area, Grady High School draws students from the city's total socioeconomic spectrum. Enrollment is 979 students, including 188 seniors in 2004. Sixty-four percent of the students are African-American, 31 percent are white and five percent are from other racial or ethnic backgrounds.

The school was established in 1947 and was named for the visionary southern newspaper editor Henry W. Grady. It has received many state and national honors in recent years. The school received a national Gold Award from *High Schools That Work* in 2003 for outstanding achievement in reading, mathematics and science. It received the National School Change Award from Fordham University and the Association for Supervision and Curriculum Development in 2003. It was named a Georgia School of Excellence in 2001.

Eighty-six percent of the Class of 2003 entered college. This was an increase from 59 percent in 2001.

Dramatic changes in the late 1990s

Things were not always rosy at Grady High School. In 1999, the school received a technical assistance visit by a panel of expert educators organized by *HSTW*. The panel discovered that the school had two groups of students — the ones who were enrolled in the communications magnet and the other students, including career/technical students.

Grady immediately established a leadership team of administrators and teachers to create ways to raise expectations and standards schoolwide. The school threw out low-level courses, required a more challenging curriculum, and developed syllabi and rubrics for all courses. The goal was to teach all courses at the same high level.

The mathematics curriculum underwent major changes.

- Pre-algebra became a requirement for middle grades students and is no longer taught in the high school.
- Middle grades teachers began identifying eighth-graders who needed stronger mathematics skills. These entering ninth-graders attend a summer transition program taught by Grady mathematics teachers.
- A special one-day-a-week course was developed to assist all mathematics students. Ninth- and 10th-graders who are getting ready to take the PSAT, 11th-graders who are preparing for the Georgia High School Graduation Test, and seniors who plan to take the SAT attend the course. Grady mathematics teachers are the instructors for the course, which is offered during the regular school day.
- Tutorials were established for students who need extra help with mathematics. These sessions take place before and after school several times a week. In addition to the school's mathematics faculty, volunteers from Grady's educational partners donate their time and expertise as tutors. The partners include Clark Atlanta University, the Georgia Institute of Technology, Georgia State University and the U.S. Department of Labor.
- Saturday tutorials were scheduled to provide additional help to mathematics students. Grady mathematics teachers conduct the sessions.

"It is important to have several support systems for students," Davis said. "Students in many schools fall through the cracks because so much attention is focused on the highest- and lowest-achieving students. We believe that providing many opportunities for students to receive extra help in mathematics will ensure that all students are served."

The value of high expectations in mathematics achievement

Grady High School has learned that high expectations result in higher achievement. "Students who are clear about what is expected of them tend to rise to the occasion and perform better," Davis said.

All students receive syllabi for their mathematics classes and most teachers provide scoring guides on how students will be evaluated on their work. The school has conducted several

workshops for teachers on how to develop scoring guides. Davis has assembled a collection (samples) of tasks and student work that represent what students need to know and do in geometry.

Grady became one of *HSTW*'s top schools in mathematics achievement in 2002. The distinction is based on the fact that 86 percent of students participating in the *HSTW* Assessment met the curriculum goal (four courses, including three high-level courses) in mathematics and 88 percent met the mathematics performance goal. Grady students' mean mathematics score rose from 308 in the 2000 assessment to 324 in 2002. The *HSTW* goal is 297.

The performance of Grady's 11th-graders (first-time test-takers) on the mathematics portion of the Georgia High School Graduation Test has grown steadily since 1999. (See Table 1.)

Table 1
Percentages of 11th-graders at Henry W. Grady High School Passing the Mathematics Portion of the Georgia High School Graduation Test

	1999	2000	2001	2002	2003
Mathematics	84%	85%	90%	91%	94%

Source: Georgia Department of Education

The Georgia Department of Education assigns the pass plus distinction to students reaching an advanced level of passing on the state graduation test. Greater percentages of Grady High School 11th-graders than students in the state as a whole have achieved the pass plus distinction in mathematics since 1999. (See Table 2.)

Table 2
Percentages of 11th-graders at Henry W. Grady High School Achieving the Pass Plus Distinction on the Mathematics Portion of the Georgia High School Graduation Test

	1999	2000	2001	2002	2003
Henry W. Grady High School	46%	50%	55%	61%	59%
State of Georgia	41	50	47	53	52

Source: Georgia Department of Education

Project-based learning

The faculty at Grady uses project-based learning to teach all students a challenging mathematics curriculum. **Algebra I students** are required to enter a project in the school mathematics and science fair. The winners are entered in the districtwide Science and Mathematics Congress.

Geometry students are required to complete a number of real-world projects throughout the school year. A logic in advertising project connects concepts of logic to television — something teenagers know a lot about. Students choose a TV commercial and list the conditional statements they find in it. Then they create ads for something they want to buy — and also include conditional statements. Lastly, they learn to recognize and use “false logic.” They discover that ads in the real world may be logically correct but not necessarily true.

Another project for geometry students involves designing a helium balloon for a parade. The students use concepts of three-dimensional figures, areas and volumes to calculate the surface area and volume of the balloon.

Algebra II students use graphing calculators to study real-world applications of mathematics. A project dealing with a roller coaster allows students to learn about polynomials at a deeper level. Basically, the students classify polynomials by degree and number of terms. They also graph polynomials and use substitution to calculate the height of the roller coaster at various time intervals. Students must be able to differentiate between quadratic, cubic and quartic functions; determine the maxima and minima of functions; and describe the end behavior (i.e., limits). They use factoring and the rational root theorem to identify the zeros of polynomial functions.

The teacher provides a scoring guide to let students know what to expect in the roller coaster project. The project is worth 10 percent of their semester grade. This total includes two points each for timeliness, accuracy, completeness, neatness and presentation.

Evidence that students learn mathematics from the roller coaster project is derived from the written reports that students submit to the teacher and the oral presentations they make.

“Hands-on projects and regular curriculum content are combining to raise the level of understanding and extend the concepts of mathematics beyond the classroom,” Davis said. “The result is higher student achievement.”

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Indiana students reap rewards from schoolwide emphasis on reading and writing

Administrators, students and teachers read silently for the first 20 minutes of every school day at this small rural high school in southern Indiana. The school launched its focus on reading and writing across the curriculum 10 years ago by training teachers to promote schoolwide literacy, teach reading in the content areas and create rubrics to assess students' progress. The results have been impressive — scores on the state writing test are increasing steadily, students are meeting goal on the High Schools That Work Reading Assessment, and the school has received awards for its reading program.

The pervasive culture of reading and writing at Heritage Hills High School is paying off in higher student achievement. It is also showing up in awards from groups that value literacy among young people.

“Our primary goal is to improve the reading and writing skills of our students,” said Elaine Daubenspeck, senior English teacher at this small rural high school (700 students) in Lincoln City, Indiana. Reading and writing are interwoven at the school; every student reads and writes as naturally as he or she sleeps or eats.

Heritage Hills High School is located in the southern tip of the state between Evansville, Indiana, and Louisville, Kentucky. School enrollment is 97 percent white and three percent minority, including Hispanics and Asians. The community’s economic base is primarily agriculture, small business and limited industry.

The literacy effort at Heritage Hills High School began 10 years ago when administrators and teachers decided to concentrate on building students’ reading skills as part of the school improvement plan. To launch the initiative, all teachers participated in professional development to learn how to promote schoolwide literacy, teach reading in the content areas and create rubrics to assess students’ progress.

The results are impressive for a school that considers itself a work in progress:

- Scores on the Indiana Statewide Testing for Educational Progress-Plus (ISTEP+) have shown a steady increase in the number of sophomores at Heritage Hills scoring a four, five or six on the six-point writing portion of the test. The percentages of students receiving a six on the test grew from five percent in 2000 to 15 percent in 2002. The percentages receiving a five on the test increased from 30 percent in 2000 to 45 percent two years later. Ninety-one percent of Heritage Hills sophomores passed the ISTEP+ writing test in 2000. That percentage rose to 94 percent in 2001 and to 98 percent in 2002.

- Career-bound students' mean scores on the *High Schools That Work* Assessment of reading achievement increased from 282 in 2000 to 294 in 2002. The scores exceeded the *HSTW* reading goal both years and placed the school on the list of the top 50 *HSTW* sites in giving students outstanding literacy experiences.
- Heritage Hills High School received an award from the International Reading Association in 2001 and the Exemplary Reading Award from the Indiana Reading Association in 2000.

Everybody reads — students, teachers and administrators

The school's silent sustained reading program occurs like clockwork in each classroom during the first 20 minutes of the school day. Administrators, teachers and students all pour over books and magazines during this special time. A school survey revealed that these daily read-ins have made a positive impact on students. Nearly 80 percent of seniors said the early-morning reading periods have kindled their desire to read books, newspapers and magazines.

"We hook the students on certain authors, provide interesting books and place magazines and other reading materials everywhere in the school," Daubenspeck said.

Teachers organize students into groups to stimulate discussion about the books they have read. These groups may take the form of informal book talks or structured literature circles in which students assume the roles of characters from the books. Students eagerly discuss books with their teachers in conferences before and after school.

"We track what students read on a weekly basis," Daubenspeck said. "When we talk with students and review what they have written, we find out if they understand the main ideas of what they have been reading."

Every classroom has a library containing a variety of subject-related reading materials, including fiction and biographies. The media center offers materials that relate to all disciplines, including career/technical studies. Teachers use these resources regularly to get students to do research and to increase academic and career/technical knowledge and skills.

"We don't have to make our students read," Daubenspeck said. "We have fostered the habit of reading for pleasure to the extent that students want to do outside reading."

The results have been documented. A survey of graduating seniors in 2002-2003 showed that 45 percent read 10 or more books outside of class during the year, 29 percent read seven to nine additional books and 16 percent read at least six books in their spare time. Only 10 percent (about 14 students) read fewer than six books outside of school.

Writing goes hand-in-hand with reading

Leaders at Heritage Hills High School launched a writing initiative in 2002-2003 to reinforce the belief that reading and writing are inseparable and must be part of a continuous process. All content area teachers — mathematics, science, social studies and career/technical as well as English/language arts — developed ways to incorporate frequent writing assignments into their lessons. In each grading period, teachers require two types of writing: Level 2 writing

in which pieces are not thoroughly edited or revised but are written to be read by others and/or graded and Level 3 writing in which the pieces are thoroughly edited and revised and usually contain research.

Students are required to draft, edit, proofread and revise their Level 3 written work using the school's style manual that incorporates the Modern Language Association (MLA) guidelines for style and format. Hallways and classrooms are decorated with posters that remind students of the importance of editing and revising their written work.

English teachers designed schoolwide writing assessments that were given to all students in the second semester of 2002-2003. All teachers participated in training to learn how to use the Indiana Writing Rubric, which is used to score the ISTEP+. The entire faculty helped score the local assessment.

These practices that work in improving the writing skills of Heritage Hills students can serve as recommendation for other schools:

- Require students to keep notebooks that their teachers grade.
- Teach students to use annotation — writing about their personal connections, questions and comments regarding a piece of literature. “This method appeals to students because it is more personal and eliminates the need to take traditional notes,” Daubenspeck said.
- Ask students to read for 30 minutes and to summarize what they have read. Students give their opinions of the piece and tell how the story connects to their lives. “There is no more ‘fake reading’ in senior English at our school,” Daubenspeck said.

All students take four years of college-preparatory-level English/language arts. Approximately half of the seniors take Advanced Placement literature/composition.

Seniors are required to maintain a portfolio showcasing their best work in several genres throughout the year. The written pieces are based on what they have read and how they have responded to authors' ideas. They include essays, stories, poems and research papers. In 2003 the final portfolios replaced traditional final exams for the first time.

Computers are available in every classroom and computer laboratories are set up throughout the school to assist and encourage students to write. The availability of computers enables students to use technology as they work on projects or complete the writing assignments required across the curriculum in each grading period.

Guidelines for improving reading and writing

The following guidelines are based on the actions that Heritage Hills High School has taken in raising reading and writing achievement across the curriculum:

- Ensure strong administrative leadership and support.
- Set clear, attainable goals shared by the entire faculty.
- Consult experts in teaching reading and writing across the curriculum.

- Step out of the comfort zone. Visit schools with successful programs and model their efforts.
- Learn from research on building reading and writing skills.
- Model what you want students to be able to do.
- Collect data to improve instruction and to show what is working and what is not working.
- Fix the problems identified in the data.
- Involve students in the improvement process by informing them of school goals, emphasizing the necessity to show growth in reading and writing, and giving them the tools to meet the goals.
- Create a school culture in which reading and writing are natural, daily events in student learning.

“Improving the overall literacy of a school will lead to higher student achievement,” Daubenspeck said. “Teachers and students will be energized when they see what they have accomplished and will be eager to continue to learn and grow.”

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Science students' beakers are filled to overflowing with knowledge and skills needed in an increasingly scientific world: four years of science in this regional technical high school

Students attending this regional high school from 16 surrounding communities in Massachusetts understand that they will have to do more academic work than usual. Almost one-fourth of the students are minorities and more than half of the students are special education students. All students take four years of high-level science and have access to modern science-based programs. They also complete a four-year cumulative science project. Students participating in the 2002 High Schools That Work Assessment had a mean score that exceeded the HSTW science performance goal.

Students at Minuteman Regional High School in Lexington, Massachusetts, take four years of science, have access to a large variety of science courses and cutting-edge science-based programs, and benefit from multiple instructional methods such as laboratories, the Internet, group work, presentations and demonstrations. All students complete senior projects that demonstrate the science knowledge and skills they have learned at the school.

Located on a 70-acre campus in suburban Boston, the school enrolled 715 students from 16 surrounding communities in fall 2003. Twenty-one percent of the students are minorities. Fifty-five percent are special education students. Fifteen percent are from low-income families. Statistics on the Class of 2003 show that 62 percent of graduates enrolled in college, 30 percent went to work, and 2.5 percent entered the military.

Students who participated in the *High Schools That Work* Assessment posted a mean score of 315 on the science test in 2002, a one-point increase over the 2000 assessment. These scores exceeded the *HSTW* performance goal of 299 in science. The results placed Minuteman Regional High School in the top 50 *HSTW* sites in science achievement.

The school's assessment of science knowledge begins when students enter the ninth grade. As part of an academic evaluation, students take a test in either biology or chemistry. Beginning in 2006, the state of Massachusetts will require 10th-graders to take an end-of-course test in one of the following areas: biology, chemistry, physics or science, or technology engineering.

"Our students understand that they will have to do more academic work at Minuteman than they would do at their regular high schools," said James Amara, coordinator of academic and science/technology studies. He pointed out that 90 percent of students who major in science/technology enter college.

The science curriculum

Minuteman students are required to take and successfully pass four full-year science courses. This means that all students take science in their senior year. Biology is required in the ninth grade and chemistry in the 10th grade.

A full range of science courses is offered to students in grades 11 and 12. The courses include Physics I and II, Principles of Technology I and II, Food and Nutrition, Earth Science, Astronomy, Current Issues in Science, Oceanography, Anatomy, Electricity, Biology, and Chemistry. Some students opt to take an Internet science course for credit in earth science, biology or chemistry.

The school has developed standards for science courses in grades nine through 12 defining what students will be expected to know in each aspect of biology/life sciences, physics/applied physics, chemistry, and anatomy and physiology.

Minuteman asks students to complete a science classroom survey that helps teachers understand how their students learn best. It asks them to agree or disagree with statements such as, “I learn well by using diagrams and other visual media,” or “I learn well by using computer-based materials.” The second part of the classroom survey asks students to agree or disagree with statements such as, “Often in laboratory I didn’t understand the concept behind the laboratory experiment.” Students also rank how they know when they understand something (“I can apply ideas to new situations.”) and whether the teacher is meeting instructional needs (“The teacher discovers when I need help and gives it to me.”).

Laboratory activities

Laboratories are an integral and important part of all science courses. Students complete one to two laboratories weekly using scientific equipment, collecting data and doing computer-based research.

A unit on plankton in the oceanography course is one example of the role that laboratories play in science learning. Students collect plankton organisms from the ocean, take the water and the samples to the school laboratory and perform a number of experiments. Plankton are the microscopic animals and plants that aquatic animals use for food.

- Students use plankton splitters, stereo microscopes and compound microscopes to identify and separate the samples into phytoplankton and zooplankton.
- They determine the water’s pH value, amount of dissolved oxygen, temperature, level of carbon dioxide and salt content.
- They use the Internet to identify and do research on specific species of plankton, the importance of plankton in the food supply, optimal growth conditions, diseases carried by plankton organisms, and man’s impact on plankton production. They consult scientific and government Web sites to see satellite imagery of plankton and to learn about research being done on plankton.

When there is not enough time or laboratory equipment for students to conduct a specific activity related to a project, teachers use simulations that can be found on the Internet. One site used by Minuteman biology students and teachers is the National Health Museum’s Access Excellence site at www.accessexcellence.com. “The Internet has a wealth of simulations, virtual laboratories and on-site experiences that can supplement a laboratory or add value to a science program,” Amara said.

Science in students' daily lives

Teachers use a variety of methods to help students focus on current science happenings and their effects on people's lives. Students discuss newspaper and magazine articles in class, talk with their parents about the articles, make presentations and participate in special events. One teacher initiated "Mars Week" to heighten interest in the Red Planet when it came close to Earth. Another teacher asked students to observe a food and nutrition day by calculating the total calories and the amounts of sugar, carbohydrates, fat and salt they consumed in one week. Students prepared tables, graphs, charts and lists of food habits to discuss with the class. They investigated both the physiological and the psychological aspects of Americans' dietary choices.

"With respect to making science student friendly, we have found that teacher enthusiasm and application of science concepts to real-world solutions is vital in making science both interesting and demanding," Amara said. "A hands-on environment and the use of multiple methods of instruction play large roles in maintaining a high level of interest and support for our science program."

Career/technical studies

Minuteman students follow a "week about" schedule that has them attend academic classes one week and career/technical classes the next week. They choose from three broad career programs: science/technology, commercial services and construction/power. Twenty-two technical areas are included in the three program divisions.

"We were the first high school in Massachusetts to get state approval for our biotechnology, telecommunications and robotics/engineering programs," Amara said.

A total of 250 industry partners work with the school to give students real-world knowledge and skills for staying afloat in the rapidly moving technology stream. In addition, each career/technical program has college articulation agreements that motivate students to earn college credits while completing high school.

Four specialized science and technology programs

Minuteman has established four academies with specialized academic and career/technology curriculum to prepare high-achieving, technically oriented students for college and careers. The special programs are Pro-Tech; the Biotechnology Career Academy, co-sponsored by the National Science Foundation; the Pre-Engineering Academy, presented in partnership with Project Lead The Way and state educational institutions; and the new Ocean Science Academy that will open in September 2004.

The biotechnology program, which combines fields such as technology and engineering with biology to manipulate DNA and create or change living organisms, is housed in a fully equipped biotech laboratory and a workroom with a controlled level of airborne microbes. This rigorous four-year program has the support of local biotechnology companies of the type that has proliferated in the Boston area over the past decade.

The new ocean science academy will incorporate many of the technical skills from marine biotechnology, marine biology, physical oceanography and remote underwater vehicle operation and construction. High-level academic courses will be required, including one year of marine biology, two years of chemistry and one year of physics. Students will benefit from partnerships with universities, the Boston Museum of Science and the New England Aquarium.

A four-year cumulative project focusing on science

As part of the overall science program, all ninth-graders embark on a multi-year process that prepares them to participate in the mandatory junior science fair and to complete a required senior project demonstrating their science knowledge and skills.

Each freshman writes a research paper on a topic of his or her choice. Ninth-graders have chosen to write about rheumatoid arthritis, organic vs. inorganic beauty products and aluminum vs. wooden bats.

Sophomores and juniors continue the process by writing reports that get longer and better each year. They work alone or in small groups to research a topic, write about it, make a presentation and create a visual display of what the junior science fair project will entail. English/language arts teachers have developed printed guidelines for students on how to write a research paper.

The school provides rubrics showing how students will be graded on written reports and on the science fair project. (Rubrics for science laboratory reports and open-ended questions also are available.) The rubric for science writing focuses on five categories where the writing will be judged as advanced, adept or unacceptable. The five categories are organization/format, content, writing styles, research and data/information interpretation, and vocabulary.

Students who are enrolled in college-preparatory and honors science courses are required to participate in the science fair as part of their competency requirements. Students in other programs enter science fair projects or career-related projects allowing them to showcase the scientific principles and concepts underlying a particular technical area. For example, juniors have written computer programs for operating robots, described the operation of a heat pump and demonstrated the corrosion rate for metals after using various paint processes, and incorporated 19th century research on the transmission of cholera in water.

Every student is required to do a senior project that utilizes scientific principles and research in a career/technical area as part of graduation and technical certification requirements. Each project consists of research, a written report, an oral presentation to his or her peers and teachers, and a tangible product. The projects encompass many of the skills, competencies and concepts that students have gained during four years at Minuteman. This culminating activity becomes part of the student's portfolio.

Seniors have focused on robots with the capacity to “see,” automated manufacturing processes, the effect of hydroponics on water quality and a computer-based analysis of “junk DNA.” Four students working together identified a problem in the community — a traffic light at an intersection — and designed a new stoplight that would increase safety at the intersection for a minimal price in electricity and maintenance.

“We are constantly striving to integrate new and emerging technologies into students’ science studies,” Amara said. “We want to make sure we build students’ skills at every grade level.”

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This school involves all teachers in raising students’ mathematics achievement: four years of mathematics required

This suburban school with high percentages of at-risk and transient students also faced the challenge of teaching mathematics to many incoming ninth-graders who needed special attention to be successful in high school mathematics. To stem the tide, the school made teaching numeracy across the curriculum a major goal in its school improvement plan. Career-oriented students reached goal on the 2002 High Schools That Work Assessment and greater percentages than two years earlier said their teachers provided worthwhile mathematics experiences in the classroom.

The entire faculty at South Cobb High School in Austell, Georgia, is involved in raising students’ mathematics achievement. The school improvement plan includes a goal for all teachers to incorporate problem-solving activities into the daily curriculum and to keep records on how students are doing in learning mathematics concepts in their classes.

Before the mathematics goal was set, teachers examined data on incoming students and on current and former students’ performance on high-stakes tests. When they discovered that many students were performing below grade level, they unanimously supported the plan to raise mathematics requirements and to emphasize numeracy across the curriculum.

Changing demographics

South Cobb High School is a comprehensive high school offering academic and career/technical studies to 2,007 students. The school was established in 1952 to serve a comparatively small rural area of Cobb County near Atlanta, Georgia. As the metropolitan Atlanta area grew, the school became suburban and its enrollment became increasingly diverse and transient. The area around the school is undergoing both social and economic transition.

Between 1999-2000 and 2003-2004, the percentage of white students decreased from 61 to 37 percent. The percentage of African-American students climbed from 31 to 51 percent and the Hispanic student population grew from four to eight percent.

In 2002 the Cobb County School District identified South Cobb High School as a high priority school. The designation is based on the percentages of at-risk students and the transiency rates of students. In defining at risk, the district counted the numbers/percentages of students participating in specific programs such as free and reduced-price lunches, English as a second language and remedial instruction. Approximately 45 percent of South Cobb High School students are eligible for free or reduced-price lunches. The transiency rate at the school is 47 percent.

Shining the spotlight on mathematics

“When Michael Johnson came to the school as principal in 2000-2001, he began focusing on academics, particularly mathematics,” said Associate Principal Gail Buice. Some of the school’s mathematics strengths are

Four courses for graduation — All students at South Cobb High School are required to take at least four mathematics courses. Three of the courses must be Algebra I, Geometry and Algebra II.

