SREB

An Undeveloped National Resource: The Unrealized Potential of the Nation's Career/Technical Centers

January 2012

Southern
Regional
Education
Board

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The Southern Regional Education Board is a nonprofit and nonpartisan organization based in Atlanta, Georgia, that works with state leaders and educators to improve education. SREB was created in 1948 by southern governors and legislatures to help leaders in education and government work cooperatively to advance education and improve the social and economic life of the region. SREB has 16 member states: Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia and West Virginia. Each is represented by its governor and four gubernatorial appointees. For more information, visit www.sreb.org.

Foreword

"*People have sort of gotten used to it. Indeed, that sense … that sense that America's best days are behind it and China's best days are ahead of it, have become the subject of water-cooler, dinner-party, grocery-line, and classroom conversations all across America today.*"[i]

When Thomas L. Friedman and Michael Mandelbaum made this observation in their book, *That Used to Be Us: How America Fell Behind in the World It Invented and How We Can Come Back*, they recognized the potentially bleak future our students may inherit — and even a bleak present that is a reality for many adults who are unable to match their skills and knowledge with the demands of today's economy. The educational system is in a key position to ensure that the nation's best days still lie ahead by providing today's students with the higher-level thinking skills, knowledge and tools they will need to succeed tomorrow. States, districts and schools must find answers to the critical questions about our future:

- How can we help teachers and parents recognize that too few students are prepared for further study and work?
- How can we better prepare students for what they need to know and be able to do after high school?
- How can we provide instruction that will advance students' academic and problem-solving skills, abilities to understand and use technologies, and abilities to acquire the habits of mind and behavior essential for the 21st-century?
- How can we increase the percentage of students who graduate from high school prepared for postsecondary studies *and* careers, and how can we help teachers understand their role in preparing students for this dual goal?

The Southern Regional Education Board (SREB) has a long history of developing and supporting improvement initiatives that address these and other questions that continually confront the educational system. In 2007, SREB created a new initiative specifically to address students who attend shared-time centers for a portion of their school day or school year. *Technology Centers That Work* (*TCTW*) was founded with the belief that students are more likely to succeed when they acquire strong academic and technical knowledge and skills.

While technology centers traditionally have been viewed as schools to provide high school students with skills for jobs, the mission of technology centers must change to prepare students for success in postsecondary studies and for jobs in the new economy. ***Students attending these centers must be taught the academic and technical skills to help them be successful in both careers and further study***.

This research brief tells the story of how 11 technology centers took steps to improve students' academic performance in reading, mathematics and science. These practices, when replicated throughout the nation's shared-time centers, will arm students with the skills they need for success in whatever path they choose beyond high school. To replicate and build on the success of these 11 centers, other centers must become learning centers where academic and technical skills are blended and support each other. They must provide intellectually demanding, authentic learning experiences that enhance students' readiness for both careers and postsecondary studies.

Many students can benefit from the relevance provided by career/technical studies. Technology centers can provide students with a context for mastering academic content and introduce students to the array of careers available to them. These centers can reduce the number of students who drop out by providing ***hope*** to those students who have otherwise lost interest in high school and traditional academic studies. Shared-time centers are positioned to have a significant impact on the future of students and the contributions they make to the economic welfare of our nation.

Ann Benson
Director, *Technology Centers That Work*

Introduction

Across the nation, there is an urgency to increase high school graduation rates and students' college and career readiness to be competitive in a global economy. Recent reports[ii] illustrate that the United States trails more than a dozen other countries in student achievement, particularly in mathematics and science. These reports virtually mirror the country's collective mind-set after the release of *A Nation at Risk*.[iii] Ironically, many of the risk indicators identified in that report still hold true almost 30 years later:

- The United States ranks far below other industrialized nations in international comparisons of student achievement.[iv]
- Millions of adolescents lack the reading and writing skills necessary to graduate from high school, much less to succeed in college or a career.