Help for entering ninth-graders — Entering freshmen in 2002-2003 had a composite score of 6.45 — the equivalent of mid-sixth grade — on the Stanford 9 test. To respond to these weak mathematics skills, the high school implemented a full-year program for students who are performing below grade level in mathematics when they enter high school. These students take Integrated Mathematics I and II. The purpose of the extended program is to prepare students for higher achievement in mathematics in the remaining years of high school. “We administer pre- and post-tests and look at algebra scores in the 10th grade to determine the progress that these students make as a result of the one-year program,” said Leigh Graham, administrator in charge of mathematics at the high school. Eighty-three percent of these students pass Algebra I and continue with other mathematics courses.

Curriculum alignment with other schools — Graham meets often with a vertical team of teachers from schools in their area of Cobb County. The team includes elementary and middle grades teachers as well as high school mathematics instructors. They work to align the mathematics curriculum at the various schools they represent. South Cobb High School started vertical alignment with feeder middle grades schools three years ago in order to give middle grades mathematics

teachers a better understanding of students' weaknesses when they enter high school. South Cobb is in the process of sharing its rubrics with feeder schools so that these schools will know what is expected of high school freshmen. The results of curriculum alignment are showing up in student achievement. For example, the percentage of students needing the extended mathematics program in the ninth grade has declined from 66 to 59 percent.

Computerized mathematics program — The Carnegie Learning Mathematics Program for Algebra I was introduced at South Cobb High School in 2002. Students spend 40 percent of the time solving mathematics problems on the computer and the remainder of the time doing textbook and classroom activities that emphasize written analyses and oral presentations.

Mathematics and science magnet program

The Academy of Mathematics and Medical Sciences at South Cobb High School is a new magnet program for students from high schools throughout Cobb County who are interested in and want to take higher-level courses in mathematics, science and technology. The academy offers an accelerated and advanced curriculum that focuses on career opportunities in research and medical sciences.

Freshmen and sophomores in the academy take core-curriculum classes in mathematics and science. They choose programs of study for grades 11 and 12 that reflect their specific interests. Students in the research program do a research project and intern with professionals in the field. These students focus on areas of research such as mathematics, life sciences, physics, chemistry and technology. Students in the medical science program participate in a field experience program that utilizes an on-site medical laboratory/clinic and in an internship with a health professional.

A total of 121 students — less than half the number of students who applied — were enrolled in the academy in 2003-2004. Students enter as freshmen. Academy leaders urge students who are interested in attending the academy to do their best in the middle grades and to take the highest possible mathematics and science classes through the eighth grade.

Measuring student achievement

South Cobb High School uses the Georgia High School Graduation Test (GHS GT), the Cobb County Core Challenge Test (CCT), the SAT and the *High Schools That Work* Assessment to measure student achievement.

Georgia High School Graduation Test — Eighty-nine percent of first-time test-takers at South Cobb High School passed the mathematics test in two consecutive years (2001-2002 and 2002-2003). The percentage was up from 87 percent passing on the first try in 2000-2001.

Cobb County Core Challenge Test — Tests in Algebra I and II and Geometry are given to students in grades nine through 12. South Cobb High School's scores rose during the past three years, but the percentage passing both the Algebra I and the Algebra II tests remained below

the county average. In an effort to improve student achievement, the school administered a mathematics placement test to students entering the ninth grade in 2002. The results were combined with their eighth grade mathematics grades. Students who had not completed Algebra I credit were enrolled in two consecutive semesters of mathematics (Integrated Mathematics I and II or Algebra I, parts 1 and 2).

SAT scores — These scores have improved since South Cobb High School implemented its school improvement plan in 2001. The 2001-2002 testing period showed a 20-point increase in the overall mean score on the mathematics portion of the SAT.

High Schools That Work Assessment — Fifty-four percent of career-oriented students participating in the assessment at South Cobb High School in 2002 met the *HSTW* performance goal in mathematics. This was an increase from 47 percent meeting the goal in 2000. These students' mean mathematics scores increased from 285 in 2000 to 297 in 2002.

Providing the right numeracy experiences

Greater percentages of career-oriented students at South Cobb High School in 2002 than in 2000 said they are getting the types of experiences designed to raise mathematics achievement. (See Table.)

Teaching numeracy across the curriculum

All teachers at South Cobb High School are expected to engage students in mathematics-related activities. "Students see the importance of math in all classrooms — not just in math classrooms — and this has heightened their involvement in learning math," Graham said.

Using mathematics rubrics

Each department develops a mathematics rubric to integrate mathematics concepts into course content and to measure students' progress in learning the concepts. The department can choose to concentrate on one of three specific areas of mathematics — charts and graphs, measurement or computation.

"Our goal in using the rubrics is to ensure that teachers are embedding mathematics concepts into their curriculum in an organized way and that they can measure student progress in those concepts," said Diane Hart, instructional lead teacher. "The rubric is also a great tool for identifying students' weaknesses. For example, we found that students had difficulty combining positive and negative integers and doing computations involving irrational numbers." This information enabled teachers to emphasize what students need to know in mathematics.

Teachers in all courses are expected to turn in at least three rubrics per semester showing how each student (by name) is using mathematics knowledge and skills in the classroom. School administrators receive copies of each department's rubrics and issue a report at the end of each semester. The number of rubrics used schoolwide in the fall of 2003 increased from 74 in September to 80 in December.

Table
Percentages of South Cobb High School Students Who Said They Had
Worthwhile Mathematics Experiences in 2000 and 2002

<i>Students said</i>	2000	2002
They used graphing calculators to complete mathematics assignments weekly.	14%	72%
They completed a written report for a major mathematics project each year.	37	43
They defended orally each month a process that was used to solve a mathematics problem.	21	43
They worked in groups several times a year to brainstorm how to solve a mathematics problem.	46	72
They made a presentation on a mathematics project in class once a semester.	28	36
Their mathematics teachers often showed them how to use mathematics concepts to solve real-life problems.	6	19
They used mathematics weekly to complete career/technical assignments.	22	29

Source: *High Schools That Work* Student Survey

Examples of integrated learning

The following examples illustrate how mathematics is being woven into academic and career/technical classes.

Science — Students collect and interpret data and put it into charts and graphs to analyze and interpret findings from their own experiments.

Social studies — Students examine population data and create atlas tables that become the basis for writing assignments. They measure distance and apply map-reading skills in everyday situations such as calculating the distances to and from locations in the community and factoring in time constraints.

Business — Students figure percentage discounts. They take trips to local businesses to interview the managers about pricing and sales events and to learn how to maintain profits.

Construction — Students figure the room dimensions for a new home to determine how much paint, carpet, sheetrock and wiring will be needed. Building contractors from the community visit the school to emphasize the need for strong mathematics skills in the construction business.

Learning new instructional strategies

Mathematics teachers participated in instructional strategies workshops in 2003 to learn new ways to engage students in learning mathematics. They immediately began to use the strategies to get students to talk about mathematics. Students do “group solve” problems and present their solutions orally to the rest of the class.

Mathematics teachers also benefited from a professional development session that focused on the data presented by Robert Marzano, author of *Classroom Instruction That Works: Research-Based Strategies for Increasing Student Achievement*. “Our teachers were impressed to discover that the type of learning that most students retain comes from using a variety of teaching strategies and well-planned homework assignments,” Hart said.

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Rural school receives support from leaders, teachers and parents in raising mathematics standards

A rigorous mathematics curriculum has helped large percentages of career-oriented students at this Kentucky school meet the High Schools That Work curriculum and performance goals and outpace similar students at other high-performing HSTW sites in mathematics achievement. The school focuses on using data to pinpoint the progress of each student and to take action to improve curriculum and instruction.

Leaders, teachers and parents at South Laurel High School in Kentucky saw the need for all students to learn high-level mathematics in preparing for postsecondary education and careers. In the 2002-2003 school year, they formed committees, reviewed the curriculum and recommended requiring four rigorous mathematics courses for graduation.

The group followed the guidelines of *High Schools That Work* and the standards of the Kentucky Education Reform Act (KERA) in upgrading the mathematics curriculum. Students complete four mathematics credits for graduation, including Algebra I, Geometry and Algebra II. They choose a higher-level course for the fourth credit.

Some students select Business and Industry Mathematics, an interdisciplinary course linking career/technical content with mathematics core content. This course is recognized by the Kentucky Department of Education as a way to incorporate practical skills into mathematics learning. It gives career-oriented students insights into the mathematics used in everyday life.

“We have made a commitment to the importance of mathematics as a foundation for every student’s success,” said Principal Jeff Jackson. “As a result, we have provided time and resources to make sure every student has access to a rigorous mathematics curriculum and that every student is successful in mastering the curriculum.” Two areas of emphasis in mathematics are technology integration and professional development. Teachers have the opportunity to identify their instructional needs and to enroll in mathematics-specific professional development conducted at the school.

South Laurel High School is in rural London, Kentucky, off I-75 between Lexington, Kentucky, and Knoxville, Tennessee. The high school enrolled 1,223 students in grades nine through 12 in the 2003-2004 school year. Less than one percent are minorities.

About 66 percent of South Laurel’s graduates enter college, including 44 percent at four-year colleges and 22 percent at two-year institutions. Fewer than 10 percent of the students entering postsecondary education need to take remedial courses.

Career-oriented students who participated in the *HSTW* Assessment at South Laurel High School had a mean mathematics score that increased from 312 in 2000 to 320 in 2002. (The *HSTW* mathematics performance goal is 297.) The percentage of students scoring at the Proficient level tripled from 13 percent in 2000 to 39 percent in 2002. In terms of mean

mathematics scores on the *HSTW* Assessment, South Laurel outpaced other high-scoring *HSTW* sites with similar students in both 2000 and 2002. Ninety percent of South Laurel students met the *HSTW* curriculum goal and 88 percent met the *HSTW* performance goal in 2002.

Using unit mapping to ensure high standards in mathematics classes

South Laurel collects and disaggregates data on individual students and the school as a whole to improve instruction and design professional development for mathematics teachers. In one activity, the mathematics department focused on unit mapping during the 2003-2004 school year and planned to continue that emphasis in meetings during summer 2004. As a result of unit mapping, all Algebra I classes contain the same concepts and are taught to the same high standards. Unit tests have been developed so that students in all Algebra I classes are tested on identical concepts. This holds true for all other mathematics courses as well.

“Unit mapping is working great,” said Chairman Dale Rogers of the mathematics department. “If you walk from one mathematics class to another, you will find every student in the same type of course studying the same concepts and meeting the same high expectations.”

Project-based learning

The emphasis on project-based learning at South Laurel provides opportunities for all teachers to create interdisciplinary units. “Our mathematics teachers prepare students to use mathematics in all walks of life,” Rogers said.

One example is the “foreign travel” project involving students in mathematics, science, hospitality, international business and foreign language. In designing an overseas business trip, students focus on the economic, cultural and business practices of a foreign country as they participate in a real-life application of learning. The oral presentations and visual aids that they prepare are delivered to a wide range of students. As a culminating event, the students visit an international business (a Toyota manufacturing plant) and enjoy dinner at a Japanese restaurant.

In another project, teachers devoted a week of instruction to a thematic unit focusing on Levi Jackson State Park, where native Americans killed 18th-century settlers in the worst pioneer massacre in Kentucky history. Geometry students used coordinates to design a map pointing the way to “treasure” that might have been lost during the attack.

South Laurel uses authentic assessments, formative and summative evaluations, and portfolios to help students achieve at a high level in mathematics. A mathematics portfolio contains five pieces. In one entry, students are asked to investigate the mathematics tool known as Koch’s Snowflake and derive a plan for finding the area of a snowflake. In another, students are asked to use the medians of triangles to locate ships on an ocean.

Dual-credit partnerships

South Laurel students have opportunities to earn college credits for their high school mathematics studies. In articulation agreements with Sullivan University and Spencerian College (both in Kentucky), students who pass Algebra II can receive credit for college algebra if they enroll in either of the two postsecondary institutions. More than 19 percent of South Laurel's total enrollment had access to the dual credit by taking Algebra II in 2003-2004.

Eastern Kentucky University's Jump Start program makes room for high school mathematics students in classes that are not filled. Jump Start is designed for high school seniors who want to take college-level course work while still enrolled in high school. Many South Laurel students would like to enter the program, but space was available for only three percent of South Laurel mathematics students in 2003-2004. Those students welcomed the opportunity to take college algebra so they could obtain assistance from their high school mathematics teachers as needed. Tuition is waived for students participating in Jump Start.

One South Laurel sophomore took Advanced Placement Calculus through Kentucky's virtual high school on the Internet in 2003-2004. Usually, students participating in the distance learning program are juniors and seniors.

Using test scores to meet the needs of each student

When state or national test scores arrive, each teacher receives a report and students' scores are matched against the grades they received in mathematics courses at South Laurel. The state of Kentucky rates students as distinguished, proficient, apprentice or novice. "If a student received an 'A' in one of our mathematics classes, he or she should have scored high on the state test. If not, we look at the curriculum and instruction to see where the problem lies," Rogers said.

Mathematics teachers also receive reports on students' performance on the PLAN[®] pre-ACT test for 10th-graders and on the ACT pre-college test. "We look at the content of our mathematics classes and determine how to meet the needs of students who lack skills in a particular area," Rogers said.

After trying different approaches to helping lower-performing ninth-graders adjust to high school mathematics, the South Laurel mathematics department decided to enroll all freshmen in Algebra I, taught in an 85-minute block for one semester. This approach will begin in the 2004-2005 school year. Extended School Services (ESS) offered during the school day will ensure that students keep up.

Students who need extra help know that mathematics teachers are always available to provide assistance. This includes staying after school to help students catch up. In addition to ESS and tutoring, students can recover lost credits by enrolling in a PLATO computerized learning laboratory at school. Students (and their parents) contract with the school to use this second chance for success. The laboratory is open from 3:30 p.m. to 9 p.m. daily. Students work independently to complete computer modules that help them master content they missed in regular classrooms.

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Making Learning Relevant and Meaningful to Students

Career/technical program integrates academic and technical knowledge and skills

This career and technical center offers courses and instruction that motivate students to work harder in both academic and career/technical studies. Students keep portfolios to show employers what they have learned to do. Students' scores on career proficiency tests and the High Schools That Work Assessment demonstrate that students are meeting high standards in a challenging career/technical program. The HSTW Student Survey shows that these students are having superior learning experiences in career/technical studies, compared with students at other high-performing HSTW sites.

Students at Columbiana County Career and Technical Center in Lisbon, Ohio, acquire the skills and knowledge needed to become technically literate. They regularly read, write and use mathematics in career/technical areas and use terms, concepts and procedures associated with those fields. The result is students who proudly say “*I can do that*” when asked about the many academic and career/technical competencies needed to enter and get ahead in a career.

Columbiana enrolls 400 students in grades 11 and 12 who are intent on completing a career/technical major and receiving a passport to the future. These students come from high schools in nine school districts. In addition to career/technical studies, all students take English, mathematics, science and social studies both years on a 4X4 block schedule.

The center offers six career pathways containing two or more related majors. The pathways are automotive technologies, construction, health technology, information technologies, services, and trade and industrial.

Each graduate receives a career passport that includes a résumé, a career/technical certificate and any career-path licenses or endorsements. Students use these portfolios to gain entry to their next phase of life.

The center focuses on industry-based competencies by administering employer certification exams in a number of career areas — welding and metal fabrication (the American Welding Society), health services (state licensure exams), computer networking technologies, and cosmetology (the state licensure exam).

In addition, the center has completed articulation agreements with academic and technical postsecondary institutions. These agreements allow students in the computer networking technologies, interactive media, health services, automotive services and horticulture programs to earn credit for further study. Thirty-eight percent of students earned credits in 2003. The various postsecondary institutions determine the credits by reviewing the students' high school courses and discussing the students' performance with secondary teachers.

Meeting standards in academic and career/technical studies

Each career/technical teacher records students' accomplishments on an "I can" list encompassing the major academic, technical and employability competencies of the career field. For example, students in the health technologies pathway try to measure up in 39 categories, such as medical terminology, medical law and ethics, clinical chemistry, microbiology and computer literacy, in addition to teamwork, communication and professionalism. Under the "first aid and medical emergencies" category, students need to be able to:

- *identify emergency procedures;*
- *perform first aid;*
- *maintain cardiopulmonary resuscitation proficiency; and*
- *respond to medical emergencies.*

Both juniors and seniors participate in the "I can" process. The competencies are listed in a profile that goes in each student's portfolio so that potential employers will have a better perspective on the capabilities of these students.

If students master the "I can" lists, they are able to meet or exceed the benchmarks on Ohio's Integrated Technical and Academic Competencies (ITAC) tests, which are part of the Ohio Career-Technical Competency Assessment system. Columbiana seniors in the following career areas took ITAC tests in 2003: early childhood education and care; food management, production and services; welding and metal fabrication; auto mechanics; building and property maintenance; auto collision repair; interactive media; horticulture care and turf and landscape workers; precision machine technologies; and computer network systems.

The ITAC results have been impressive. Eighty percent of Columbiana students met the ITAC benchmark score in 2003, up from 58 percent in 2002. Eighty-one percent of students in the industrial manufacturing career path at Columbiana met the ITAC benchmark score in 2003, an increase from 73 percent in 2002.

“Students in all but two of our 15 career majors met or exceeded the state benchmarks on the ITAC in 2003, and we are working to make sure students in those two areas meet the standards in 2004,” Blankenship said.

The center has taken the state requirement a step further by developing two types of certificates for graduation. A Certificate of Completion is issued to each student who successfully finishes a career/technical program. An Honors Certificate is issued to graduating students who have a 91 percent average in a career/technical program, 95 percent attendance in the career path and have completed all benchmarks on the ITAC.

Columbiana students participating in the *High Schools That Work* Assessment made large gains in achievement between 2000 and 2002. Their mean reading score rose from 255 to 287, their mean mathematics score improved from 290 to 299, and their mean science score increased from 273 to 302. The assessment also documented that the percentage of students using mathematics weekly to complete career/technical assignments improved from 29 percent in 2000 to 42 percent in 2002. The percentage of students presenting assignments to the class each month improved from 24 percent in 2000 to 42 percent in 2002.

The center outpaced high-scoring *HSTW* sites with students similar to those enrolled at the center on five indicators of student involvement in career/technical studies. (See Table.)

Table
Students’ Experiences in Career/Technical Studies at
Columbiana County Career and Technical Center and at
High-scoring *HSTW with Similar Students**

<i>Career/technical students said they:</i>	Columbiana County Career and Technical Center	High-scoring <i>HSTW</i> Sites with similar students
Used mathematics weekly.	42%	22%
Read technical materials weekly.	48	24
Read career-related articles at least monthly.	58	48
Planned a project and conducted research to complete it.	88	77
Did two or more hours of outside reading each week.	38	22

Source: *High Schools That Work* Student Survey

* High-scoring sites are the high schools that ranked in the top 15 percent in two or three test areas (reading, mathematics and science) on the 2002 *HSTW* Assessment.

Getting students to read in and out of school

Reading materials are plentiful in academic and career/technical classes. Students can select from a wide variety of materials, many of which are depicted in book- and reading-related posters displayed in the classroom. The posters feature celebrities from sports and entertainment and are available from local bookstores or through the Get Caught Reading program, sponsored by the Association of American Publishers (AAP). (For more information, see www.getcaughtreading.org.)

Each classroom has a library of books and other materials to encourage reading throughout the day, not just when students go to the media center. Time for required reading and preferred reading is built into every school day. Teachers honor students' choices of what to read, whether it is an auto service manual, a dirt bike magazine or a classic novel.

Columbiana teachers work hard to inspire reluctant readers or non-readers to read outside of school. After finding that career/technical students, particularly male students, preferred non-fiction books and articles, teachers began to ask for more non-fiction and informational materials. As part of this effort, the center receives multiple copies of the local newspaper for students to read.

Teachers take the time to capitalize on individual interests in getting students to read. If they know which activities attract students outside of school, they can suggest reading materials related to those interests. They inventory students by talking with them, asking them to complete interest surveys and getting them to keep interest journals of things they like.

Another way the center involves students in reading is to offer book talks or mini-reviews by students, teachers and media specialists. This activity often leads to additional reading outside of class. In fact, 38 percent of career/technical students said in 2002 that they did two or more hours of outside reading each week. This was 14 percentage points higher than students at high-implementation *HSTW* sites and 16 percentage points higher than students at high-scoring *HSTW* sites with students similar to those enrolled at Columbiana.

The center is establishing a literature response program in which students relate to young adult literature in a creative way. The media specialist will coordinate the program and the students will perform and display their creative works at an evening coffee house event in the school's restaurant. The event will celebrate reading and creativity in a career/technical school.

"We believe that the best way to get students to read outside of school is to engage them in meaningful reading in school," said Principal Frank Blankenship. "By giving students a choice of reading materials and by reminding them that reading is a read-world necessity, we are making progress in getting students to read," Blankenship said. "Of course, it is important to allocate the resources to purchase these materials."

Using mathematics to complete challenging career/technical assignments

Students are placed in mathematics classes based on their current knowledge and their chosen career/technical clusters. Teachers tailor the mathematics curriculum to meet the needs of students in mathematics knowledge and skills.

Mathematics scheduling by cluster allows teachers to maximize mathematics learning. Teachers require students to comprehend the material and to be able to relate it to their career/technical areas. One example involves the mathematics concept of sine and cosine. Students in the precision machining program learn the concept in order to save time and materials in calculating the angle of taper. In another example, students in the building and property maintenance program used the concept of slope and angles in constructing “Huts for Mutts” — doghouses for the local humane society.

In an activity that promotes literacy, mathematics and career/technical skills, each mathematics student is required to complete projects that blend mathematics concepts with career/technical areas that use those concepts. The student prepares at least two mathematics problems for each project. Acting as an instructor, the student shows the class how to solve one of the problems. Then he or she assigns the other problem to the students to solve individually. After the class works on the problem, the student instructor explains it and lists the steps for solving it. Each presentation includes a written conclusion.

In addition to weekly assessments, mathematics students take two cumulative exams. These exams motivate students to continue to focus on mathematics concepts that they have learned during the year. “Students feel pride when they do well on the tests,” Blankenship said.

Using computers in academic and career/technical classes

Before students enroll in the center, they must have computer skills that enable them to use the Internet for research, do word processing to write reports and use software to develop presentations. At the center, they increase these skills daily by using computers in every academic and career/technical class.

All classrooms and career/technical laboratories are equipped with computer workstations. Students also have access to a 20-station computer laboratory in the media center, another laboratory with 20 stations devoted to classroom applications and a “virtual school” in some classes.

In computer-related career/technical classes, students learn career/technical applications, how to prepare spreadsheets and databases, and how to do online research. The information technologies cluster provides training in advanced hardware and software applications such as network training and certification, graphics and Web page design, and video editing.

Students complete challenging assignments such as editing yearbooks, creating PowerPoint presentations, developing brochures, making compact discs, producing videos, designing advertisements and assembling displays.

Project-based learning in career/technical courses

Students in several career paths complete projects that require research and written plans.

Interactive media — Students use the Internet and media center resources to do research on occupations in their career fields. They write reports that describe the jobs, salary ranges, educational requirements, working conditions and job opportunities in the community. They

convert the information into PowerPoint presentations that they make to the entire class. Students get to learn about various jobs and observe the research and presentation skills of their peers.

Early childhood education — Students find and read at least three articles or book chapters on chosen topics. They summarize each piece of research, prepare rough drafts, write three- to five-page reports and make presentations to the class.

These students do a lot of preparation when they are scheduled to teach a unit to children in the center's in-house pre-school. If the topic is rain forests, they investigate the locations and characteristics of rain forests and write a report on the fruits, insects, animals and reptiles that grow and live there. The information goes into a booklet for the children.

Senior projects

All career/technical programs at Columbiana include senior projects that are guided by both academic and career/technical teachers to ensure integrated learning. Students do research, create projects or perform services, write reports and make formal presentations of their findings. The project must show what the student has learned and how he or she has applied this knowledge in solving a problem.

Two projects illustrate the academic and career/technical depth of this senior requirement:

Senior memories — A student in the interactive media program used digital photography, sound and editing skills to create a multi-media presentation for the center's annual awards program. The presentation was offered for sale with all proceeds earmarked to benefit future students in the career/technical program.

Landscape design — One student learned the software that would allow him to design and produce a digitally-enhanced landscape design. The student selected a site, interviewed a potential customer, presented a design proposal and estimated the cost of the installation.

Doing homework to enhance laboratory experiences

Most homework in career/technical classes is in the form of assignments that require students to write something such as a research report, an essay or a presentation. Students are expected to expand or reflect on a hands-on laboratory technique.

Instructors grade the homework and consider it an integral part of learning. Students recognize that homework is a way to increase their knowledge of a career area and to prepare for future projects, presentations and career enrichment activities.

Interaction with the business community

Partnerships with business and industry play a big role in preparing students for careers. The center conducts an annual job and college fair to give students a better understanding of their postsecondary options. The objectives of the all-day event are to give students an opportunity to spend time with representatives of business, industry, government and higher

education, and to help students identify the advanced knowledge and skills they will need after high school. Students select the representatives they want to interview and spend a week preparing to ask questions about careers and educational requirements.

“I want a career in computer technology,” one student said. “In talking with a job fair representative, I was surprised to learn about the many behind-the-scenes jobs in my field.”

Students have opportunities to transition into the workplace through job shadowing, summer internships and mentor programs that combine school-based and work-based learning.

Teams of academic and career/technical teachers spend time during the summer observing firsthand the needs and operation of business and industry.

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Five deans help teachers find time and methods to integrate learning

Students at this extension campus focus on career/technical studies and work-based learning opportunities. Their school is organized to promote integrated academic and career/technical learning and their teachers spend a great deal of time planning and presenting ways to blend academic and career/technical content. One example is a citywide arts festival involving many students from the campus. Students taking the High Schools That Work Assessment exceeded goal in reading, mathematics and science in 2000 and 2002.

Every staff member at Hanna-Westside Extension Campus in Anderson, South Carolina, is serious about boosting students' academic achievement while strengthening career/technical skills. Students' mean scores on the *High Schools That Work* Assessment of reading, mathematics and science exceeded goal in all three categories in 2000 and 2002. Twenty-three percent of the career/technical students who participated in the 2002 assessment were African-American.

“The *High Schools That Work* Key Practices are the foundation for our strategic plan to raise student achievement,” said Director Rick Mascaro. “Students and teachers live and breathe these practices.” In fact, the practices are posted throughout the school as constant reminders of the school's goal to build academic as well as technical competencies.

The school is an extension of two major high schools (T.L. Hanna and Westside) in Anderson School District Five. It focuses mainly on career/technical education and work-based learning experiences. Students are able to flow freely back and forth between the open campus and their home high schools.

Some 1,500 students per semester (a total of 3,000 students per year) are enrolled in grades 10 through 12. They select career/technical courses from three broad career areas of study — health and human services, business and finance, and manufacturing and engineering.

T. L. Hanna and Westside High Schools are noted for academic achievement. Both schools have received Palmetto Gold awards from the state for dramatic improvement in student achievement.

Deans facilitate academic and career/technical partnerships

To ensure that academic and career/technical studies go hand in hand, Mascaro has assigned five staff members as “deans” to coordinate integrated learning. “The sole purpose of the deans is to work with teachers to plan lessons and projects that combine academic and technical content,” he said.

The group of deans consists of master teachers — two English/language arts teachers and three career/technical teachers — who perform their special duties without receiving extra pay. They teach two classes and get a regular planning period and a dean’s period. “These teachers are very serious about their responsibilities to integrate learning,” Mascaro said.

The deans host a summer workshop focusing on integrated learning. They coordinate interdisciplinary workshops at least two days a year (at least one day per semester) to allow teachers to share their integrated activities and projects with the entire faculty. The deans work closely with school administrators and teachers in helping teachers plan projects and in finding time for teachers to work together.

Integrated projects multiply at the school

Integrated learning has had a domino effect at the school. A few teachers tried working together on projects and found that students showed more interest in their studies, participated more actively and developed ownership of the projects. As teachers realized the benefits of integrated learning, they did more to plan joint projects and activities. Examples include

The Carolina raptor rescue — Students in building construction classes joined biology students from Westside High School and the extension campus in a project to prevent the further decline of two species of raptors or birds of prey — the American kestrel and the common barn owl. The students conducted research on the Internet; designed, built and erected 50 nest boxes in Anderson County; and followed wildlife federation guidelines to monitor and maintain the boxes.

The butterfly garden — This project involved students in English, mathematics, science and landscape design. After reading a novel in English class about a high school student’s defense of the endangered California blue butterfly,

students decided to plant and maintain a butterfly garden at Westside High School. They studied environmental issues and the life cycle of the butterfly in science classes, designed the garden in landscape design classes and calculated the number of plants needed for the garden in mathematics classes.

The learning shelter — Academic and career/technical students in English, mathematics, science, building construction, landscape design and desktop publishing are planning to build a gazebo for the extension campus. They will do research on gazebos in English classes, calculate materials and costs in geometry classes, build and maintain the gazebo in building construction classes, plant and beautify the area in landscape design classes, and produce printed materials about the project in desktop publishing classes.

Integrating academic skills into career/technical classes

Visits to classrooms at Hanna-Westside Extension Campus reveal that career-oriented students are putting reading, writing, mathematics and computer skills to work in their studies.

Business education — Students enrolled in business classes — such as computer applications, financial management, banking and credit, and accounting — use the Internet to study business trends and investigate new technology. Then they write summaries of what they have learned. They also use the Internet to find and analyze financial reports.

Business students use mathematics to develop amortization scales and learn to use the “rule of 72” — a formula for figuring money earned at certain interest rates for certain periods of time. They read from a variety of technical materials, including the text, and work sample problems on the computer.

Academy of Engineering — The curriculum is geared to help students develop problem-solving skills. Students learn about the design process and how to use it in industry. In one assignment, students analyze and evaluate the designs of various products. They also study the application of digital logic and the principles of rapid prototyping, robotics and automation.

Precision metalworking — These students read instruction manuals and safety procedures for completing a project. They must also be able to read and interpret manuals describing how to solve problems that may arise during the project. Students learn technical terms, read about the components of machines, and study processes and materials used in the metalworking field. They put their mathematics skills to work in determining threads per inch, drill sizes, the tool offset for milling and the depth of cut and paper for metal turning. They calculate the revolutions per minute (RPM) for certain materials.

Allied health — Reading, writing and mathematics are essential skills for health professionals. Students read and record patients’ histories, study illnesses and infectious diseases, learn about drugs and their effects, and understand medical terminology. They write reports on topics such as cultural diversity, medical careers and disease pathology, and present the findings orally to their classmates. One assignment involves students in studying the “seven stages of life” and developing a project and a presentation based on each stage. Students use mathematics to calculate the correct dosage of a medicine, figure the number of calories in various diets, and determine the amounts of nutrients in foods.

Culinary arts — Students need literacy and numeracy skills as well as a way with food to become culinary arts professionals. They read and write recipes and design and plan menus. They use mathematics to measure ingredients, increase or decrease the quantities in recipes and fill orders for customers.

Construction — Students read and interpret manuals and instruction sheets, as well as make lists of materials used in a project. They use mathematics skills to figure quantities and costs of materials and to write statements for customers.

Using computer skills in career/technical classes

Every career/technical teacher at Hanna-Westside Extension Campus is dedicated to producing students who can use computer technology in their career fields. “We work constantly to integrate technology into academic studies and real-life situations,” Mascaro said.

Business education students would be lost without their computers — each student has one in the classroom. They learn computer programs that are used in the real world, design and develop computer programs of their own, and design and maintain Web pages. Students who are studying computer repair and support learn how to install hardware and software and set up computer networks.

Computer-assisted drafting (CAD) classes are loaded with technology. Students use the computer to develop plans for residential and commercial buildings. They do research on the Internet and produce layouts and blueprints for various projects and jobs that they are assigned.

Computer skills also come in handy in allied health, where students do Internet-based research and use a computer software program to answer medical terminology questions that are assigned weekly. They use computer programs on medical topics to reinforce their knowledge when studying certain units.

Completing a required senior project

All students in the district complete senior projects in English that combine the skills they have acquired during their high school years — skills such as research, writing, speaking, organization and time management. Beginning in the ninth grade, teachers emphasize the importance of the senior project by making assignments to build students’ skills.

Students receive specific instructions about the 10-page research paper, the mentoring process and the 10-minute presentation included in the project. They receive the scoring guides for the research paper and the presentation in advance. The guide for the presentation is based on a model provided by *High Schools That Work*.

Many students choose topics that underscore their chosen career fields. A student who aspired to be an architect used research and computer-assisted drafting (CAD) skills in explaining the plans for a new county courthouse. Another student videotaped procedures in three veterinary offices for her presentation.

Learning by conducting a citywide arts festival

In March 2004 many students from the extension campus participated in a high-profile integrated learning project. The 10-day youth arts festival for the city of Anderson emphasized schools and the community working together in the areas of fine arts, academic studies and career/technical studies. It was sponsored by Anderson School District Five and *The Anderson Independent-Mail* daily newspaper but was actually conducted by students.

Students put their career-oriented talents to work in the festival as accountants, performers, costume designers, sound and lighting technicians, and cooks. For example, students from the extension campus Academy of Finance kept financial records for the event and worked in sales and marketing. Students studying advertising designed newspaper ads and other promotional activities for the event. Building technology students designed the stage sets for the performances; fashion students did research to get ideas for the hundreds of costumes they designed.

“This was a giant project that underscored my philosophy of teaching through hands-on, real-life projects,” Mascaro said. “The students gained a lot in academic and career studies. They also saw immediate results and received recognition in public for their efforts.”

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Career/technical students complete challenging assignments and are required to do senior projects for graduation

Even though opportunities to observe business and industry in action are limited at this small school in rural Tennessee, the career/technical program is rich in experiences designed to help graduates succeed in college and careers. Students use technology regularly and complete challenging senior projects. Teachers blend academic and career/technical studies to strengthen students' understanding of content. One-third of the senior class participates in work-based learning. Student achievement is evident in the High Schools That Work Assessment, where students made sizeable gains and met the performance goals in all three areas — reading, mathematics and science — in 2002.

Residents of rural Selmer, Tennessee, keep a watchful eye on the academic and technical achievements of their young people. They expect the best from students at McNairy Central High School and are seldom disappointed.

McNairy Central ranked in the top 50 *High Schools That Work* sites in 2002 in emphasizing career/technical studies that integrate academic knowledge and skills and prepare students for future success. Students participating in the 2002 *HSTW* Assessment showed sizeable gains and met the *HSTW* performance goals in all areas — reading, mathematics and science. Between 2000 and 2002, students' mean scores rose from 275 to 292 in reading, from 284 to 299 in mathematics, and from 293 to 299 in science.

McNairy County is an agricultural community with a population of 25,000. Located in western Tennessee, the county is 92 percent white, six percent African-American and two percent other minorities. Almost half of the 770 students at McNairy Central are eligible for free or reduced-price lunches.

The high school is on a 4X4 block schedule that allows students to meet the graduation requirement of 26 credits. Students complete a challenging academic curriculum, including four English courses, three mathematics courses and three science courses. All students take mathematics or science in their senior year.

The state of Tennessee requires career/technical students to complete at least four courses in a chosen technical area. Fifty-five of the 151 seniors who will graduate in 2004 are involved in work-based learning — a point of pride for a county with a limited number of businesses and industries. Students majoring in nursing complete a clinical rotation at a local health facility during their senior year.

Thirty-eight students who were expected to graduate in May 2004 were working on a dual diploma based on taking both career/technical courses and college-preparatory courses. Students who earn dual diplomas often place in the top 10 percent of the senior class.

Integrated learning

Ron Teague, vocational director for McNairy County Schools, encourages career/technical teachers to incorporate reading, writing, mathematics and science into their classes. Career/technical teachers attend staff development sessions to learn how to teach mathematics and science in their career/technical areas. Formal and informal classroom observations show that these teachers are building their students' mathematics and science knowledge and skills in the context of career/technical learning. Teague also makes it possible for career/technical teachers to purchase educational materials to enhance students' academic learning.

A schoolwide emphasis on literacy includes the DEAR (Drop Everything and Read) program. Students bring books, magazine articles and other materials to read during "DEAR time" — 30 minutes each week.

The reading continues in academic and career/technical classes, where teachers assign students to read and report on career-related articles or descriptions of new technology in their career fields. Some teachers schedule time for students to discuss current events related to the class content. The 27 percent of McNairy career/technical students who said they read a career-related article and demonstrated understanding of the content at least once a semester had a mean score of 295 in reading on the 2002 *HSTW* Assessment. Likewise, the 13 percent of career/technical students who said they discussed or debated topics with other students about what they had read in career/technical classes at least once a semester had a mean score of 303 on the 2002 *HSTW* Reading Assessment.

Career/technical students may be asked to write how-to manuals on subjects such as welding that list the steps to be taken and the materials and equipment to be used in completing a project. The true test is whether other students can understand and use the manuals successfully. The 23 percent of McNairy career/technical students who said they completed short writing assignments of one to three pages at least once or twice a month had a mean score of 301 on the 2002 *HSTW* Reading Assessment.

Teachers in career/technical areas make sure their students use mathematics in solving career-related problems. The 34 percent of McNairy career/technical students who said they use mathematics to complete assignments in their career/technical areas at least once or twice a month had a mean score of 301 on the 2002 *HSTW* Mathematics Assessment. Students learn to use algebra and geometry principles in finding the answers to real-world problems.

Emphasis on technology

The availability of technology gives McNairy Central students a tremendous boost in learning. The school is filled with computers that students use in making reports, developing PowerPoint presentations and completing senior projects. Many students access interactive computer programs from home as they review and catch up on schoolwork. One group of students developed and agreed to maintain Web sites for all schools in the county.

The 2002 *HSTW* Assessment showed that the 34 percent of McNairy career/technical students who said they stood before the class to present an assignment at least once or twice a month achieved mean scores of 298 in reading, 307 in mathematics and 308 in science.

Teachers in English/language arts, science, history, business and marketing, office occupations, health sciences, trade and industry, and agriculture require students to make computer-generated presentations to the class or the community. For example, FAMS (Ford Academy of Manufacturing Sciences) students develop a product, marketing plan and budget to present to an audience of business leaders.

Students complete challenging assignments in their career/technical classes:

- Agriculture students grow, weigh, package and sell tomatoes and cucumbers to the community. These vegetables are grown in water as part of a hydroponics and aquaculture program developed through a \$100,000 grant to both high schools in the county from the U.S. Department of Agriculture.
- Health occupations students tracked the progress of a teacher who went on a popular diet for nine weeks. The local hospital donated blood work and other tests at the beginning and end of the diet and the students recorded the teacher's weight and vital signs. Students wrote a report and presented their findings.
- FAMS students investigated possibilities and made a presentation to the school board when the board was considering purchasing a building for central office headquarters. The students interviewed central office supervisors and community members about their needs in connection with the new building.

Senior Projects

All students complete senior projects involving research, writing and presentation skills, and showcasing many things they have learned in academic and career/technical studies. The projects represent a learning stretch for students and are required for graduation. Principal Cecil Stroup says, "Nothing we do emphasizes the school's mission better than senior projects."

Assistant Principal Cristy King says, "Senior projects are the best thing we've ever done at McNairy Central. Some people were skeptical at first, but parent and community involvement has been phenomenal."

The projects bring out the best in students and build a positive image for the school in the community. "Hundreds of people have come to the school to see the incredible learning that is taking place in our building as a result of senior projects," said English teacher Delise Teague.

A senior project has four parts: a written research paper (produced in senior English class and evaluated by an English teacher) that must be at least five pages long and cite at least five sources of information; a product or service requiring at least 15 hours to produce or deliver; a portfolio consisting of a three-ring binder filled with documents related to the project; and a formal presentation to an evaluating committee of community representatives.

Students have two advisers for their projects and a school or community mentor for their products. They choose the topics, many of which are related to the students' future careers. The projects must be interesting, affordable and intellectually challenging.

In addition to integrating academic and career/technical studies, the projects help students develop skills such as time management, decision making, cost analysis, communication and critical thinking.

Here are some senior project examples:

- One student wrote a research paper on leukemia and developed a display based on extensive volunteer work he did at St. Jude's Children's Research Hospital in Memphis, Tennessee.
- A student who chose the War Between the States as his topic participated in a re-enactment at Shiloh National Military Park and visited a local middle grades school to talk with students about the war and his experiences as a re-enactor.
- A high school athlete trained children to compete in the Special Olympics and accompanied them to the event. He served as an assistant coach and captured the emotions of the young people on videotape to show at the high school.

Cristy King says the senior project has raised the bar for all students — not just seniors. Students entering high school hear about the projects and are expected to begin honing their writing and presentation skills for the big event in grade 12.

“Our success rate is 100 percent,” Delise Teague said. “Most students succeed on the first try; the ones who are not ready receive extra help before they make another presentation. No student has failed in the three years that we have required a senior project.”

Leaders and teachers at McNairy Central High School believe there are three keys to their success with senior projects:

- have a committed team of academic and career/technical teachers to manage the process;
- strengthen students' research and writing skills across the curriculum in grades nine through 11; and
- provide safety nets in the form of extra help for students who need a second chance.

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Students benefit from a guidance program that receives strong support from teachers and parents

When this large South Carolina high school learned that many of the 80 percent of its graduates who were accepted at postsecondary institutions either dropped out or took courses that had little value in the real world, it made a number of drastic changes. Students began receiving intensive guidance and advisement services in grades nine through 12 to ensure that they took rigorous courses and made plans for further education and careers. The percentages of career-oriented students completing the High Schools That Work recommended curriculum increased in English/language arts from 38 percent in 2000 to 95 percent in 2002, in mathematics from 43 percent in 2000 to 85 percent in 2002, and in science from 55 percent in 2000 to 100 percent in 2002. Mean scores on the HSTW Assessment improved in all three areas — reading, mathematics and science. Ninety-five percent of students who participated in the 2002 assessment were African-American.

Orangeburg, South Carolina, is a source of inspiration for schools and communities that want to guide minority students into stronger academic pathways. Students at Orangeburg-Wilkinson High School complete tougher programs of study than in the past and score increasingly higher on the *High Schools That Work* Assessment and other measures of achievement.

A guidance and advisement system that is ingrained into the school culture enjoys the support of administrators, counselors, teachers, students, parents and community mentors. Students receive intensive guidance assistance from pre-high school through the senior year as they take rigorous courses and make plans for further education and careers.

Located 40 miles from Columbia in the southern part of the state, Orangeburg has a population of 45,000. When agriculture and textile manufacturing declined, new companies began manufacturing fluoropolymer tubing, making insulators for electrical wire and cable, and producing printed materials.

The high school enrolls 1,800 students in grades nine through 12, including 88 percent African-Americans and 12 percent whites. Seventy-five percent of these students are eligible for free or reduced-price lunches.

Just over a decade ago, many Orangeburg-Wilkinson students were allowed to take easy courses. Among students graduating with a career/technical focus, half took general English courses and three-fourths took general mathematics and science courses. More than 80 percent of graduates were accepted at postsecondary institutions, but many either dropped out or completed vocational courses that had little value in the real world.

Strong leadership by the superintendent, the high school principal and the school board turned the school around. The superintendent identified the actions needed to raise academic

and technical achievement and hired a strong principal. The principal closed down the general track, raised expectations and established discipline and order; the school board increased graduation requirements and established a policy that all students in grades 10 through 12 would complete a four-credit academic or career/technical major.

Paying off in student achievement

Continuous guidance and advisement services are paying off in the tougher courses that students are taking and the scores that students are making on achievement tests.

- The percentage of career-oriented students who completed the *HSTW*-recommended English/language arts curriculum increased from 38 percent in 2000 to 95 percent in 2002.
- The percentage of career-oriented students completing four college-preparatory mathematics courses beginning with Algebra I increased from 43 percent in 2000 to 85 percent in 2002.
- The percentage of career-oriented students completing the *HSTW*-recommended science curriculum increased from 55 percent in 2000 to 100 percent in 2002.

Career-oriented students participating in the *HSTW* Assessment at Orangeburg-Wilkinson High School had a mean reading score that increased from 275 in 2000 to 280 (exceeding the *HSTW* goal) in 2002, a mean mathematics score that increased from 296 in 2000 to 302 (exceeding the *HSTW* goal) in 2002, and a mean science score that increased from 281 in 2000 to 282 in 2002. Ninety-five percent of students who participated in the 2002 *HSTW* Assessment were African-American, an increase from 86 percent in 2000.

SAT and ACT scores have improved. The 2003 SAT data showed an overall 49-point increase in students' composite verbal and mathematics scores from the previous year. The mean composite ACT score in 2003 was 17 — up from 16 one year earlier.

Guiding students in the right direction

School leaders say the school's comprehensive guidance system deserves credit for marked improvement in student achievement. The program involves teacher advisers and community mentors in helping students make wise education and career choices. The chief components of the system are

Strong leadership by counselors — Counselors begin working with students and their parents in the eighth grade. They encourage every student to select a career cluster and identify a career major by the end of grade 10. In the ninth grade, counselors administer interest inventories and aptitude tests to help students plan for the future. More than half of career-oriented students in 2002 said they received the most help in planning a high school program of study by the end of grade nine.

Counselors also develop materials for teacher advisers, who provide information to students and parents. "We reassured teachers that they would not be doing the work of counselors but would be assisting students in making good choices about

high school courses and future goals,” said Angelia Fersner, director of guidance at Orangeburg-Wilkinson High School. “We put a lot of emphasis on the word *assist*.”

The ninth-grade counselor helps freshman academy teachers develop programs and materials designed to assist students in making the transition from the middle grades to high school and to increase students’ success in grade nine.

The guidance department also co-sponsors an annual fair to introduce students in grades nine through 11 to the career/technical curriculum available at nearby Orangeburg Consolidated Five Technology Center. Teachers and students demonstrate skills taught at the center and show how academic knowledge is integrated into the career/technical courses. The head of the high school English department serves as chairperson for the event.

Teacher involvement — Every student is assigned to a teacher adviser who meets with students in small groups for the duration of the students’ high school years. Teacher advisers encourage all students to complete the *HSTW*-recommended curriculum of high-level English, mathematics and science courses.

- The percentage of career-oriented students taking four or more mathematics courses increased from 43 percent to 90 percent between 2000 and 2002.
- The percentage of career-oriented students taking four or more science courses increased from 18 percent in 2000 to 44 percent in 2002.

Teacher advisers meet with students and parents on a special advisory day in the fall and in the spring. The meetings give everyone a chance to examine interest and aptitude tests and to register students for the next semester. Teachers phone parents in advance to emphasize the importance of helping students plan for high school and beyond.

Parental involvement — Parents meet with their students and counselors one-on-one to review transcripts and grades and to explore the requirements of careers and postsecondary education. Parents come to the school to pick up their students’ report cards for the first grading period of each semester. While there, they talk with teachers and counselors about students’ progress. One parent said, “This is the first time I ever sat down individually with someone at the school to discuss my child’s future.”

Community involvement — Ninth-graders have mentors — adults from the community — who meet with students at least once a month to talk about grades, attendance, behavior and future plans. Some 100 representatives of various career fields have volunteered as mentors. Many remain with their assigned students throughout high school; some visit parents at home.

The local chamber of commerce sponsors a program in which juniors and seniors maintain portfolios of their school and work preparation and experiences. Employers host students for job shadowing and local technical schools conduct career exploration days.

Emphasis on the senior year — Counselors and teacher advisers urge students to put the 12th grade to good use in preparing for the future. As a result, the percentage of students taking mathematics as seniors increased from 67 to 83 percent between 2000 and 2002, while the percentage of students taking science as seniors rose from 39 in 2000 to 64 percent in 2002.

Each fall, the counselors meet with the seniors — and their parents in many instances — to make sure students have all the credits they will need for postsecondary education and a career.

Seniors who qualify by completing all of their required high school courses and maintaining a “B” average can attend a local college while in grade 12. They can earn three hours of college credit and one-half hour of high school credit in the program. The credits will transfer to any college — not just the local institution.

“Given the task of moving Orangeburg-Wilkinson High School has been a challenge but a rewarding experience,” Fersner said. “In my 14 years at Orangeburg-Wilkinson, I have seen the mind-set of both the teachers and students improve, and parental involvement grow stronger each day through the consistent leadership of the guidance program. We encourage our parents to be an integral part of their children’s career choices and will continue to invite them to meetings, open houses, parent and teacher conferences, and grade-level activities sponsored by the guidance department.”

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Teacher adviser system is a guiding light to help students succeed in high school

Forty-five percent of students at this Indiana high school qualify for free or reduced-price lunches. Many families' earnings are below the poverty level. To help students meet high curriculum standards, the school provides an intensive guidance and advisement system that begins before students enter high school and continues into the senior year. The results are showing up in academic achievement on state tests of English/language arts and mathematics and in the High Schools That Work Assessment. The percentages of career-oriented students meeting the HSTW performance goals in 2002 included 68 percent in reading, 70 percent in mathematics and 57 percent in science.

No student slips through the cracks at Owen Valley High School in Spencer, Indiana. Every student is contacted while in the middle grades and is assigned to a teacher adviser who becomes a single point of contact for the next four years. Through advisory sessions and other activities, students receive ongoing assistance in setting goals, selecting majors, choosing courses and updating four-year plans.

“All full-time teachers participate in the teacher adviser program and all students have four-year plans,” said Sue Cull, *High Schools That Work* coordinator at the school. “It’s just the way we do things here.”

The school population of 923 students is 99 percent white. The median income in Owen County is less than \$33,000 per year and 14 percent of the residents (compared to 12 percent statewide) are below the poverty level.

Getting students to plan rigorous high school programs of study is paying off in academic achievement. Sixty-seven percent of 10th-graders passed (i.e., scored above standard) the mathematics portion of the Indiana Statewide Testing for Educational Progress-Plus (ISTEP+) test in fall 2003. That percentage, which equaled the state mean for all 10th-graders taking the test, was an increase from 61 percent passing in 2001 to 64 percent passing in 2002. In English/language arts, the passing percentages for Owen Valley 10th-graders grew from 61 percent in 2001 to 64 percent in 2002 and 2003. The 10th-grade version of ISTEP+ measures students’ progress in mastering the reading, writing and mathematics skills required in conjunction with course credits to earn a high school diploma in Indiana. Students have four additional opportunities to pass the tests — twice in grade 11 and twice in grade 12.

Sixty-eight percent of career-oriented students participating in the *HSTW* Assessment at Owen Valley High School in 2002 met the *HSTW* performance goal in reading, 70 percent met the performance goal in mathematics, and 57 percent met the performance goal in science.

Setting up a grade-by-grade guidance system

When Owen Valley High School joined *HSTW* in 1995, the guidance focus team researched and recommended a structured program that would involve counselors, teachers and parents in ensuring that all students would receive intensive, high-quality guidance services. The team participated in workshops and visited schools to gather ideas for the guidance system. In 2001 the team completed a curriculum mapping process to add more sequence and relevance to the program.

The result is a grade-by-grade plan for reaching students and their parents.

Grade Eight — The three high school counselors spend a week with eighth-graders and their teachers at Owen Valley Middle School in the period between January and March each year. They orient the middle grades teachers to the high school scheduling process, the ninth-grade course requirements and the transition programs that are available to help students meet high school standards. Using distance-learning technology, the counselors send scheduling information to the entire eighth grade. They meet with small groups of eighth-graders to review packets of information on career majors, freshmen electives, diploma options, freshman transition programs and schedules. One-by-one, the counselors help all eighth-graders develop schedules for the ninth grade.

The high school holds an orientation night to give incoming freshmen and their parents an opportunity to meet the counselors and the teacher advisers, and to ask questions about students' schedules. Administrators explain school rules and expectations and describe the various programs.

Grade Nine — Freshman Kickoff Night is held in August before school begins. Seventy-eight percent of incoming ninth-graders attended in 2002 — the first year for this event. The freshmen receive their schedules, work out any scheduling problems, meet the teachers and tour the building. Upperclassmen are on hand to answer questions and promote clubs and activities.

Grade 10 — Counselors and teacher advisers keep watch on students' total credits and grade point averages.

Grade 11 — Students take the lead in conducting Junior Conferences involving parents and counselors. The conferences are scheduled during the day and at night to accommodate parents. Participation in this event has grown each year — from 52 percent of juniors in 2001 to 64 percent in 2002 and 67 percent in 2003. One purpose of the conference is to match students' earned credits with course requirements and to adjust the four-year plans as needed. The meeting provides an opportunity for students and their parents to discuss the senior projects that are required for graduation. A senior project consists of a written report and a tangible product. The conference is also a time for reviewing information on the SAT, scholarship essays, postsecondary options and future employment.

Grade 12 — Seniors and their parents attend Financial Aid Night. They learn that assistance in applying for financial aid is available online from counselors and technology teachers at the school. Counselors and teacher advisers continue to monitor students' credits and grade point averages before graduation.

Ongoing guidance activities

Other guidance activities are ongoing throughout a student's high school years. Each teacher adviser is responsible for guiding and advising 20 students. The groups meet for 40 minutes twice a week. During these periods, students set goals, select majors, choose courses and work on their four-year plans. Teacher advisers are responsible for monitoring students' progress in completing senior projects.

Teachers use the advisement periods to give interest and career inventories, re-emphasize career majors and provide information on postsecondary institutions and the military. They help students match career majors with postsecondary choices and scholarship possibilities, locate scholarships and prepare résumés and applications.

In January and February, counselors meet with individual students in grades nine through 11 to provide guidance on their schedules for the coming year. An annual Scheduling Night involves students, parents and teacher advisers in revising students' four-year plans.

Counselors send newsletters to students in grades 11 and 12. These communications announce PSAT, SAT and ACT test dates; tell when colleges will send representatives to the campus; and announce deadlines for postsecondary and scholarship applications.

To help students develop good study skills and other habits for success, the freshman academies added an elective course that orients students to the qualities they will need in life and careers. The course became a requirement in 2003-2004. "This course demonstrates the school's commitment to high expectations for all students," counselor Christi McBride said.

The three counselors meet regularly with the teacher advisers to discuss new and/or updated information and procedures in the guidance system. They also discuss the roles and responsibilities of teachers in guiding students to make wise choices. "This includes helping teachers understand how to guide students into math and science in the senior year," Cull said.

Enrolling students in high-level academic courses

The percentages of students taking mathematics and science courses above the graduation requirements have more than doubled since 1996. The percentage of students taking extra mathematics courses rose from 31 percent in 1996 to 73 percent in 2004. The percentage completing science courses above the requirement increased from 37 percent in 1996 to 78 percent in 2004. Seventy-six percent of career/technical seniors in 2004 took extra mathematics, while 78 percent of this group took extra science.

Beginning in the 2004-2005 school year, all students will be enrolled in career academies where they will complete at minimum the academic requirements for a Core 40 diploma — Indiana's standard for a challenging high school curriculum. The diploma represents four credits

in English, at least three credits each in college-preparatory mathematics and science, two and a half credits in social studies, and at least four credits in a career field of study.

Career academies

With funding from the Indiana Department of Workforce Development, the school is developing a system of six career academies: Engineering, Manufacturing and Industrial Technology; Art, Design and Communication; Health Services; Human Services; Business and Information Technology; and Agriculture and Natural Resources.

The first academy — Engineering, Manufacturing and Industrial Technology — will open in fall 2004. One academy will be added each year. The cornerstone of the engineering academy will be Project Lead The Way, the challenging pre-engineering program of study currently available to Owen Valley students through the SREB's school improvement initiative.

Students will complete grades 10 through 12 in an academy. This will enable them to earn eight-plus elective credits in a concentration in their major. (One Indiana credit equals two Carnegie units.) Academy students will be able to earn college credits for several courses and will be eligible to participate in a new paid internship program or in the rigorous and successful unpaid internship program already offered at the school.

Dual enrollment

Owen Valley High School has 14 dual-credit courses and is continuing to develop articulation agreements with two- and four-year postsecondary institutions. Some of the dual-credit courses are in mathematics and science.

In the fall of 2004, Owen Valley High School students were enrolled in six courses that offered dual credit from Indiana University: literature (19 students), composition (35 students), calculus (17 students), chemistry (45 students), history (24 students) and another history course (24 students). Students were taking eight courses that offered dual credit from Ivy Tech State College: geometry (177 students), intermediate algebra (102 students), college algebra (87 students), computer applications (70 students), technical writing (54 students), beginning childhood development (84 students), curriculum in early childhood development (27 students) and accounting (28 students).

“Students and their parents see the worth of being able to enter a college or tech school early at a reduced cost,” McBride said. “Dual enrollment is another reason that students are selecting higher-level math and science courses.”

Keys to a successful guidance program

Owen Valley High School has learned that it is okay to start out small and to build a program until it becomes embedded in the culture and everyday routine of the school. “A strong guidance program must have commitment, dedication and teamwork from counselors and teachers and support from the administration,” McBride said. It helps to utilize human resources in the school and the community. “Parents will be part of the team if you ask them,” she said. “Business and civic leaders will participate if you request their help.”

Reaching out to parents and the community

The school makes a special effort to involve parents in the guidance and advisement process. In addition to inviting them to attend scheduled events with their children, the school hosts a parent enrichment seminar in conjunction with local businesses and agencies. The emphasis is on parenting older children. Experts lead discussions of topics such as avoiding abusive situations, planning for college expenses, detecting and responding to substance abuse, selecting a college, and improving the quality of family time.

“We want parents to know that we are partners in the education process and that we truly care about each student,” McBride said.

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Teenagers perform like professionals in a high-quality work-based learning program supported by the school and businesses

Work-based learning at this comprehensive Maryland high school is designed for students who are serious about academic and technical achievement and are pursuing a strong academic and career/technical program of study. More than 60 companies provide opportunities for students to complete formal training plans developed by the employers and the school. Students' scores on the High Schools That Work Assessment improved between 2000 and 2002 in reading, mathematics and science. Employers gave students 95-plus ratings in four critical areas: technical skills, workplace readiness skills, application of skills and learning new skills.

The work-based learning program at Queen Anne’s County High School in Centreville, Maryland, was launched eight years ago after employers said the school’s graduates needed more practical job experiences. Since then, a team of administrators, teachers and students — headed by Bernice Hammond, the county’s director of career and technology education — has worked diligently to make the program a purposeful component of high school studies. Students, parents, teachers, employers and the community want a quality work-based learning program.

Dave Montgomery, coordinator of career/technical education at the high school, headed a focus group that helped the school improvement team develop and implement a work-based learning plan that has produced positive results. The plan was designed to:

- develop and maintain a program supervised by school and work-site personnel;
- develop structured training, mentors and evaluation procedures at job sites;
- develop smooth career pathways that connect school-based learning and work-site opportunities;
- require students to develop short- and long-range goals; and
- require students to learn how to prepare applications, write résumés, interview with potential employers and develop portfolios containing employability profiles.

“I am convinced that students display more professional conduct in the classroom and on the job as a result of work-based learning,” Montgomery said. “This in turn leads to more learning at school and in the workplace.”

Students excel in reading, mathematics and science

Queen Anne’s County High School is a comprehensive high school with an enrollment of 1,100 students in grades nine through 12 entering from two middle grades schools in the county. It offers approved career/technical programs in five broad clusters. Work-based learning programs — including directed work experience, internships, supervised career orientation and special populations transitioning — are available to qualified students.

Career/technical students participating in the 2002 *High Schools That Work* Assessment showed improvement in all three areas — reading, mathematics and science. They had a mean score of 284 in reading, up from 279 in 2000; 303 in mathematics, an increase from 300 two years earlier; and 293 in science, a gain of three points from 2000.

A survey of work-site supervisors who provided work-based learning opportunities for 251 Queen Anne’s County students in 2002-2003 showed that these students received 95-plus percent ratings in four critical areas: technical skills, workplace readiness skills, application of skills and learning new skills.

School credits

Students at Queen Anne’s County High School can earn eight credits per year and 32 credits while in high school. All students are encouraged to earn at least one English, mathematics, science and social studies credit per year.

The school offers career majors in five broad clusters: health and human services; engineering, mechanical and construction technologies; arts and communication; business management; and biological, environmental and natural resources technology.

Second-semester 11th-graders and first- and second-semester 12th-graders can apply for work-based learning opportunities with employers in the students' areas of study. Students who are chosen for the program spend from 10 to 15 hours per week at the work site.

Students are serious about academic and career studies

Work-based learning at Queen Anne's County High School is designed for students who are serious about academic and technical achievement and are pursuing a strong career and educational program of study. Participating students must be passing all academic and career/technical courses and must have good attendance and punctuality records.

Each student assembles an employability portfolio that includes a résumé, sample letter to an employer, an evaluation by a work-based learning employer, certificates and awards, certifications, progress reports, proof of career-area competencies, and other documents related to the student's preparation and experience.

Students in internships and supervised work-based learning programs are required to complete a rigorous set of assignments that connect schoolwork with the responsibilities outlined in the job plan. Teachers develop assignments and evaluation guides aligned to the Maryland Core Learning Goals and Maryland Skills for Success criteria.

As in real jobs, students interviewing for internships and work-based learning positions are hired only if they meet the employers' business needs. In return for dedicating themselves to school-based and work-based learning, students receive credit toward graduation and a salary at least commensurate with entry-level skills.

One Queen Anne's County High School student described work-based learning as: "I expand skills learned in school and apply them in the real world. My supervisor introduces me to new skills on the job and checks to see that my performance meets company standards."

The school prepares students for work-based learning by setting standards for quality work in classrooms and laboratories. "We teach skills that help young people grow and mature on the job," Montgomery said.

Employer participation

Each year, more than 60 companies provide work-based learning experiences for students in high-demand career fields such as construction, agriscience, automotive, health occupations and business. Employers agree in writing to guarantee work-based learning experiences for a certain number of students annually. No student has to wait for work-based learning. When a student is ready, a slot is available.

Maryland companies that invest in students' futures through work-based learning are eligible for state tax credits based on the number of students employed for a minimum of 200 hours during a tax year. The credit amounts to 15 percent of the wages paid to students. **To be eligible, employers must offer approved, paid work-based learning programs that include structured, employer-supervised learning experiences for students.**

Each student completes a formal training plan developed by the employer and the school. The plan ensures that students' experiences are real, meaningful and aligned with the school's career/technical program. It also lists specific work experiences that the student will gain in the program.

The employer agrees to assign one member of the organization (a journeyman, a foreman, a supervisor or another highly qualified employee) to be responsible for training and mentoring students at the work site. These individuals make sure that the training plans are followed and that the specific tasks are performed.

Employers and teachers evaluate the students

Work-based learning coordinators have produced thick manuals of forms and procedures outlining the responsibilities of students, parents, teachers and employers. Students know what they will be expected to learn in the program, how they will be expected to behave on the job and how they will be evaluated on their school and job performance.

Students keep a daily journal of hours worked, salary earned, task(s) assigned and skills acquired. In addition, the work-based learning coordinators visit work sites to observe the students as they perform their duties.

Employers provide written reports of students' progress in gaining certain competencies on the job. The reports tell the school's career and technology department whether the students are employable at the current level of training. If not, the school and the employer cooperate on a plan of action for the classroom and the job to make sure the students acquire the knowledge and skills needed to become productive employees.

Students' employers rate them and do final evaluations of job performance. The rating scale ranges from one to four, with one being unacceptable and four being excellent. Students are rated on attendance, punctuality, cooperation, courtesy, accuracy, work habits, personal appearance and job knowledge.

Often, employers indicate on the final evaluation that they have offered full-time jobs to the students after graduation. "Virtually all students are offered full-time employment," Montgomery said.

Classroom teachers fill out weekly reports that the work-based learning coordinators use in monitoring students' academic progress. If a student's grade falls below a "C" in any class, the student must terminate his or her employment and return to a full-time classroom schedule at the school.

Employers are enthusiastic about the program

Employers are generous in their praise of the program. The Director of Human Resources for Dixon Valve and Coupling Company said, “I have found the program to be run very professionally with an eye on developing students for the work world. The academic and career preparation at Queen Anne’s County High School creates a young person who is prepared to work at the level necessary to keep business competitive.” The company shows its support in a number of ways, including offering scholarships and tuition reimbursement for students to pursue college or technical classes during the school year.

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Students line up to attend a comprehensive career/technical school that offers a challenging academic program of study

All academic courses at this full-time technical high school in rural Delaware are taught at the college-preparatory level and are aligned with state standards. School leaders review the curriculum to make sure it addresses the standards and provides the level of education needed by students to succeed in college, a career or both. The career/technical curriculum contains integrated academic content and is based on industry standards. The percentages of students meeting the High Schools That Work performance goals rose by 41 percentage points in reading, 24 percentage points in mathematics and 30 percentage points in science between 2000 and 2002.

Sussex Technical High School in rural Georgetown, Delaware, underwent an “extreme makeover” in 1991. The school has demonstrated to the state and nation that career/technical students can excel in an environment of rigorous academic and technical studies.

The school’s most dramatic improvement was the introduction of a highly structured and sequential program of study consisting of tough academic courses and industry-based career/technical studies. Prior to 1991, the school was a shared-time vocational center where no academic subjects were taught.

“Our curriculum has only one level,” Principal Sandra Walls-Culotta said. “It meets the standards of a college-prep program of study and is aligned with Delaware’s state standards. We review the curriculum every two years to make sure it addresses the standards. The only thing students are expected to choose is a career/technical concentration or major.”

The focus on rigorous standards begins when a student enrolls at Sussex Tech and continues throughout high school. The school’s goal is to increase students’ higher-order thinking and problem-solving skills by relating academic content to real-life experiences.

Instead of scaring students away, the school has flourished in an atmosphere of high expectations and high achievement. Enrollment has more than doubled since 1991 and only 300 of 600 applicants are accepted each year.

Sussex Tech accepts students for grades nine through 12. The students come from 10 public middle grades schools, five private schools and one charter school in the county. Seventy-seven percent of the students are white, 19 percent are African-American and the other four percent are Hispanic, Native American or Asian. Thirteen percent of students are enrolled in special education and 23 percent qualify for free or reduced-price lunches.

Student achievement is the best advertisement

The school's best advertisement is student achievement. Before the massive overhaul, Sussex Tech was in a downward spiral. Students were testing at a dismally low level; enrollment was declining rapidly, and teachers were losing their jobs because they were no longer needed.

In a dramatic turnaround, the school has excelled in important ways:

- The percentages of career-oriented students meeting the reading, mathematics and science goals on the *High Schools That Work* Assessment grew considerably between 2000 and 2002. (See Table.)
- Fifty-four percent of students met or exceeded the writing standards in the Delaware Student Testing Program in 2002. The state mean is 49 percent.
- Almost half of Sussex Tech students took the SAT in 2002. The mean scores have increased steadily during the past 10 years.

Table
Percentages of Career-oriented Students at Sussex Technical High School Meeting the *High Schools That Work* Performance Goals

	Reading	Mathematics	Science
2000	44%	57%	43%
2002	85	81	73

Source: *High Schools That Work* Assessment

Constant improvement

Sussex leaders and teachers believe in constant improvement. A major effort has been under way for the past five years to review all courses in order to identify weaknesses and strengthen content. All teachers use a common template to revise courses and develop new ones.

Each course syllabus contains a number of items, including a course description, lists of textbooks and references, the date of the last course revision, major course objectives, student performance objectives, integrated subject areas, and integrated projects and activities. The syllabus also contains classroom expectations and requirements; classroom procedures and rules; policies for homework, grading, make-up work and using the Internet; and explanations of how state standards are integrated into the curriculum.

School leaders conducted teacher focus groups and analyzed state and local test data (including the *HSTW* Assessment and Teacher Survey) to determine gaps between what was being taught and what students were learning. Teachers in all areas found that they needed to

revise their curriculum. As a result, teachers decided to develop a curriculum scope and sequence for each program area. They also created common course evaluations and assessments, including common end-of-course tests for all courses in most departments.

Making all four years of high school count

In 1991 the school adopted the *HSTW*-recommended curriculum of high-level English, mathematics and science courses. Students had to complete 22½ credits for graduation. In a new move, the school will require students beginning with the class of 2007 to complete 28 credits for graduation (made possible by an eight-period block schedule). Students take four college-preparatory English/language arts courses, at least three (41 percent of students take four) mathematics courses and three laboratory-science courses. They earn 10 credits in a career/technical concentration.

“Curriculum revision at Sussex Tech is an ongoing and never-ending process,” said Sandra Falatek, director of instructional services for the Sussex Technical School District. “The day a school stops doing curriculum revision is the day it stops moving forward.”

During the past five years, English/language arts teachers have rewritten the four-year English curriculum, while science teachers have begun field-testing a revision of the first two years of the science curriculum.

Mathematics teachers have upgraded the mathematics curriculum twice. Currently, every freshman is required to take either Algebra I, Algebra I Plus or Geometry. Algebra I Plus is mandated for students who did not score at the proficient level on Delaware’s eighth-grade mathematics exam. Algebra I Plus is a 90-minute “double dose” (twice the regular class time) in which students study the same content and meet the same standards but receive extra help to meet higher expectations.

Among career-oriented students who participated in the 2002 *HSTW* Assessment, 46 percent were taking calculus as seniors. Other courses that students take in the 12th grade are Trigonometry and Advanced Mathematics IV.

A revised career/technical curriculum

When Sussex Tech leaders and teachers reviewed the career/technical curriculum, they discovered that the courses were inadequate to prepare students for the expectations of business and industry. They took action to increase the career/technical requirements from six credits to 10 credits in a concentration. Students select from four demanding career clusters: automotive technologies, communications and information technologies, health/human services technologies, and industrial/engineering technologies.

The career/technical curriculum is integrated with academic knowledge and skills and is based on industry standards. Many courses allow students to receive postsecondary credits at colleges and universities.

Support for teachers and students

A school that upgrades its curriculum needs to provide many support systems for teachers and students. Sussex Tech offers the following assistance:

Support for teachers — A teacher from each academic area serves as a content specialist to help career/technical teachers establish goals and develop applied and integrated lessons that build students' academic skills. In addition, the school has been organized into clusters so that teachers can work and plan together. Staff development focuses on the needs of students and teachers.

Support for students — After-school tutoring is available to any student needing assistance or wanting to improve in English, mathematics and science. Extra-help classes also are available after school. They provide additional instructional time for ninth- and 10th-graders in reading, writing and mathematics. A student assistance team composed of teachers, administrators and counselors meets monthly to review students' progress and to recommend assistance for those who need it.

Explaining the curriculum to students and parents

Students and parents know what to expect at Sussex Tech from the beginning. The school holds an open house each fall to explain the curriculum to eighth-graders interested in attending the school the following year. School personnel visit the middle grades schools and meet with parents of incoming freshmen at school assemblies and at home.

Ninth-graders enter school two days early in the fall. This allows them to become familiar with the campus, school policies and procedures, and their personal schedules before the older students arrive for the new school year.

The value of an integrated curriculum

Integrated learning is a priority for students at all grade levels and across all programs at Sussex Tech. Scientific inquiry is a popular method for connecting course work to real problems, issues and projects.

Students are expected to do project-based learning at every grade level. Ninth-graders explore careers in six technology programs and 11th-graders complete comprehensive individual projects. The integrated approach culminates with a senior exhibition of mastery. This assignment requires 12th-graders to develop and present integrated projects that represent high-level academic and technical skills.

Bringing everyone on board for higher achievement

It took a couple of years to get students to recognize that they needed to work hard to meet higher standards. Now, most students see the importance of completing a challenging curriculum and decide to stay at Sussex Tech. Leaders and teachers are committed to a high-quality, integrated education that gives students a competitive edge in careers and in postsecondary education. They will continue to evaluate the curriculum and make changes to meet students' needs.

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Student achievement underscores the value of integrating academic and career/technical knowledge and skills

Every career/technical teacher at this Kentucky high school conducts integrated learning activities with their colleagues in English/language arts, mathematics and science. The activities range from a complete class — such as a new integrated agribiology class — to units linking academic and career/technical studies. The school has won recognition from the state for progress in meeting the school improvement goal and students' scores have exceeded state averages on tests of reading, mathematics and science. The percentages of career-oriented students meeting the High Schools That Work performance goals more than doubled in reading, and increased in mathematics and science between 2000 and 2002.

Good things are happening for students at Woodford County High School in Versailles, Kentucky. As teachers find innovative, practical ways to incorporate academic skills into career/technical courses, students are scoring increasingly higher on state and national tests of reading, mathematics and science.

“It has not been difficult to get our career/technical instructors to teach academic skills,” said David Bird, coordinator of career/technical education. The faculty willingly focuses on teaching advanced academic skills. They show how to use these skills in career/technical fields and reinforce the importance of knowing how to read, write and use algebra and geometry in everyday situations.

Woodford County High School enrolls 1,150 students in grades nine through 12. Ninety-two percent are white; the remaining students are African-American with a small but growing percentage of Hispanic students.

Versailles is midway between Lexington and Frankfort (the state capital) but is considered part of the greater Lexington area. The community is “rural affluent” with many white-collar jobs and a strong farming economy based on tobacco and the horse industry.

Woodford County High School requires 26 credits for graduation, including 17 mandatory credits and nine electives. The required academic courses include four English/language arts courses, four mathematics courses (including Algebra I and geometry) and three science courses, plus one credit in computer technology.

For their elective courses, students may choose majors in English, mathematics, science, social studies, arts and humanities, foreign language, and in the following career/technical areas: agriculture, industrial technology, business, marketing, family and consumer sciences, health sciences and technology education, and career pathways.

Reaping the rewards of using academic skills in career/technical courses

“Our students benefit greatly from technical classes that are encased in a strong academic framework,” said Principal Sam Watkins, who was named Kentucky Principal of the Year in 2002. “Our scores on the Kentucky Core Content Test for the past two biennials have exceeded our improvement goal, giving us a state designation as a reward school.”

The reward designation is based on the school’s progress toward the goal of having an academic index of 100 by 2014. The school’s academic index rose from 56.9 in 1999 to 69.9 in 2003. The designation also takes into consideration a specific decrease in the percentage of novice scores and a decline in the dropout rate.

The Kentucky Core Content Test (KCCT) is the most important component of Kentucky’s Commonwealth Accountability Testing System (CATS) in terms of its contribution to a school’s academic index. Woodford County High School students’ scores increased in reading, mathematics and science between 1999 and 2003. The mean scores rose from 64 to 76 in reading, from 52 to 65 in mathematics and from 53 to 65 in science. All three scores exceeded the state averages in those subjects in 2003.

Woodford County High School students who took the practical living/vocational studies portion of the KCCT had a mean score of 84 in 2003 — the highest in the history of the school and eight points higher than the state average. “Fifty-nine percent of these students scored at the proficient or the distinguished level,” Watkins continued. “These scores are testimony to our progress in technical courses.” (See Table 1.)

The effects of integrated academic and career/technical learning are evident in the writing portfolios that the state requires of all graduating seniors. English and career/technical teachers work together to make sure students have quality writing samples in their portfolios.

Table 1
Woodford County High School Students' Progress on the
Kentucky Core Content Test (KCCT)

	Reading	Mathematics	Science	Practical Living/ Vocational Studies	Total Writing	Total Academic Index
1999	64	52	53	75	54	56.9
2003	76	65	65	84	67	69.9
2003 State Average	71	64	64	76	64	—

Source: Kentucky Core Content Test

Each student keeps a file of his or her best work throughout high school. The pieces are turned in each term and are graded. Seniors choose the very best for their portfolios. Each portfolio must contain five pieces: a formal letter to the portfolio reviewer, a memoir or personal narrative, a poem, a feature article, and two “transactive” pieces from classes other than English. All teachers at the school have participated in staff development to learn to grade the portfolios.

The portfolio grade is factored in along with the writing on demand that students do on the KCCT to produce a total writing score. Woodford County High School’s total mean writing score improved from 54 in 1999 to 67 in 2003. The state average in 2003 was 64.

Woodford County High School students participating in the *High Schools That Work* Assessment showed healthy increases in their scores and exceeded all three *HSTW* performance goals — reading, mathematics and science — in 2002. Between 2000 and 2002, students’ mean scores rose from 252 to 290 in reading, from 299 to 309 in mathematics and from 287 to 309 in science. The percentages of students meeting the *HSTW* performance goals more than doubled in reading and increased in mathematics and science between 2000 and 2002. (See Table 2.)

Table 2
Percentages of Career-oriented Students at Woodford High School
Meeting the *HSTW* Performance Goals in 2000 and 2002

	Reading	Mathematics	Science
2000	30%	60%	51%
2002	72	71	70

Source: *High Schools That Work* Assessment

These students said their school does an outstanding job of blending academic and career/technical knowledge and skills to beef up their preparation for postsecondary education and careers. They agreed that their career/technical teachers stress reading, writing and mathematics and computer skills in completing projects and assignments in career/technical areas.

Implementing the integrated learning aspect of the school improvement plan

As part of the school improvement plan, every career/technical teacher conducts integrated learning activities with English/language arts, mathematics and science teachers. The activities range from a complete class (integrated agribiology) to individual units linking courses such as geometry and drafting, biology and medical terminology, mathematics/science and animal science (aquaculture), and physics and agriculture.

Woodford County High School is a pilot site for Integrated Agribiology, a life science course that meets the Kentucky criteria for either a life science credit or a science elective. It also serves as an agriculture class. The course teaches students the biology curriculum from an applied perspective. While this class meets the science standards, it is housed in the career/technical education department and addresses core content for the career/technical discipline and for science.

The school's agricultural mechanics career major is a big success in the school and the community. "Unlike many programs that rely on static examples to teach career/technical concepts, this program involves students in operating a full-service school-based enterprise," Bird said. Students repair and maintain machinery and equipment brought to the school from working farms and construction sites. They read and interpret technical manuals daily to diagnose problems and to disassemble and repair equipment. The "business" works on more than \$800,000 worth of equipment per year. "Where else would you find four students who came to school for two days over the Christmas holidays just to continue to work and learn?" Bird asked.

All career/technical teachers at Woodford County High School use open-response questions that cause students to write in class and on tests. The entire career/technical department has been trained to evaluate students' work.

Examples of using academic skills in career/technical classes

Career/technical teachers find many ways to blend academic content with technical knowledge and skills. Here are a few of these methods:

Reading and writing in career/technical courses

Linda Cook, **computer science and business education** teacher, assigns a reading-for-fun project in which students read a book of their choice (that hasn't been read in English/language arts) and write two-page summaries. Students have six weeks to read their books and create reports using a word processing program. Students become accustomed to doing much research and writing many reports in Cook's classes. She makes daily writing assignments of programs, brochures, reports, open-ended responses and essays. Students select software programs and write technical manuals on how to use them. They write versions for beginning, intermediate and advanced users.

Walter Cunliffe's **business education students** read from the text and the Internet every day. They also read and report on assigned books, such as *Nickel and Dimed — On (Not) Getting By in America*, a current affairs book by Barbara Ehrenreich on the struggles of workers in low-level jobs. Cunliffe's **desktop publishing students** write summaries of classroom activities, such as computer animation. Their portfolio entries have included film reviews and critiques of the Yahoo Internet search engine.

Health science teacher Faye Daniel requires students to read a daily newspaper in class. Students research facts and learn about new developments in medical practice. Daniel's students in **advanced health sciences** write portfolio articles on topics such as their work-based learning experiences, while students in **medical science** develop written descriptions of how to perform certain medical procedures. Students in **introduction to health science** use their knowledge of anatomy and physiology to write articles for the local newspaper or lesson plans to be used in the instruction of elementary students.

"Busy Bee" is a Woodford County High School program for children ages three to five. It meets on Monday, Wednesday and Friday mornings. Instructor Chris Bott's **child care** students get experience in teaching young children about the ABCs, numbers, shapes and time. The high school students develop lessons that include a story, a craft and a song in addition to the daily activities of saying the Pledge of Allegiance, reciting the ABCs, telling time and identifying the day of the week and month. Bott provides curriculum-related books for students to read and discuss. Students write extensively, including letters to parents, invitations and announcements of events — real-life products that make a pre-school work.

Using mathematics in career/technical courses

David Bird requires his students in **agricultural mechanics** and **agriculture production** to know how to solve mathematics problems without using calculators. They never know when they will need to "do problems in the dust on the hood of a pickup truck" when figuring the cost of a repair job or making adjustments to a sprayer.

In the agricultural mechanics shop, students measure and calculate engine bores to one-thousandth of an inch. They also use flow meters and pressure gauges in making complex hydraulics repairs.

Students in Cook's **business education** classes use mathematics knowledge and skills to make cables for computer networking. The "cable guys" sell their products to other schools and members of the community. Cunliffe's business education students use mathematics in creating and updating imaginary stock portfolios and calculating percentages of gain or loss from their investments.

All of Daniel's **health science** students use the metric system — a must in the medical field. They use mathematics in learning to measure patients' blood pressure, temperature, pulse rate, respiration, and fluid intake and output. They also learn the mathematical aspects of daily patient care in a variety of health careers. They review fractions and decimals as a reminder that mathematics is a vital part of the health career field.

Reading and interpreting technical books and manuals to complete projects

Teams of students in the agricultural mechanics program may read hundreds of pages of complex technical data to determine how to increase the strength of a \$20,000 backhoe someone has asked them to fix. They refer to technical service bulletins to decide how to recommend upgrading the backhoe and whether the improvements have already been made. They consult other manuals to formulate a hypothesis for doing the repairs.

Cook's **computer** students have weekly lessons on A+ computer certification. The students must be able to read and find the information they need in a 900-page book of concepts and practices.

Daniel's **medical science** students read technical procedures manuals to preview the hands-on skills they will learn in clinical studies.

Using computers to do career/technical assignments

Cook's students use computers daily to complete assignments. They do research; use word processing; prepare spreadsheets, charts and graphs; and create Web pages and multi-media projects and presentations. Daniel's lesson plans contain computer-based assignments and class participation. Students use classroom computers regularly to check on medical terminology and other information for their reports and projects.

Cunliffe requires students in **accounting** and **desktop publishing** classes to use computers every day to complete assignments. His students do research on computer pioneers and write reports on the technical contributions they made to the computer industry. His **marketing** students create PowerPoint presentations on products — such as lighting fixtures or computer programs — related to their career/technical fields.

Child care students teach a lesson to pre-schoolers on the computer and use computer skills such as PowerPoint to provide information. The Internet is an important tool in these classes.

Medical science students have access to 10 computers in the classroom and others in the school computer laboratory. They use the computers regularly to study medical terminology, anatomy and physiology. They also go online to find information about the medical field. The medical terminology class is totally computerized through health education software programs.

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Work-based learning program is carefully structured and closely monitored for student success

A comprehensive technical high school in southern Pennsylvania keeps close tabs on its work-based learning students to ensure that they excel in academic studies and receive maximum benefit from work-site learning experiences. Career-oriented students participating in the High Schools That Work Assessment posted gains in reading, mathematics and science between 2000 and 2002.

Students and employers appreciate the fact that the work-based learning program at the York County School of Technology in York, Pennsylvania, is carefully structured and closely monitored. There are no surprises in the program — students, parents, employers and school coordinators know their responsibilities and agree to carry them out.

School-to-career coordinators at the school place 100 career/technical students per year in the program. These students adhere to formal training plans outlining what they will do each day or week of the work-based learning experience. For example, a student in the manufacturing/transportation academy would be expected to do the following things:

Day one — Review the company's safety procedures.

Weeks 1-3 — Perform specific job duties under the close supervision of the company's training supervisor.

Week 4 and ongoing — Perform job duties in an increasingly independent manner and make progress in using academic and technical competencies.

Ongoing — Follow established safety practices, procedures and Occupational Health and Safety Administration (OSHA) standards.

Students' academic studies are very important. The student-learner must pass required academic courses to graduate and must maintain good grades during work-based learning. "Graduation comes first," said Connie Sohnleitner, guidance counselor and former school-to-career coordinator. "If a student is not passing, he or she is put on probation. If the grades don't improve, the student is removed from the program." This serves to reinforce the seriousness of the academic learning connected to the work-based learning.

School blends academic and technical studies

Located in south central Pennsylvania, York County School of Technology is a comprehensive technical high school offering both academic and technical courses in grades nine through 12. Students come from urban, suburban and rural settings in 14 districts in York County. The school enrolled 1,386 students in 2003-2004, including 85 percent white students, eight percent African-American, six percent Hispanic and one percent American Indian and Asian.

Every student at York County School of Technology enrolls in one of five career academies: Construction; Arts and Consumer Services (cosmetology, culinary arts and visual communications pathways); Health and Human Services (dental occupations, health occupations, early childhood education and protective services pathways); Engineering; and Manufacturing/Transportation (manufacturing and transportation pathways). After rotating through the various programs in an academy, each student enrolls in a specific technical program.

As part of the school's career academy model, students receive some of their English, mathematics, science and social studies education in technical laboratories under the direction of technical and/or academic teachers. All teachers in an academy work closely together and share common facilities and planning time.

Making progress on state and national tests

The percentage of students at York County School of Technology scoring at the proficient level or above on the Pennsylvania System of School Assessment (PSSA) reading test for students in grade 11 increased from 17 percent in 2000 to 32 percent in 2003. The PSSA is administered annually to measure how well the state's students are learning at certain grade levels. York County School of Technology has developed guidelines for improving students' scores. The effort includes requiring remediation in reading, writing and mathematics, and providing a re-testing program.

In 2002, 35 percent of seniors at York Tech earned Pennsylvania Skills Certificates for demonstrating high skills in their chosen technical areas. The certificates are based on students' performance on the National Occupational Competency Testing Institute (NOCTI) job-ready exams designed to measure knowledge of basic procedures, including the identification and use of terminology and tools. The state of Pennsylvania requires all career/technical completers to take the NOCTI tests. The percentages of York Tech students who received skills certificates exceeded the national average in seven of the school's technical programs: computer programming, fashion design, graphic arts, health assisting, marketing, mechanical drafting and precision machining.

The achievement of career-oriented students who participated in the *High Schools That Work* Assessment increased between 2000 and 2002. These students' mean scores increased from 249 to 278 in reading, from 283 to 297 in mathematics, and from 254 to 293 in science.

The advances on the *HSTW* Assessment took place in a two-year period after the school joined *HSTW*. "We worked hard to involve teachers, students, parents and the community in the *High Schools That Work* improvement design," said Guidance Counselor Tom Uricheck. We made changes in curriculum, instruction and guidance services to increase student achievement."

Preparing students for work-based learning

York's school-to-career coordinators meet with career/technical students in small groups each spring to discuss the requirements for work-based learning and to help them begin to line up jobs and do paperwork for the coming year. The students report to the job site during each technical week of the year. Technical or shop weeks alternate with academic studies at York.

For the first time in 2003, the program included 40 juniors who met the qualifications. “We want to make it possible for 11th-graders to work for the same employer during the fourth quarter of their junior year, over the summer and in the senior year,” Sohnleitner said. This amounts to an extra six months of experience.

Another activity that leads into work-based learning is the school’s job shadowing program for students. The program gives students in grades nine through 11 a chance to improve their job skills and to become familiar with what is needed in the workplace.

Ninth-graders are required to visit businesses related to their chosen career fields. For example, students in family and consumer sciences — an academic course that all Pennsylvania high school freshmen are required to take — spend a minimum of five hours at a job site. They interview employers to get a thorough understanding of the education needed to do the jobs and then write reports and make oral presentations in class.

Clear expectations for everyone

Expectations for students, the school, employers and parents are clearly defined:

Students’ responsibilities — The student-learner agrees to maintain good grades, adhere to company policies and procedures, attend school and the job regularly, and report any job problems to the company mentor and the school coordinator. Each student turns in a weekly work form of hours worked and tasks completed, and a monthly rating sheet of employers’ evaluations of job performance.

“We expect students to report any technical or personal problems to their mentor and their coordinator,” said Gigi Warner, school-to-career coordinator. “This allows us to address potential problems earlier rather than later.” For example, if an employer tells the coordinator about a potential problem at the work site, the coordinator meets with the student and the appropriate academic or career/technical teachers to resolve the possible hurdle. In the same vein, the coordinator meets with teachers to arrange for extra help if students are underperforming in academic subjects. If a student needs a boost in a technical area, he or she may temporarily be returned to a technical program laboratory to develop needed skills.

The school’s responsibilities — The student-learner receives job-related instruction — including information on safety — prior to job placement. One of the coordinators visits the student and the training supervisor regularly at the work site to evaluate what the student is learning. The coordinator also investigates the possibility of an apprenticeship for the student after graduation.

The entire group of work-based learning students meets with the school-to-career coordinators once a month to discuss topics such as effective communication skills, team building, goal setting and safety. The coordinators use this time to reinforce the connection between school-based and work-site learning.

The coordinators participate in activities designed to promote the program and enlist community support. They make presentations to the chamber of commerce and other community groups, meet with potential employers and invite company representatives to visit

the school. They also conduct workshops to acquaint career/technical teachers with the work-based learning opportunities available to their students and take part in school conferences to orient parents to the program.

A local radio station publicized the program by selecting outstanding students to profile on the air. The broadcaster described one student this way:

“Krystle Jo Labr is a junior in the auto collision repair technology program at York Tech. When Krystle first visited the school, she couldn’t choose between commercial art and collision repair. She loved art and painting but had spent extensive time under the hood. She was excited to learn that she could develop her painting skills and work in the area of custom painting in collision repair technology. Upon graduation, Krystle plans to attend the PPG Industries training center in Baltimore, Maryland, to further her custom paint skills and then pursue a one-year degree at Nashville Auto Diesel College in Nashville, Tennessee.”

The employer’s responsibilities — The employer agrees to adhere to all state and federal regulations regarding employment and salaries. A training supervisor or mentor plans a variety of work experiences to give each student a well-rounded stint in the workplace. The mentor evaluates the student monthly and sends a progress report to the student’s school coordinator.

The report rates students in seven critical areas: job knowledge — the ability to understand job techniques and procedures; work output — the work required to be proficient; quality of work — accuracy, thoroughness and related characteristics of work; safety — the ability to observe and practice safe work habits and to follow correct company procedures; judgment — the ability to think through a problem and arrive at a sound solution; reliability — the ability to carry out work as directed; and cooperation — the ability to work with and for others. The possible ratings are excellent, above average, average, below average and unsatisfactory.

In reviewing the rating sheets, school leaders have identified a definite upward trend from average to above average scores as students move through the program during the year. “We attribute this increase to students becoming more confident in their positions and expanding the academic and technical skills resulting from on-the-job experiences and interaction with employers, supervisors and co-workers,” said James A. Kraft, the school’s administrative director.

Parents’ responsibilities — Parents agree to encourage students to work hard at school and on the job. They are asked to support student-learners as they practice work behaviors such as honesty, courtesy, respect, willingness to learn, attendance, punctuality, appropriate dress, and proper health and grooming habits. Each parent agrees to work as a team member with the school coordinator and the employer to promote the student’s success on the job.

Employer participation

More than 50 local employers work with the school to welcome students into their companies for work-based learning. The career fields include construction, transportation, manufacturing, engineering, health and consumer services, and the arts.

Most of the business partners have participated in the program for many years and encourage new businesses to support the program.

Because employers helped develop the program, they have a great deal of input into it. Many of the employers serve on the school's occupational advisory committees, where they provide advice on curriculum and equipment.

When the work-based learning experience is completed, it's time to celebrate. Students, parents, teachers, coordinators and employers attend an annual recognition banquet planned by the school. Each student-learner is given a certificate of achievement and each employer receives a certificate of appreciation.

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Providing Support and Personal Relationships for Students

The final two years of high school are no day at the beach for these reading- and writing-savvy students: all take college-preparatory English

Teachers at this two-year career academy in South Carolina focus on improving students' attitudes toward reading as well as their reading and writing skills. All students take college-preparatory or higher-level English courses. Teachers, students and the community participate in projects in which everybody reads and discusses books. In both 2000 and 2002, students' scores on the High Schools That Work Assessment exceeded the HSTW performance goal in reading.

Students who enroll in the two-year program at the Academy for the Arts, Science, and Technology in Myrtle Beach, South Carolina, may not need additional courses to graduate, but they are required to take a full academic load. This includes taking high-level English courses and participating in the school's culture of reading, writing and doing literacy-enhancing projects that involve written reports and oral presentations.

The school insists on two things: no early dismissals for students and a full schedule of courses for juniors and seniors. “We believe these two decisions by our school are the reasons we have been successful in raising students’ literacy levels,” said Debby Pace, the academy’s lead English teacher.

Other schools in the district are on a 4X4 block schedule that enables students to complete many of their required courses before they enter the academy. Even though students may have met graduation requirements by the end of the 11th grade, the academy makes sure that each senior takes English, mathematics, science, social studies and possibly a foreign language. “We have found a big difference in students’ progress when they are challenged in their final year of high school,” Pace said.

The advances in reading and writing at the academy were shown clearly in the *High Schools That Work* Assessment, in which students’ mean reading scores increased from 299 to 307 in a two-year span between 2000 and 2002. (The scores exceeded the *HSTW* goal both years.) These scores and the fact that all students complete the *HSTW*-recommended curriculum of high-level English courses placed the academy in the top echelon of achievement among all *HSTW* sites in reading and literacy.

Academic courses and career/technical majors

The Academy for the Arts, Science, and Technology is open to juniors and seniors from high schools in the Horry County School District. The 2003-2004 enrollment was 340. Students attend classes in their career/technical majors every day and take four or five academic courses in an A/B block schedule every other day throughout the year.

The eight career/technical majors are advanced art, dance, digital communications, education, entertainment technology, introduction to pre-medicine, pre-engineering and theater. All academic and career/technical courses are designed to prepare students for success in further education and careers.

Teachers demonstrate high expectations for students by focusing instruction on the knowledge and application of reading, writing, research, speaking, listening and thinking skills. They also emphasize the use of technology in gathering and presenting information and ideas.

Depending on achievement, students may take courses at a local technical college and/or a local university while at the academy. In the 2003-2004 school year, 25 students were taking English 101 and 102 for six hours of credit, 22 students were enrolled in calculus and trigonometry for six hours of credit, and seven students were taking social studies classes (government, psychology and economics). The academy has articulation agreements with Coastal Carolina University for three hours of credit for students in the education major and with Horry-Georgetown Tech for three hours of credit for students in the pre-medicine major.

A strong English/language arts curriculum

Five years ago, the academy began enrolling all students in college-preparatory or higher level English courses. The action was based on the academy’s philosophy that all students can learn; learning occurs in an enriched environment with high expectations for all students;

students need fundamental academic and life skills that foster success and lifelong learning; and learning occurs and is retained best through integrated, relevant, authentic and applied experiences. All administrators, teachers and staff members at the academy share in this philosophy.

Constant reading assignments

In addition to reading textbooks required by the district for English/language arts classes, academy students must read a minimum of four novels (one per nine-week period) outside of English class each year. They also read technical materials (the equivalent of three to four books) in their career/technical majors and other classes and the equivalent of several books in doing research for their junior and senior projects. Students are expected to read non-fiction articles in newspapers and magazines for classes across the curriculum.

The school continually works to improve the reading requirements for all students. Beginning in 2003, the school required all students to do summer reading to keep their literacy skills sharp. (The district's summer reading requirement is for honors English students only.) Academy students must read one novel chosen from an approved list and write a report that is due the first day of school. With parental approval, they may also choose a second novel for summer reading. An assignment based on that novel will be completed after the school year begins. "Our goal is to require all students to read at least 10 books or their equivalent in English classes each year," Pace said.

Everybody reads and discusses a best-selling book on World War II

All students and teachers at the Academy for Arts, Science, and Technology, as well as adults from the community, participated in a schoolwide reading project focusing on NBC newsman Tom Brokaw's book *The Greatest Generation*. After local World War II veterans spoke and read excerpts from the book in a school assembly program, each student received a copy of the book and joined a book club with three or four other students. English teachers divided the book into three sections and set meeting times for discussing each section.

Before each book club meeting, students completed reading response forms like the ones used for English classroom reading throughout the year. The form asks students to develop five discussion questions about the text, to locate passages of interest worthy of discussion, to define and use 10 new vocabulary words in sentences, and to write a paragraph containing personal connections and comments about the text.

Students and teachers participated in discussions at the book club meetings. Students were graded on their response forms, their participation and final writing assignments. Each book club invited one adult from the community to join in the final discussion. A total of 45 people came to the school to talk about the book with the students and faculty.

Improving writing skills

Students have writing assignments in all of their classes at the academy. They keep learning logs in which they recall and reflect on what they have learned during the week. They also complete major class assignments calling for written reports and oral presentations. Each year, students complete at least two schoolwide projects that call for written components, media presentation components and oral presentation components.

All academic teachers make assignments that require students to write, and all English/language arts teachers require students to keep portfolios of their written work. Every reading assignment is followed by written reflection on what the student has read and learned. The reflection may be in the form of an oral discussion, a learning log, a project-based assignment, an essay or a double-entry journal.

Junior and senior projects

For the past eight years, all seniors have been required to complete an exhibition of mastery — a year-long project based on some aspect of a student’s career/technical major. The project includes a research paper and a product or performance based on the research. Students make oral and visual presentations to a panel of judges composed of teachers, parents and professionals from the students’ career/technical fields. This project is integrated into the curriculum in English classes and other academic subjects that are related to each student’s project topic.

In a literacy-building project, each junior completes at least 20 hours of community service and does research on a topic related to the service. Past community service projects have focused on Habitat for Humanity — the plight of the homeless and the need for low-income housing; nursing homes — the increasing cost of nursing care; American Red Cross — the blood donor crisis and the need for volunteers; and churches — issues affecting families or young people. Each student writes a research paper, keeps a learning log of what he or she has learned and accomplished, and makes an oral presentation on the project.

Working in teams

All teachers give students opportunities to work in teams in order to reach a goal. The purpose is to boost the employability and lifelong skills that students are expected to learn at the academy. Usually, the student is held accountable for a portion of the assignment and the team is graded on the portion that it does together.

Some examples of teamwork are book clubs in English/language arts, rocket design teams in physics, ecology projects in biology, bridge-building teams in pre-engineering, and cast and technical teams in theater. “All of these cooperative ventures are designed to help students learn to be productive individuals and team members,” Pace said.

Personalized learning

Academy leaders and teachers evaluate the English and reading skills of each new student in order to meet his or her individual needs. “We work not only on improving students’ reading skills but also on improving their attitudes about reading,” Pace said. “Students frequently read articles or books related to a career major. This heightens their interest in reading and helps them see that the school values reading across the curriculum.”

While expecting the best from all students, the academy takes into account that students come from a variety of educational, social, cultural and economic backgrounds. The school is flexible in terms of the time, place and manner in which students learn.

Teachers always are willing to make either short-term or long-term adjustments to a student’s schedule to help him or her succeed. For example, a student who is falling behind in an academic course may be removed from one of the three blocks of his major class so that he can double up in the academic subject until he catches up.

Students who need extra help are assigned to before- or after-school sessions or to staff members who have been designated academic coaches.

Assessing students’ progress

Academy leaders and teachers believe assessment should measure what a student has learned and what he or she is able to do with that knowledge. Academy teachers use a variety of assessments — portfolios, presentations, projects and performances — to measure students’ progress. Students must use a number of academic and career/technical skills to meet the requirements of projects. They must examine worthy topics, demonstrate a clear understanding and application of standards, conduct and present research, create products or perform at a high-quality level, solve problems, and think deeply about significant issues.

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It's all systems go when minority students are expected to perform at a high level

This inner-city school makes it perfectly clear to its 99 percent minority enrollment that the school's focus is on helping students achieve at a higher level. More students at this school than at high-scoring High Schools That Work sites with similar students recognize that their teachers have set high standards and expect students to measure up. Students' scores on the HSTW Assessment and on statewide tests have improved in recent years as students meet and exceed their school's expectations.

Assessing students' progress

A total of 2,074 students in the Houston Independent School District in Texas chose to attend James Madison Senior High School in 2002-2003. Some 250 of these students from all over the district enrolled in the High School for Meteorology and Space Science — Madison's magnet school.

Over 99 percent of Madison students are minorities. The percentages include 64 percent African-American students, 35 percent Hispanic and fractions of one percent Asian-Pacific Islander and white. Eighty-two percent of the students are economically disadvantaged and 70 percent are considered at risk of failing or dropping out.

Despite the statistics, all students know they will be expected to achieve at a high level; they also know that administrators and teachers are ready to help them meet high standards.

The 2002 *High Schools That Work* Student Survey revealed that greater percentages of students at James Madison High School than at high-scoring *HSTW* sites with similar demographics say their teachers create a climate that promotes higher achievement. (See Table 1.)

"We tell students that education is a good thing and that they should work hard and take pride in making good grades," said Principal Gloria Legington. The school holds a reception for honor roll students and the principal gives an award for good behavior. The number of students in the Texas Scholars Program — a cooperative venture between education and business to encourage students to take more demanding classes in high school — grew from 375 students in 2001 to 400 students in 2002.

The state requires four English/language arts courses, three mathematics courses and three science courses for high school graduation, but most James Madison students take more mathematics and science than the school and the state require. This is especially true in the meteorology and space magnet, which is based heavily on mathematics and science. Magnet students complete four years each of mathematics and science, plus one credit in meteorology and one in astronomy.

Table 1
Percentages of Career-oriented Students in the 2002
High Schools That Work Student Survey Crediting Their Teachers
 with Setting Higher Expectations

<i>Students said</i>	James Madison High School	High-scoring <i>HSTW</i> sites* with similar students
Their teachers often indicated at the beginning of a project or a unit the amount and quality of work necessary to earn a grade of “A” or “B.”	64%	48%
They usually did one or more hours of homework each day.	56	32
Teachers often set high standards and were willing to help students meet them.	60	44
Teachers often encouraged them to do well in school.	63	54

Source: Houston Independent School District

* High-scoring sites are the high schools that ranked in the top 15 percent for two or three areas (reading, mathematics and science) on the 2002 *HSTW* Assessment.

High hopes for James Madison High School students are paying off in increased achievement on tests of academic knowledge and skills. The mean scores of career-oriented students participating in the *HSTW* Assessment of reading, mathematics and science increased between 2000 and 2002. Ninety-two percent of these students met the *HSTW* performance goal in mathematics in 2002.

The Texas Assessment of Academic Skills (TAAS™) showed the same pattern of increased achievement between 2001 and 2002. (See Table 2.)

Table 2
Percentages of James Madison High School Students Passing Tests in the Texas Assessment of Academic Skills (TAAS™) in 2001 and 2002

	Reading	Mathematics
Language arts	94%	88%
Writing	91	89
Mathematics	91	87

Score: Texas Assessment of Academic Skills, 2001 and 2002

Preparing students for high school

Even before they enter Madison High School, students get a taste of what lies ahead. In 2002, the school provided a summer bridge program for students from Dick Dowling Middle School who risked failing in their first year of high school. In addition to improving their reading, writing and mathematics skills, students received an orientation to the high school's high standards.

In the summer of 2003, the school was involved in a renovation project that prevented students from attending summer school. As a result, eight teachers from James Madison went to the feeder middle grades school to do team teaching with students who needed extra help with mathematics and science before entering high school.

Setting clear expectations and providing extra help

Each teacher provides students with a syllabus at the beginning of the semester. The syllabus describes the course and includes expectations, major assignments, grading scale, projects and the tutoring process. Sixty-four percent of career-oriented students responding to the 2002 *HSTW* Student Survey said their teachers often clearly indicated the amount of work necessary to earn an "A" or a "B." This compares to 48 percent of students at high-scoring *HSTW* sites with similar students. (See Table 1.)

Fifty-six percent of Madison students, compared to 32 percent at high-scoring *HSTW* sites, said they usually do one or more hours of homework daily. One English teacher began the practice of e-mailing assignments to students' homes in addition to providing hard copies of the assignments. In that way, students who are absent can check on their work and can ask the teacher questions by return e-mail. Students can access the e-mail at home or at school. Other teachers are beginning to use e-mail in this way to keep students informed and to provide more experience with technology.

All departments provide tutoring. The department decides on the day (for example, science on Monday) and schedules teachers to be available mostly after school but also before school in some instances.

The school's Adopt a TAAS Student program identifies students who may not be able to pass the state's high school graduation tests. Each teacher is assigned two students to encourage and assist in learning the required content. These students are ones who scored low on pre-assessment tests and do not attend other tutoring sessions on a regular basis.

Creating a profile of every student

A program known as PASS (Profiler for Academic Student Success) gives teachers the full picture of every student in a course. The background information includes students' standardized and state test scores and demographic makeup (at-risk, English as a Second Language, etc.). Teachers use this information to meet one-on-one with the students and to share insights with parents on student achievement.

The principal uses the information in another way — she compares the profiles with data on how the students are progressing in various subjects. “This gives me good information for conferences with individual teachers on whether they are meeting their objectives,” Legington said.

The High School for Meteorology and Space Science

This magnet program, housed on campus, offers a rigorous college-preparatory curriculum. The 250 students in the program are required to earn four science credits (biology, chemistry, physics and space physics); one credit in meteorology; one credit in astronomy; four English credits; four mathematics credits; three credits in foreign language; four credits in social studies; and one credit in computer applications. In addition, students are able to choose from among several hands-on courses such as Geology, Environmental Science and Agricultural Science. Students take field trips, hear guest speakers and have opportunities to serve internships.

The interdisciplinary approach to teaching involves technology, mathematics, science and communications. Weathernet 2, an on-site weather station and technology laboratory, permits students to analyze real-time and historical weather data. Students use the Internet to obtain satellite weather images and to probe the atmosphere of other planets in the solar system.

Students in these magnet courses interact with the community. They visit the astronaut training program at National Aeronautics and Space Administration (NASA) headquarters in Houston and receive mentoring from professionals at the National Weather Service, environmental agencies, NASA, the American Meteorological Society and the weather centers of local radio and TV stations.

The magnet program allows students to explore careers in geology, environmental science, oceanography, broadcast meteorology, manned space flight and astronomy. Applicants are evaluated on the basis of grades, conduct, school attendance and test scores.

Ensuring input by teachers and students

The principal has organized a shared decision-making committee that meets in an open session each month to disseminate information and to address concerns of students, staff and parents. The committee has about a dozen members, including the principal, teachers, support

staff members, business and community partners (including parents), and at least two students. “The questions range from A to Z,” Principal Legington said. “Typical questions deal with ways to improve student achievement or how to handle a discipline problem.”

Legington works hard to keep teachers’ morale high so that they will want to work with each other and the students to change things for the better. The school motto is, “Together We Will Make a Difference.”

“I try to provide an environment in which there are no excuses for failure,” Legington said. “The key words are collaboration, teamwork and information. If teachers need additional resources to help their students, I find a way to provide what is needed.”

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School continues to upgrade the curriculum as students meet higher expectations

The curriculum is challenging and the standards continue to rise at this North Carolina high school with 35 percent minority enrollment. School leaders have been phasing in the following courses as graduation requirements: four English courses, four high-level mathematics courses and three science courses (students are urged to take four). Students showed gains on end-of-course tests in mathematics and science between spring and fall 2003 and the percentage of students reaching the Proficient Level in English rose from 78 percent in 2000-2001 to 92 percent a year later. In the 2002 High Schools That Work Assessment, the percentages of students meeting the HSTW performance goals were 53 percent in reading, 72 percent in mathematics and 71 percent in science.

Southwest Guilford High School in High Point, North Carolina, is known for its rigorous academic curriculum, but school leaders keep raising the bar. Beginning with the Class of 2007, all students are required to complete four college-preparatory-level English courses, four high-level mathematics courses and three science courses (four are encouraged). The Class of 2004 will need 27 credits to graduate, while the Classes of 2005 through 2007 will need 28 credits.

Furthermore, Guilford County is one of two counties in North Carolina refusing to offer one of the state’s recommended diplomas for graduation. District leaders think the state’s career-prep diploma is not tough enough, so they have opted not to offer it.

Southwest Guilford High School enrolls 1,255 students in grades nine through 12. Sixty-five percent of students are white, 24 percent African-American, six percent Asian, three percent Hispanic and two percent American Indian or multi-cultural. The school has the lowest absentee and dropout rates in the county.

Fifty-three percent of students participating in the 2002 *High Schools That Work* Assessment at Southwest Guilford High School met the *HSTW* performance goal in reading, while 72 percent reached the mathematics goal and 71 percent met the science goal.

End-of-course tests taken by students at Southwest Guilford High School reveal gains in mathematics and science. Between spring and fall 2003, students' mean scores rose from 64 to 73 in Algebra I, from 71 to 74 in Algebra II and from 69 to 71 in physical science. The percentages of students reaching the proficient level in English rose from 78 percent in 2000-2001 to 92 percent in 2002-2003. The mean SAT score for students at Southwest Guilford increased from 1011 in 2001 to 1088 in 2002 and 2003.

"I am a strong believer that students will rise to meet higher expectations and standards," Southwest's principal, Wanda Legrand, said. "When I became principal two years ago, I realized that we needed to make sure all students complete a full academic load. Practically every student is enrolled in either a college-tech-prep or a college-university-prep program of study."

English/language arts — Four units of English/language arts are required for graduation. Students select from college-preparatory English 9-12, Honors English 9-12 and Advanced Placement English 11-12.

Mathematics — Four mathematics credits are required. Students must earn credits in Algebra I and II and Geometry or Algebra I and Technical Math I and II. The fourth credit can be in Calculus, Advanced Mathematics or Statistics. There is no such thing as pre-algebra or general mathematics at Southwest Guilford High School.

Science — Students must take three science courses, but the school encourages four. The courses include College Prep/Honors Physical Science, College Prep/Honors Biology, College Prep/Honors/Advanced Placement Environmental Science or College Prep/Honors Earth Science (required). Others sciences offered are College Prep/Honors Marine Science, Honors Physiology/Anatomy and College Prep/Honors Physics.

Career/technical majors — Each student chooses one of 14 career pathways. If a student maintains an "A" average while completing a major, he or she is eligible for membership in the school's career/technical honor society.

School leaders and teachers have high expectations for all students. "We really push our students to take higher-level courses," said Assistant Principal Lori Braxton. "This has been a challenge, but we continue to work on it and see improvement." As a result of talking with parents about students' PSAT scores and programs of study, the enrollment of minority students in honors and advanced placement classes has increased over the past two years.

Southwest Guilford has developed a registration process to ensure that students take challenging courses. School counselors meet with all students one-on-one to plan and review students' four-year programs of study. Teachers in each department have created guidelines that

include recommended sequences of courses and prerequisites for each course. The purpose is to help the counselors guide the students into high-level courses. If students resist taking tough courses, the counselors meet with students and their parents to emphasize the importance of a demanding high school schedule.

“I personally sign off on all schedule changes to keep students from dropping hard courses,” Legrand said. “I talk with the students about the consequences of their choices and meet with parents as necessary.” She also doesn’t let students slack off in their senior year.

Communicating the importance of higher-level courses

The school is always working to communicate to parents that students can take more difficult courses. When a parent attends a school conference, the principal takes the time to discuss the student’s opportunities for learning. “Many parents don’t know about the higher-level courses and don’t realize that their children are eligible to take them,” Braxton said.

The school’s instructional support team is responsible for ensuring that every student takes the right courses and for answering students’ and parents’ questions about the curriculum. The team consists of the four counselors, the dropout prevention specialist, the behavioral improvement specialist, the career/technical coordinator and school administrators.

“It wasn’t difficult to get our teachers to raise standards, even though some of them needed a little nudging when they saw new faces in their honors classes,” Legrand said. “Our teachers work together to make sure students have what they need before moving to the next level.”

Staff development is a school priority in preparing teachers to help students succeed in more demanding courses. Teachers have participated in sessions on focused learning and literacy across the curriculum. The county provided technology training at no cost to the teachers.

Helping ninth-graders succeed in a rigorous high school curriculum

Before incoming ninth-graders pre-register for high school classes in February, their parents attend a Success at Southwest open house to meet the teachers and learn about the high school curriculum. This event contributes to wiser choices by students and parents and results in fewer schedule changes after registration. All students have had teacher advisers in the middle grades to help them plan their high school programs of study.

New ninth-graders spend three days during the summer at the high school. They tour the school, meet their teachers and participate in team-building activities to overcome inhibitions about entering high school. They become familiar with the curriculum and school policies concerning attendance and discipline.

A freshman back-to-school event in the fall is a showcase for all high school activities. The student resource officer reassures everyone that success is possible in a large high school.

Peer helpers from the Student Leadership Class — a group of student ambassadors who work with administrators, teachers and PTSA leaders — provide orientation and assistance to new students. They serve as role models, help students solve problems and offer tutoring after school.

Most ninth-graders are housed in one area of the school building. They have lockers near their classes and spend the first 10 days of school in a homeroom where they can ask questions about their studies.

Ninth-graders who need help with mathematics can take Algebra I in a mathematics laboratory. Teachers use the I Can Learn® mathematics program to strengthen students' skills. This computerized algebra curriculum is designed to help students learn higher-level mathematics and thinking skills and to improve their problem-solving proficiency.

Keeping on track with achievement

Each course has a syllabus that the teacher creates and distributes to students and parents at open house events and in the classroom at the beginning of each semester. Teams of teachers design common rubrics to align the content and expectations from class to class.

Every four and a half weeks, students take a benchmark test to determine if they have learned the material covered. The benchmarks were developed as an assessment and planning tool to let the administration know the status of learning in each class. A lesson-pacing guide ensures that teachers are following the North Carolina Standard Course of Study.

Extra help

Each department identifies one or two teachers who are stationed in designated classrooms to help students with their schoolwork between 3 p.m. and 4:30 p.m., Monday through Thursday. Daily review sessions help students get ready for end-of-course testing. Some students are so involved in the review sessions that they stay until 5 p.m.

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High expectations boost students' prospects for the future

This large Arkansas high school — where 25 percent of students are minorities — makes a special effort to motivate every student and to involve parents in the process. Students' hard work reflects the work ethic of the community, which is corporate headquarters for several large companies. The benefits of requiring students to take challenging academic courses show up in students' scores on the High Schools That Work Assessment and in students' responses to survey questions about clear expectations, high standards, homework and teacher support.

Springdale High School in Arkansas has a well-deserved reputation for keeping students in school and helping them excel in academic and career/technical studies. This large high school (2,700 students) has the curriculum, instruction and achievement to inspire students to reach constantly for a higher rung.

Ninety-seven percent of students who enter grade 12 at Springdale High School graduate at the end of the year. In 2003, this total was 625 of 644 seniors. "Ten of the remaining 19 had transferred from other schools and lacked the credits to graduate," explained David Kellogg, assistant principal. "They graduated after summer school." Of the nine seniors who did not graduate in spring 2003, five graduated by December 2003; two moved away and two could not be located.

High expectations for students go hand-in-hand with hard work by parents in this northwestern area of the state that embraces the University of Arkansas and the corporate headquarters of Wal-Mart, J.B. Hunt Trucking Company and Tyson Foods Inc. With a population of 50,000, Springdale is part of the sixth fastest-growing metro area in the nation. Unemployment is low at two percent.

The high school's growth reflects that of the surrounding area. A total of 2,700 students enrolled in 2003-2004, an increase of 200 students in one year. Last year's total included 75 percent white students, 18 percent Hispanic, 5.8 percent Asian and 1.2 percent African-American or Native American.

Career-oriented students' mean scores on the 2002 *High Schools That Work* Assessment remained high and over goal, including 298 in reading, 313 in mathematics and 313 in science. The mean reading score was 10 points above the Proficient level on the National Assessment of Educational Progress (NAEP)-referenced *HSTW* Assessment. Both the mean mathematics score and the mean science score were midway between the Basic level and the Proficient level. Students completing the *HSTW* Student Survey exhibited a high degree of satisfaction with the school's efforts to raise expectations and achievement. As a result, Springdale High School ranked in the top 50 among *HSTW* sites in setting high standards and helping students do their best.

No surprises

Students know what to expect in all of their classes. A syllabus in each course tells the content to be covered and rubrics show how work will be graded. Early in the semester, teachers in all courses explain what it will take to make a grade of “A” or “B.” Each department uses common assessments to standardize the requirements for an “A” or a “B.”

A homework policy makes it very clear to students, teachers and parents that the purposes of homework are to reinforce new learning through independent or parent-guided practice, teach responsibility, introduce new material (such as reading an assigned chapter), enrich and extend the curriculum, and complete assignments that were not finished during the day.

Teachers follow these homework guidelines:

- Homework must relate to classroom instruction.
- Homework is not to be assigned to punish students.
- Skills taught in the classroom are to be practiced in the classroom under the teacher’s supervision before homework is assigned.
- High school students are expected to spend approximately two hours nightly on homework.

Hard Work

The challenging curriculum at Springdale High School ensures that students exert a great deal of effort. Students are required to complete 24 credits for graduation. The requirements include four college-preparatory-level English/language arts courses, four high-level mathematics courses (including Algebra I and II and Geometry) and three science courses (including two chosen from biology, chemistry or physics). A fourth science course is strongly recommended. Northwest Arkansas Community College grants Technical Advanced Placement (TAP) credit for a number of career-oriented courses taught at Springdale High School.

Mastery Learning in Algebra and Geometry is a competency-based program that has clear standards for student achievement and multiple opportunities for students to learn mathematics skills. Low-achieving students receive extra time and extra help to meet the competency levels. Students who need more assistance at the end of the semester are re-grouped and required to repeat the course before moving on through the curriculum. Students in Mastery Algebra and Geometry are required to demonstrate and apply mathematics skills in daily open-ended questions and end-of-unit tests.

For the past three years, Arkansas has had state-mandated end-of-course tests in algebra and geometry. In the first two years, Springdale students ranking proficient on the tests had a mean score 15 points above the state average in algebra and 23 points over the state average in geometry. Teachers provide extra help and support for students who need it.

Teachers and students are trained in reading and writing across the curriculum so that these skills are incorporated into every course.

The writing process for Springdale students includes four steps: brainstorm a topic; write the first draft; revise and rewrite as needed; and submit the final copy. Teachers may require students to revise or rewrite the final copy if it does not meet standards.

Students who do not meet the proficiency requirement (a score of 200 points or above) on the 11th-grade state-mandated end-of-course literacy exam are required to complete a remediation component in the 12th grade. Senior English teachers evaluate students' individual scores to determine areas of weakness. Students who scored basic or below basic complete remediation practice exercises and re-test once a month during the first semester of the senior year. Each time a student is re-tested, he or she has the opportunity to be proficient, thus testing out of the remediation process. Students have one opportunity per month — as well as a final remediation test given during the semester exam period — to achieve proficiency.

Guiding students to take rigorous courses

The school's award-winning teacher adviser system has been in operation since 1991. Students enter the system in the spring of the eighth grade when they meet with their parents and teacher advisers to plan challenging high school programs of study. The parents meet with students and the teacher advisers each fall and spring throughout high school.

In the 11th grade, when students are firming up their schedules for the critical senior year, the participation by parents in school guidance conferences is 96 percent.

“Our counselors contact students and parents regularly to make sure the students are on track,” Kellogg said. “The counselors even keep graduation records by hand to make sure they are closely involved in how students are doing in school.”

Support for students

After the first progress report of the school year, counselors contact the parents of students who are falling behind in their studies to plan how to assist the students in learning the content. By the third or fourth week of school, Springdale's night school is under way. Certified teachers staff this successful after-school program. The cost of \$75 per course is earmarked to reimburse teachers for their time. Students also know that safety nets are available in the form of tutoring, extra-help sessions before school and during lunch, and during the summer.

Students who miss 11 or more days of school are ineligible to receive credit for their courses. These students are allowed to buy back the time by attending study sessions on Saturday mornings.

The school has a large percentage of Hispanic students whose parents have moved to Springdale to seek jobs in local industry. An “immersion” course is designed to bring Hispanic students up to speed. In addition, the school's Spanish instructors help their colleagues communicate with Hispanic students.

“Springdale High School has actively pursued the goal of raising expectations and achievement,” Kellogg said. “We will continue this process with the involvement of students, parents and staff.”

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A tradition of extra help is paying off in higher student achievement

This small school in rural North Carolina has been able to bring all of its extra-help activities under one umbrella. The package includes more counseling services and enrichment activities to nurture and support students in reaching their full potential. All teachers, the media center and college students provide tutoring services. Students participating in the after-school program have outpaced students who do not participate in the program in two important areas — end-of-course tests and the 10th-grade comprehensive test of reading and mathematics.

Swain County High School's multi-faceted extra-help program and a strong tradition of supporting students to reach their full potential is paying off in higher student achievement. This rural school in western North Carolina is measuring progress with SAT scores and *High Schools That Work* Assessment results.

"We always give our best — and then some," says Principal Janet Clapsaddle.

"Our teachers and administrators are willing to go the extra mile to help students succeed," observes Rachel Lackey, after-school program coordinator.

Fewer than 500 students are enrolled at Swain County High School. Seventy-six percent are white and 23 percent Native American Cherokee. The county is economically challenged and mostly owned by the federal government. (The Cherokee reservation occupies 84 percent of the county.)

As one of the original pilot sites in *High Schools That Work*, Swain County High School has engaged in a vigorous effort to raise standards and achievement. After joining *HSTW* in 1987, the school eliminated "dumbed-down" courses, replacing them with a challenging academic and career/technical curriculum. Eighty-three percent of students are currently completing either a college-technical prep or a college-preparatory curriculum.

Student achievement

Among students participating in the 2002 *HSTW* Assessment at Swain County High School, 91 percent scored at the Basic level or higher in reading, 76 percent in mathematics, and 78 percent in science. Sixty-eight percent reached the Proficient level or higher in reading. The combination of assessment scores and students' responses to questions about the availability of extra help placed Swain County High School in the top 50 among *HSTW* sites in providing quality extra-help services to assist students in mastering more difficult content.

Mean SAT scores have shown a gradual increase at Swain County High School since 1996, when 47 percent of students took the test with a combined mean score of 924 (479 verbal and 445 mathematics). In 2003, 49 percent of students took the SAT and had a combined mean score of 1032 (520 verbal and 512 mathematics).

Students who participate in the after-school program at Swain County High School have outpaced students who do not participate in the program in two important areas — end-of-course tests and the 10th-grade comprehensive test of reading and mathematics. An informal survey showed that participating students did four percent better on a cumulative mean score of end-of-course tests and two percent better on the 10th-grade test than students who did not receive assistance after school.

“These results show that some students have made real gains, since the after-school program includes students who have been sent there by their teachers because they were struggling in class,” Principal Janet Clapsaddle said.

A decade of after-school tutoring

“Ten years ago, we asked teachers from every department to volunteer to tutor students after school,” Clapsaddle said. They committed to spend the time from the end of the student day to the end of the teacher workday to help students catch up and move forward in their studies.”

Teachers are available to students four days a week from 2:45 p.m. to 3:30 p.m. Some teachers require students to attend the tutoring sessions if they have made a low grade on a test and need to re-test. Faculty advisers and parents urge students to seek this extra help.

The **media center** plays an important role in the extra-help system. It is open from 7 a.m. to 8 a.m. on Wednesdays and Fridays and from 3 p.m. to 8 p.m. the other three days of the week. The media coordinator, the media assistant or a teacher is available to help students during this time. Students flock to the center to use the computers, find printed resource materials or get help with their research projects. “The extended hours are very popular because many students do not have computers or Internet access at home,” Lackey said.

College students have been recruited to provide homework help from 6 p.m. to 8 p.m. three nights a week. High school students come to the school for help with assignments or call in on the Homework Help Line.

Swain County High School has expanded its **ninth-grade transition** program to include a

four-week summer class for students who may need help adjusting to high school. Students can earn one high school credit by participating in the summer program and completing follow-up activities during the school year.

Adding services and activities

“Recently, we were able to bring all of our extra-help components under one umbrella,” Clapsaddle said. “With the help of a 21st Century Community Learning Center grant, we have been able to include counseling services, add more enrichment activities for students, and name a director for the extra-help program.” The four-year grant from the U.S. Department of Education is administered by the state.

Swain County High School calls its after-school program Project EXTREME — short for “extreme west counties” of North Carolina. The purpose of the project is to offer a variety of educational and youth-development activities in a safe, positive environment.

“Research has shown that students’ grades and attendance improve when they are enrolled in an after-school program rather than left to their own devices in the hours between 3 p.m. and 6 p.m.,” Lackey said. “These programs result in fewer school dropouts and higher college aspirations,” she said.

In addition to helping students with their academic studies, Project EXTREME provides opportunities for students to improve their computer skills in preparation for the computer test required for graduation; express their creativity in writing, art and music; discuss school problems such as tardiness in a group setting with a local therapist; and explore their heritage (in the case of Native American students).

Student participation in Project EXTREME is excellent. During the past year, 407 of 480 students — a total of 84 percent of all students — used some aspect of the program. Sixty-nine percent of the participants said the program helped them become better students.

“One young woman — a senior — signed a contract with us to participate in the after-school program as a way to receive tutoring and to make up time lost from school,” Lackey said. “She was very proud when she was able to graduate with her class.”

Two conditions are vital to the success of an extra-help program, Clapsaddle said:

Faculty commitment. Involve teachers in examining data and identifying trends that suggest where extra help is needed. School principals can allocate funds for special projects, arrange for flexible scheduling for teachers who arrive early or stay late, and share success with students and teachers.

A feeling of community. Teachers must work together to help our students. Middle grades schools and high schools can cooperate in a program that involves community and school resources.

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School uses multiple strategies to provide extra help for students

Helping students meet higher expectations is a hallmark of this small suburban high school in Indiana. Time for extra help is built into the daily schedule, and teachers donate additional time to assist students. Students who said they “often” or “sometimes” received extra help had scores that exceeded the performance goals in reading, mathematics and science on the High Schools That Work Assessment in 2002. The percentages of students meeting and exceeding state academic standards for graduation are increasing annually.

Students needing extra help at Wheeler High School in Valparaiso, Indiana, have no trouble finding it. A clearly defined support system surrounds them in the form of teachers, college students and outstanding high school students prepared to deliver academic assistance at multiple times during day and evening hours.

“Our teachers have discovered the joy of working in an environment of higher expectations for all — and willingly go above and beyond the regular school day to help students meet higher standards,” Principal Thomas Taylor said.

Wheeler High School is a small suburban school located in northwest Indiana, approximately 40 miles southeast of Chicago. The comprehensive school enrolls 480 students in grades nine through 12. Eighty-eight percent of the students are white. There are small percentages of Hispanic, multi-racial, African-American, Native American and Asian students.

The community contains mostly middle- to upper-income families. Parents work in the steel mills along Lake Michigan, in business and industry associated with the mills, or as business owners and professionals working in the Chicago area. The recent restructuring of the steel industry and accompanying layoffs from the steel mills have made a big dent in the local economy.

Pushing students to take more academic courses

Wheeler High School is not content with the total number of mathematics and science courses the state of Indiana requires for high school graduation and has been pushing its students to qualify for the state's Core 40 (three mathematics and three science courses) diploma and to take a fourth mathematics and a fourth science course in high school. Higher expectations mean that more students will need extra help to reach the standards.

Wheeler's students have responded well to extra help. For example:

- The number of seniors lacking graduation credits decreased 60 percent in the past four years.
- The number of students making the honor roll increased 10 percent in the past four years.
- Sixty percent of ninth-graders who are placed in a special program to strengthen their English and mathematics skills pass the Indiana Statewide Testing for Educational Progress-Plus (ISTEP+) exam in the 10th grade.
- The percentages of students who received Core 40 (college-preparatory-level) diplomas rose from 39 percent in 2001 to 61 percent in 2003. The school's goal is to have 80 percent of students earning CORE 40 diplomas by 2006.
- The percentage of students who received Academic Honors diplomas (higher requirements than the Core 40 diploma) increased from 23 percent in 2001 to 34 percent in 2003. The school's goal is to have 40 percent of students earning Academic Honors diplomas by 2006.

Students taking the *High Schools That Work* Assessment showed big gains in reading, mathematics and science between 2000 and 2002. The school's mean scores rose from 256 to 298 in reading, from 313 to 317 in mathematics, and from 271 to 316 in science. All three of the 2002 mean scores exceeded the *HSTW* performance goals.

Career-oriented students completing the 2002 *HSTW* student survey testified to the ease of getting extra help — and the ones who said they often or sometimes could obtain extra help had higher mean scores on the *HSTW* Assessment than students who said they never or seldom could get extra help. (See Table.)

The student survey revealed some reasons that Wheeler students pursue extra help:

- Ninety-one percent said they tried to do their best work in school often or sometimes, compared with nine percent who said they seldom or never made the effort.
- Seventy-four percent said it is very important to study hard to get good grades. This compares to 67 percent at high-scoring *HSTW* sites with similar students.
- Eighty-nine percent said it is very important to make good grades to get into college.

Table
Students' Experiences in Getting Extra Help and Their Mean Scores on the *High Schools That Work* Assessment at Wheeler High School in 2002

<i>Students said they could get extra help:</i>	Percentage	Mean scores		
		Reading	Mathematics	Science
Often	56%	304	324	320
Sometimes	28	294	306	309
Seldom	16	263	287	284
Never	0	—	—	—

Source: 2002 *HSTW* Student Survey

Note: The *High Schools That Work* performance goals are 279 in reading, 297 in mathematics and 299 in science. These goals are set high enough that students reaching them will have the knowledge and skills to pass employers' exams and enter postsecondary institutions without having to take remedial courses.

Developing an extra-help system

When Wheeler High School moved to a block schedule in 1999-2000, it created an extra-help system to give students an academic boost. The 3X5 block schedule consists of three 12-week semesters. Students take five 70-minute classes with a 30-minute lunch, a five-minute "passing" period and a 15-minute required student resource time. Teachers have four 70-minute classes, a 70-minute planning period and a 30-minute lunch break.

Wheeler High School's improvement plan as required by Indiana's Public Law 221 is based on *HSTW*. "The one guiding principle that we all agreed on was to increase expectations for all students," Taylor said. "In connection with that key practice, we decided to emphasize all students completing a challenging program of study, expanding the guidance and advisement system, providing a structured system of extra help, and combining several key practices to develop a middle grades to high school transition program."

Providing many opportunities for students to receive extra help

A required resource period at the end of the school day — All students participate in a 15-minute period at the end of the school day. They are assigned to teachers and classrooms — much like study halls. Students who have obtained a pre-arranged pass can go to another teacher for help. All other students do schoolwork or read.

Teachers keep logs to track the whereabouts of students. "We also use the logs to determine which teachers are requested the most during the resource periods," Taylor said. "As expected,

the mathematics and science teachers see the most students. We have adjusted the numbers of students who report to these teachers at the beginning of the period so that they will not be overloaded.”

A 30-minute period after school — Immediately after school, students can attend an optional resource period. When the bell rings to end the school day, students may choose to go home or to get a teacher’s help. Teachers’ contracts call for them to be at school from 7:45 a.m. to 3:15 p.m. The 30-minute period between 2:45 p.m. and 3:15 p.m. is reserved for extra help. All teachers are required to be in their classrooms at this time to help students. No athletic practices or other activities are allowed to begin until after 3:15 p.m. The school provides a bus for students who need transportation.

“Our teachers also assign academic detentions for this time period,” Taylor said. Academic detentions are given for incomplete homework or failure to do homework.

Before and during school hours — Teachers are very flexible in providing extra help. They will arrange to meet students before school or at other times during the day. Many teachers host students during planning periods, especially if students have study hall at that time. “Our faculty believes that professionals are willing to go beyond their contracts to help students succeed,” Taylor said.

Tutoring by college and high school students — The school has instituted a series of tutoring opportunities for students. Peer tutoring is arranged through two school organizations that promote scholarship and citizenship — the National Honor Society and the Key Club. These students volunteer to tutor their fellow students before, during or immediately after school. They also man a homework assistance program (with teacher supervision) in the school media center between 6 p.m. and 8 p.m. three nights a week. High school, middle grades and elementary school students attend these sessions.

Aspiring teachers from Valparaiso University come to the high school between 8 a.m. and 10 a.m. and 2:30 p.m. and 4 p.m. daily to help classroom teachers instruct students individually or in small groups. If students needing help are scheduled to be in class during the scheduled times, teachers will release them so that they can receive tutoring. “This relationship with the university has been very beneficial for us as well as for the college students,” Taylor said.

Special attention to ninth-graders — Wheeler’s extra-help program also includes double blocking for incoming ninth-graders who have weak English and mathematics skills. These students are identified through eighth-grade statewide test scores, classroom performance, schoolwork and teacher recommendations. They take a skills remediation class in addition to Algebra I and ninth-grade English.

Constant communication with parents — All teachers have phones and computers in their classrooms so that they can communicate easily with parents through phone calls and e-mails. “Teachers know that the administration may not support them in a parent-teacher conference if the teacher has not communicated with the parent,” Taylor said.

Teachers are developing their own Web sites and the school is purchasing a Web-based student information center that parents will be able to access from a home or work-site computer. “Communication between school and home is a vital part of our extra-help system,” Taylor said. “We constantly ask parents if they know their children can get extra help.”

In fact, 97 percent of students completing the 2002 *HSTW* student survey at Wheeler High School said someone in their family emphasized the importance of education for success and 98 percent said someone in the family talked about the importance of making good grades.

Links to guidance and advisement — Teacher advisers who meet with students in the school’s guidance and advisement system are another important component in the extra-help system. They are essential in raising expectations, guiding students into challenging programs of study and linking students to extra help as needed.

Career exploration —The school instituted a career exploration class for ninth-graders that is proving to have a specific connection to extra help. “When students focus on a career pathway, they are more open to seeking extra help,” Taylor said. They see the importance of academic performance in what they plan to do in real life.

“Wheeler High School has established a reputation for innovative programming and high student achievement,” Taylor said. “Our goal is to be an exemplary teaching and learning institution. We still have a way to go, but we all agree that we *very badly want to be good.*”

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Providing Leadership and Faculty Support for Continuous Improvement

Teamwork between administrators and teachers keeps this school moving forward in student achievement

This comprehensive Louisiana high school — where more than one-third of the students are minorities — is making continuous improvement in raising students' academic achievement. Students participating in the High Schools That Work Assessment exceeded goal in all three areas — reading, mathematics and science — in both 2000 and 2002. Teachers applaud school leaders for clarifying goals and objectives, supporting teamwork and professional development, and using data to identify needed changes in school and classroom practices.

Teachers' voices are heard and their opinions count at Destrehan High School in Destrehan, Louisiana. This school makes continuous improvement by listening to and supporting its teachers as they work to raise student achievement.

Destrehan is upriver from New Orleans on the Mississippi River. The area is rich in industry that has built up on both sides of the river. Destrehan High School is a comprehensive high school with 1,357 students and 103 teachers. Students enroll from five communities in St. Charles Parish. Sixty-four percent of the students are white, 31 percent African-American, four percent Hispanic and one percent Asian or other.

Principal Chipper Simon is an effective leader who believes that administrators and staff are placed in the school to assist teachers in doing their jobs. "We provide the newest and best tools and then give our teachers the autonomy to use the ones they need," Simon said.

The approach is working, as evidenced by students' scores on the *High Schools That Work* Assessment and teachers' responses on the *HSTW* Teacher Survey. Between 2000 and 2002, student mean achievement rose from 269 to 288 in reading, from 305 to 311 in mathematics, and from 291 to 301 in science. The mean mathematics scores exceeded goal both years, while the reading and science mean scores topped the mark in 2002. Thirty-one percent of the students who participated in the 2002 assessment were African-American.

The 2002 *HSTW* Teacher Survey revealed that large percentages of Destrehan's teachers believe that school leaders are doing a good job of clarifying goals and objectives, supporting teamwork and professional development, and keeping the school moving forward. The survey results placed Destrehan in the top 50 *HSTW* sites in terms of continuous improvement. (See Table.)

Table
Teachers' Beliefs about Continuous Improvement at Destrehan High School and at All High-implementation HSTW Sites

<i>Teachers say</i>	Destrehan High School	All High-implementation HSTW Sites
The goals for their schools are clear.	65%	48%
They maintain a demanding and supportive environment.	75	32
They meet together several times a year to examine students' schoolwork.	74	39
They continue to learn and seek new ideas.	72	49
They and the administrators work as a team.	51	39
They use data to evaluate school and classroom practices.	58	29

Source: *High Schools That Work* Teacher Survey

The decision-making structure

The school is organized so that teachers can participate fully in making decisions about curriculum and instruction. Each department elects a chairperson who serves a two-year term on the school's committee of department chairs. The principal assembles data — standardized test scores, and attendance, dropout and pass/fail rates by department — and asks the committee to identify academic needs and design a school improvement plan for the coming year. This meeting takes place in the summer.

During the school year, the committee of department chairs meets weekly with the principal and the assistant principal for curriculum to focus on the school improvement plan. This group also discusses issues that arise during the year. Although the principal usually makes the final decisions, he welcomes input from the committee members (department chairs). In certain cases, the committee has the final word on what to do.

All teachers meet by department every Monday afternoon. They hear progress reports on school improvement and learn about issues that the department heads addressed in their meetings with administrators. These weekly meetings are a boon to communication in a large faculty.

Each department chair oversees the curriculum in his or her department. Teachers of the same courses — such as Algebra I or English I — work together to design curriculum maps. These maps contain standards and benchmarks followed by all teachers of those courses.

The heads of departments have an additional preparation period during which they serve as mentors for teachers in their departments. The department chairs have been trained in mentoring practices through the Louisiana Teacher Assistance and Assessment Program.

Teachers meet by department before the end of the school year to decide which teachers will teach which courses the following year. Teachers decide what they want to teach, but the group has to agree. This is also the time to submit any special departmental requests for scheduling. For example, ninth-grade English and social studies teachers may want to team teach during the coming year. The principal, in his role as instructional leader, makes the final decisions, which usually are in line with the department's wishes.

Principal Simon believes the key to continuous improvement from a principal's point of view is to “surround yourself with good people who are innovative, ambitious and committed” to preparing students for anything they decide to do after high school.

Small learning communities

Destrehan High School has established several small learning communities of teachers and students, among them: technology, health and human services, and freshman transition. Special attention is provided to honors students and students in special education who need additional learning support.

Teachers from each community have written three-year action plans that they revise during summer retreats away from school. As a part of the retreat, the teachers decide who will facilitate each activity in the plan. Teacher leaders and administrators keep the group focused and ensure that resources are available to carry out the plans.

During the school year, teachers meet twice a month in study groups of four to six members each. They receive training, do research and make plans to integrate proven practices into their daily lessons. The time for study groups is made available by allowing students to report to school two and one-half hours late every other Wednesday. The groups use the time to examine students' work and assess student learning. Every member has time to speak.

Staff development

Steve Keyes is a former Destrehan teacher who became the school's full-time staff development coordinator seven years ago. He provides continuing education to the study groups on topics that the teachers themselves have identified. The program ensures that teachers have access to the latest research-based practices for use in the classroom.

For example, if mathematics teachers believe students need to read more in their classes, Keyes offers two or three sessions on strategies for using reading to teach mathematics. After

the teachers try the new strategies in the classroom, they give mathematics tests that require students to read and understand the problems. Then Keyes and the teachers look at the tests to see if the reading strategies are working. If students' reading skills are still weak, the teachers may try new techniques or even change the curriculum to make sure it addresses the students' needs in the beginning.

This localized approach to staff development is popular with Destrehan teachers. "They know what they need better than anyone else and are able to see results immediately in the classroom," Keyes said.

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Technical center is an original *High Schools That Work* site that continues to improve

This West Virginia technical center was labeled "needy" when it joined High Schools That Work in 1987. By following the HSTW Key Practices, the center has made steady progress in raising students' academic achievement and preparing them to enter and advance in modern career fields. The continuous improvement is evident in the HSTW Assessment and in students' performance on state core technical exams. Many students earn college credits while in high school through the center's articulation agreements with postsecondary institutions.

Like "the little engine that could," United Technical Center (UTC) in Clarksburg, West Virginia, keeps chugging along a path of steady school improvement. The center was an original member of the Southern Regional Education Board-State Vocational Education Consortium's 28 pilot sites chosen in 1987. It was also the neediest of three pilot sites in the state of West Virginia. Sixteen years later, the center maintains a position as one of *High Schools That Work's* top 50 schools in the area of continuous improvement. (See Table 1.)

"We have had good times and bad times through the years, but we have always followed the *HSTW* Key Practices," Director Joan Smith recalled. "If you do that, you can't go wrong."

Teachers are confident that they have strong leadership from their veteran principal, and students continue to make advances in academic studies in an environment where the overriding goal is to improve student achievement.

Table 1
**Percentages of United Technical Center Students Meeting
the HSTW Performance Goals**

	Reading	Mathematics	Science
2000	75%	71%	65%
2002	63	66	54
HSTW Goal	279	297	299

Source: 2002 HSTW Assessment

Note: Percentages are based on the scores made by United Technical Center seniors participating in the *High Schools That Work* Assessment of reading, mathematics and science in 2000 and 2002. The scores on each test range from 0 to 500. The performance goals are based on cut scores that are set high enough for students who reach them to have the skills needed to pass employers' exams and enter postsecondary education without having to take remedial studies.

United Technical Center serves 480 students (half in the morning and half in the afternoon) who come from seven sending high schools in three counties. Students choose from among 18 career/technical concentrations, including the popular fields of restaurant management, emergency medical services and aviation.

Nine of the 18 programs have articulation agreements with postsecondary institutions enabling students to earn various amounts of credit from one or more colleges. Students receive the credit after they enroll in the participating institution and successfully complete 15 hours of coursework. Eight UTC graduates who entered college in 2003 each had earned from six to 10 articulated credits while in high school. Students in the aviation program can earn up to 30 credits from Fairmont State College.

All UTC teachers have been trained in the West Virginia EDGE (Earn a Degree — Graduate Early) initiative, which gives students the opportunity to earn free college credit and to establish a college transcript while in high school. Students must pass the class and a final exam to obtain credit.

Students' success in passing the West Virginia core technical exams improved between May 2002 and May 2003. This finding is based on the percentages of students who passed an exam with a score of 75 or more. The seven programs in which the percentages of students either rose or stayed the same (in the case of one program) are — ProStart (restaurant management and culinary arts), general building construction, masonry, collision repair technology, welding, health assistant, and electronics technology (the program where the score stayed the same). (See Table 2.)

Table 2
Percentages of Students in 13 Career/Technical Fields at United Technical Center Scoring 75 or Above on West Virginia’s End-of-Program Technical Skills Exams May 2003

ProStart (restaurant management and culinary arts)	78%
Conventional/Computer Aided Drafting	61
Graphic Communications	65
Machine Tool Technology	70
General Building Construction	63
Masonry	69
Collision Repair Technology	71
Welding	80
Health Assistant	76
Automotive Tech	62
Medical Assistant	78
Electronics Technology	71
Electrical Technology	60

Source: West Virginia Department of Education

Technical school finds the recipe for student success in the restaurant and culinary arts field

United Technical Center in Clarksburg, West Virginia, has found a “no-fail recipe” for success in its award-winning restaurant management and culinary arts program:

- *Choose an enthusiastic instructor with experience as a chef and a restaurant owner who is a mentor and a teacher.*
- *Blend in lots of engaging, real-life experiences that prepare students for college and careers in food preparation.*
- *Add generous amounts of reading, writing and mathematics related to the food industry. Top with opportunities to earn certification and win state and national recognition.*

Twenty-eight students are enrolled in the ProStart restaurant management and culinary arts program at UTC — up from five students when the program was first offered in 2000. Every student receives National Restaurant Association certification, which is based on successful completion of an exam and 400 hours of paid work experience. More than 80 percent of the students attend college after high school graduation to continue their studies in the food field.

The program requires reading, writing, mathematics and computer skills. Students use a textbook written at the postsecondary reading level and pick up new ideas from magazines devoted to cuisine. They learn mathematics by studying profit and loss statements that have personal significance.

The students get a rich variety of real-life experiences in the program. They work as chefs in restaurants and help cater weekend events. Some students get on-the-job experience at The Greenbrier luxury resort in White Sulphur Springs, West Virginia. One student spent the summer preparing meals at a castle in Ireland. A group of students helped with an event for 1,200 people, including prominent government leaders. One year, students created a gingerbread house that soared two stories high in a local mall.

“Teaching and learning don’t stop at 3 o’clock in the afternoon,” Instructor Michael Murray said. “My students and I live and breathe this business. When we get to class on Monday, they want to talk about what they did at their weekend jobs — which foods they prepared and what they learned.”

Murray has seen the program bring students out of their shells and give them inspiration for the future. One student who had no particular direction for his life is now a chef at a local restaurant while attending both UTC and a local college. Another student described the class as “the best year of my life.”

The students’ level of learning in the program reflects positively on the program and the center. The class took the top award at a statewide culinary event for ProStart programs in 2003 and represented the state at the national ProStart competition in Denver, Colorado. The UTC group has won the state culinary event sponsored by SkillsUSA-VICA (formerly Vocational Industrial Clubs of America) three out of four years.

Students raise money to attend educational, food-related events such as the National Restaurant Association Show in Chicago each May. “This teaches them to be self-sufficient and not to depend on others to finance their trips,” Murray said.

Getting the faculty to invest time and effort in students

Every technical instructor is required to do a one-year follow-up survey on the graduates/completers of their programs from the prior year. The findings are reported to the West Virginia Department of Education, which evaluates the programs by looking at the percentages of students who enter postsecondary training, colleges and/or jobs in their high school fields of study. The 2002-2003 survey showed that 108 of 189 United Technical Center graduates from the previous year were either continuing their education in the career fields they had studied at the center (42 graduates) or were employed in their career fields (66 graduates). The remaining 81 graduates were either continuing their education in other career fields (14 graduates), employed out of their fields (32 graduates), serving in the military (three graduates), seeking work (eight graduates), unavailable for work (three graduates) or “status unknown” (21 graduates).

Smith also requires instructors to do a five-year follow-up study to detect trends in placement for program evaluation and curriculum updating and adjustment.

Instructors are encouraged to articulate their programs with colleges in- and out-of-state and to offer state and national certification and licensure.

Getting the faculty to use data to determine what is working and what is not working

Most career/technical programs in West Virginia are required to give end-of-course exams to completers. In addition to looking at the class mean on this type of exam, Smith does a breakdown on the questions that were missed and the content standards related to those questions. She gives the analysis to each instructor for use in preparing lesson plans for the coming school year.

“If more than one-third of the students missed a question pertaining to a certain content standard, it tells us that we need to improve our instructional strategies and other activities for teaching that concept,” Smith said. Instructional plans are revised as necessary.

Seeking new ideas for raising student achievement

The faculty gains new ideas for curriculum and instruction in a number of ways. They attend workshops presented by college specialists, state department of education staff, business and industry partners, and *HSTW*. They also go “out to industry” every summer to see new trends and concepts in their fields. When students question the value of studying something, teachers can point to its use in an actual workplace.

“Our instructors stress reading, writing, math and science skills in the technical areas, and they are constantly seeking ways to help students see the importance of high academic and technical achievement and the need for life long learning,” Smith said.

Smith believes instructional leaders should create a climate of higher expectations for all students by actually supporting teachers — not just talking about it. Through the years, she has been able to acquire funding from a variety of sources for equipment, materials and staff development on new teaching and learning strategies.

The focus at UTC is on teaching and re-teaching. On the basis of tests given during the first two weeks of school, students needing help are targeted for remediation. Students also receive incentives for good school attendance. Students who miss no more than two days of school per year are eligible to win an automobile that the center has purchased or that UTC students have reconditioned after it was donated to the center.

Involving teachers in making decisions about curriculum and instruction

Every staff member is involved in planning, making decisions and setting goals for the center. A faculty senate (the model used by schools in West Virginia) meets monthly to review school practices. Each instructor serves on one of four focus teams as recommended by *HSTW*. “These smaller teams promote buy-in and bring teachers closer to together,” Smith said. Observers say the faculty is like a close-knit family.

Kathleen Krizner, instructor in the medical assistant program and chairman of the curriculum focus team, said her group decided to concentrate on integrating computer technology into all program areas. For example, the computer laboratory coordinator worked with a teacher from the general building construction program to create computerized spreadsheets with embedded formulas so that students can figure the costs of various projects. An instructor in collision repair technology uses a computer program to help students write estimates of repair work. The computer laboratory coordinator learns the standards that all other teachers are using in their courses in order to emphasize those standards in the computer laboratory.

In preparing school improvement plans, formal reports and grant proposals for local, state and national agencies, the director asks the focus groups to write the sections that pertain to them. The director writes a rough draft of the entire document and returns it to the focus groups for editing. This process is repeated until the document is ready to submit. The groups review the center’s testing and placement data in completing their sections of the plans, reports and proposals.

Evaluating student assignments, exams and the quality of student work

Teachers at United Technical Center have autonomy to create assignments and exams, which must relate directly to state-mandated content standards. The director makes sure that the instructors’ lesson plans are relevant by checking them at least monthly.

Each instructor is required to prepare a syllabus — much like a college syllabus — that is given to all students at the beginning of the school year. The syllabus explains the grading process for that class — how much various assignments are worth, when the assignments are due, and how everything relates to mandated competencies. Students must re-do their work until it meets the instructor’s standards for a mastered skill.

Teachers are required to maintain a goal profile sheet on each student. Using ratings from zero to four (complete mastery), the instructors keep score on their students. A student must master at least 80 percent of the competencies in order to receive a competency certificate from the center.

Providing professional development

Professional development at the center is based on needs that are identified through test scores, teacher surveys and individual comments. Instructors have numerous opportunities to attend conferences and workshops and to hear guest speakers who are invited to the school throughout the year. The teachers receive continuing education credit for their participation. “I find the money for their registration and travel,” Smith said.

Upon their return from a workshop or conference, the instructors report to the other staff members about what they have learned and begin to incorporate the new ideas into their classroom instruction and daily lesson plans.

Teachers are very active in teaching job-seeking and job-keeping skills. They have learned to help students prepare their résumés on the computer and use the Internet to do research. Every student spends 36 hours with a computer teacher in a computer laboratory. Some of them learn to create PowerPoint presentations about their knowledge and skills.

Learning from each other

Instructors at the center model the importance of life long learning and multi-tasking by working together to create projects that are designed to challenge students. For example, instructors in auto body repair, auto mechanics and welding may collaborate on a project. The same goes for instructors of carpentry, masonry, drafting and residential electricity. English, mathematics and science teachers participate in the projects to build academic skills and to show students that academic learning is important in career/technical areas. “This shows the students that skills and programs overlap and integrate,” Smith said.

Patting teachers on the back for a job well done

The director celebrates accomplishments by recommending teachers for state and national awards and by spotlighting their successes to the staff and students, the board of education and the news media.

When and if problems arise, the director provides plenty of support. “Our teachers keep good records and documentation so that we can stand up to any crisis that occurs,” Smith said.

Keeping the focus on raising student achievement

The center and the state both have data-based accountability standards. These standards are reflected in the center’s unified school improvement plan, which is revised and adopted at the beginning of each school year. The curriculum and instruction are aligned with the plan. The focus is always on student achievement.

“In the same way that students need to know why something is happening, teachers also need to know the reasons for changing school and classroom practices,” Smith said.

Lessons learned

United Technical Center has learned that all career/technical programs must be up-to-date and must be designed to fill a need in the local economy. If the programs are weak, the students will not want to attend.

“My challenge is to find the money — no matter how hard the economic times or how many cutbacks have been made at the local and state levels — to prepare teachers for their roles in raising student achievement,” Smith said. “Often, this means looking to outside sources for grants and donations. It is important to enlist the school’s business partners, keep a positive attitude and never lose sight of the students.”

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Definitions of *HSTW* Assessment Goals — 12th Grade

Reading goal (279+) — At minimum, these 12th-graders demonstrate overall understanding of text they have read by retrieving and identifying explicitly stated ideas. They can use specific text information to form and generally support an opinion and use context clues to make a simple inference. They can relate text to their prior knowledge and demonstrate some ability to recognize and interpret the main idea and a synonymous meaning. When reading practical texts, they are able to locate multiple pieces of information and to identify an organizational pattern.

Mathematics goal (297+) — These 12th-graders demonstrate, at minimum, a general understanding of simple mathematical concepts and can perform basic mathematics operations. They can use reasoning techniques to solve straightforward one- or two-step word problems; perform simple measurement tasks; understand the properties and visualize two and three dimensions of triangles and quadrilaterals; and identify symmetric lines in geometry. They can read and interpret graphs, compute data from tables and graphs, and answer some probability questions. They have a basic understanding of algebra, including procedures, solving simple linear equations and inequalities, locating points on a coordinate grid, constructing algebraic representations and extending numerical patterns.

Science goal (299+) — Twelfth-graders demonstrate, at minimum, some elementary factual and conceptual knowledge of various areas in science that include reading and interpreting a graph or diagram, estimating distance on a map using a scale, recognizing the elements of the scientific method (such as appropriate experimental conditions) and understanding that scientific theory is founded on experimental observations and predictions that can be tested. They are familiar with basic terminology, symbols, some formulas, principles and concepts in life science, physical science and earth science.

Reading Proficiency Levels — 12th Grade

Basic

Scores: 262 – 287

Twelfth-graders performing at the Basic level demonstrate a general understanding of grade-level texts. They locate specific information and identify the main ideas and purpose, make simple connections between ideas within a text and provide general evaluations of the meaning or purpose. In addition, they identify interpretations and provide text-based support for those interpretations.

Proficient

Scores: 288 – 316

Twelfth-graders performing at the Proficient level demonstrate understanding of grade-level texts. They understand explicitly stated ideas, compare and contrast information in different parts of a text, determine the relative importance of different ideas and provide overall interpretations of a text's meaning. Proficient readers recognize connections between ideas in the text, with other texts and with real-life experiences. They recognize general organizational features and can extend ideas in the text through inferences such as predictions and conclusions.

Advanced

Scores: 317+

Twelfth-graders performing at the Advanced level demonstrate a thorough understanding of grade-level texts. They integrate text ideas, explain causal relationships and evaluate complex information and organizational features. Students analyze text ideas to provide specific and extensive support for evaluations and interpretations. They evaluate an author's opinion and explain how it is conveyed. They make connections between complex, deeply embedded ideas within the text with other texts and with real-world experiences. They can interpret and explain specialized terminology.

Mathematics Proficiency Levels — 12th Grade

Basic

Scores: 297 – 327

Students performing at the basic level possess an understanding of simple mathematical concepts and are able to perform basic arithmetic operations. They are beginning to utilize elementary reasoning techniques to solve straightforward problems. However, these students are able to process only a limited amount of mathematical information in a problem at one time and are rarely able to employ more complex solution methods if the problem requires them.

Students are able to use their knowledge of procedures and elementary concepts to solve one- or two-step word problems. They can perform simple measurement tasks and can work with metric units of measure. They have an understanding of properties of triangles and quadrilaterals, and can identify lines of symmetry on geometric figures. These students can visualize geometric figures in two and three dimensions and may be able to reason spatially using properties of those figures. Students at the basic level can read and interpret graphs, compute with data from tables and graphs, and answer simple conditional probability questions. They have acquired a procedural understanding of algebra; they can complete tasks such as combining like algebraic terms, solving simple linear equations and inequalities, and locating points on a coordinate grid. Students can construct simple algebraic representations and extend numerical patterns.

Proficient

Scores: 328 – 348

In addition to the basic skills and knowledge, students performing are beginning to demonstrate evidence of the use of analysis techniques and more sophisticated reasoning skills in their solutions to mathematics problems. They can solve problems that require the integration of more than one mathematical idea or strategy and check their answers for reasonableness. These students may demonstrate an emerging understanding of mathematics as a process.

Students are able to use their knowledge of number theory to work with prime numbers and even and odd integers. They can approximate square roots and can compute with fractions and percents (including percents greater than 100) in several contexts. Students can work with scale drawings and can successfully solve problems involving non-routine applications of area and employ more sophisticated spatial reasoning techniques. They are able to identify a correct statistical sampling method and can use a given probability to determine missing data in a question. In algebra, students have a solid understanding of linear functions and are beginning to work with nonlinear functions, such as exponential relationships. They are able to solve a system of two linear equations using simple elimination, relate integers to real-world situations, and work with distance and slope in a coordinate system. Students generally have a better understanding of the underlying concepts of linear functions than the underlying concepts of nonlinear functions. They are more likely to draw on their knowledge of procedures when working with nonlinear functions and may experience difficulty in applying concepts involving nonlinear functions in problems.

Advanced

Scores: 349+

In addition to basic and proficient skills and knowledge, students performing at the advanced level have generally acquired a certain level of sophistication in being able to understand and utilize the notation, reasoning and processes of mathematics. They are beginning to make important connections within mathematics and between mathematics and other areas, to work with non-routine applications in problem settings and to make predictions. These students regularly evaluate their work and answers for reasonableness as their approach to the study of mathematics becomes embedded in sound processes and practices.

Students can readily recall and utilize appropriate formulas in a variety of problems, among them, the formula for circumference, the Pythagorean theorem and trigonometric ratios. Students at the advanced level can solve a system of two linear equations using methods beyond one-step elimination, work with multiple representations in algebra, and possess a strong conceptual understanding of fundamental algebraic concepts. In addition, these students are able to work with non-routine problems across various content areas, such as solving problems about piecewise functions, cross-sections of three-dimensional figures, mathematical sequences and precision/tolerance.

Science Proficiency Levels — 12th Grade

Basic

Scores: 299 – 325

Students have some elementary factual and conceptual knowledge of various areas in science. Skills include reading and interpreting a graph or diagram as well as estimating distance on a map using a scale. Students recognize the elements of the scientific method, such as appropriate experimental conditions, and understand that scientific theory is founded on experimental observations and predictions that are testable.

Students are familiar with basic terms and concepts. For example, in life science, they know fundamental biological terms; can identify biological structures in a diagram; can recognize basic functions of structures in living systems; and can recognize evidence of change over time. In physical science, students know basic terminology related to matter and recognize that symbols and formulas represent chemical substances. They can identify principles of physical science, such as the laws of motion, and recognize implications of concepts such as density and reflection. In earth science, students recognize geological formations, and provide a description of basic processes taking place within Earth's systems, such as the water cycle.

Proficient

Scores: 326 – 351

In addition to knowledge and skills present at the basic level, students relate and apply concepts and are more skilled in scientific experimentation. Students can design a scientific investigation. They know how to evaluate the appropriateness of an experimental design, and understand that the credibility of experimental results depends on their reproducibility. Students also can interpret a graph and explain the results. They are able to recognize the environmental impacts of humans on nature. Students can use basic mathematical skills to solve a problem, and can interpret a topographical map.

Students know the relationship between structure and function in organisms, recognize the varying degrees of complexity in organisms and understand that a greater level of complexity causes an increase in specialization. Students know how the history of life on Earth is demonstrated. They can describe the fundamental principles of physical science and apply these concepts, such as thermal expansion, to simple practical situations. Students recognize the difference between physical and chemical changes in matter.

Advanced

Scores: 352+

In addition to knowledge and skills present at the basic and proficient levels, students performing at the advanced level understand more complex concepts and use their knowledge in complex practical situations. Students can perform specific skills such as balancing a chemical equation and analyzing a graph to solve a conceptually advanced problem.

Students know scientific terminology related to increasingly complex concepts and may be able to provide a complete explanation of processes that take place within Earth's systems (e.g. water cycle). Students know the basic structure of the universe, and are able to identify the instruments used to make astronomical determinations. They understand the particulate nature of matter and the relationships among those particles, and demonstrate an understanding of the fundamental principles of physical science, as well as the ability to apply them. In life science, these students know the hierarchy of classification, and understand physiological processes within living systems (e.g. cell division and cellular respiration). When presented with a novel situation, these students can apply prior knowledge to explain it.

New Resources — The complete materials list is available online at www.sreb.org. To order materials, contact the SREB Publications Orders Department at (404) 875-9211 ext. 236.

Research Brief: Factors Affecting Mathematics Achievement for Students in Rural Schools

This research brief is based on a study of more than 2,400 eighth-graders and more than 1,900 12th-graders in 24 clusters of rural high schools and their feeder middle grades in seven states. It surveys the mathematics achievement of eighth- and 12th-graders in these rural schools and looks at how course-taking patterns and classroom practices have affected achievement. It also offers strategies that schools can use to raise student achievement in mathematics.

By Gene Bottoms and Kathleen Carpenter
(03V04); 20 pages; \$2 each, \$1 each for 10 or more

Doing What Works: Moving Together on High Standards for All Students

Schools that make big gains in achievement are those that set high standards and dig deep to discover effective practices. Everyone connected with such a school works together toward a common goal. This publication explains how to organize school study teams that can work cooperatively to understand what changes are needed and to implement and refine the key practices accordingly.

By Gene Bottoms, Lingling Han and Alice Presson (03V07); 40 pages; \$5 each, \$3 each for 10 or more

Getting Students Ready for College-preparatory/Honors English: What Middle Grades Students Need to Know and Be Able to Do

This curriculum framework is an effort to ensure that students leave the middle grades with the knowledge and skills to succeed in college-preparatory/honors English. Educators can use this framework in developing course syllabi, lesson plans, assignments, assessments and professional development activities that will prepare students for rigorous English classes in high school.

(03V61); 60 pages; \$5 each, \$2.50 for 10 or more

Research Brief: Linking Career/Technical Studies to Broader High School Reform: What can school districts, states and the nation do to get more high schools to implement comprehensive high school reform?

The *High Schools That Work* program of comprehensive school reform can have solid benefits for career-oriented students. This publication contrasts the 2002 *HSTW* Assessment results in reading, mathematics and science for career-oriented students at 50 high-implementation *HSTW* schools with those at 50 low-implementation schools. Also considered are student and high school teacher surveys. See how linking *HSTW* key practices with a strong career/technical program can give career-oriented students the academic-core preparation they need for postsecondary education and good careers.

By Gene Bottoms, Alice Presson and Lingling Han
(04V09); 8 pages; 2004; \$2 each/\$1 each for 10 or more

Getting Students Ready for College-preparatory/Honors Science: What Middle Grades Students Need to Know and Be Able to Do

When students leave the middle grades, they need to have the knowledge and skills to succeed in college-preparatory/honors science. This report provides guidance for a rigorous science curriculum in the middle grades that is based on a solid set of standards. Educators can use this framework in developing course syllabi, lesson plans, assignments, assessments and professional development activities that prepare students for this level of work.

By Gene Bottoms, Betty Harbin and Bob Moore
(04V04); 68 pages; 2004; \$5 each/\$2.50 each for 10 or more

Site Development Guide #13: Ten Strategies for Creating a Classroom Culture of High Expectations

Motivation and classroom-management skills are essential to creating and sustaining an environment of high expectations and improvement in today's schools. This guide is designed to help teachers and school administrators assess their practices and plan strategies for improvement. The 10 strategies include tips on developing plans for classroom and school management, organizing classrooms, communicating with and involving parents, improving homework, using teaching strategies that engage students, and dealing with chronic disruptions and complaints.

By Myra Cloer Reynolds
(04V03); 8 pages; 2004; \$2 each /\$1 each for 10 or more

Research Brief: Raise Academic Standards and Get More Students to Complete High School: How 13 Georgia Schools Did It

How can education leaders raise expectations and standards without causing more students to drop out of high school? This publication shares the insights of school leaders from the 13 Georgia high schools that showed the most improvement in first-time passing rates on the Georgia High School Graduation Test (GHSGT) between 1997 and 2002 and in high school completion rates between 1999 and 2002. The publication also outlines actions that school, district and state leaders can take to increase the number of students who meet rigorous standards and, at the same time, to raise graduation rates.

By Gene Bottoms and Karen Anthony
(04V01); 8 pages; 2004; \$2 each/\$1 each for 10 or more

Site Development Guide #12: Literacy Across the Curriculum: Setting and Implementing Goals for Grades Six through 12

This volume is essential for state, district and school leaders who plan to implement schoolwide literacy programs. It provides concrete, research-based steps not only to raise reading and writing achievement but also to help students learn more in every class by using literacy skills. The guide focuses on five literacy goals: reading 25 books across the curriculum; writing weekly in all classes; using reading and writing strategies; writing research papers; and taking rigorous language arts classes.

(03V63); 224 pages; 2004; \$10 each/\$6.50 each for 10 or more

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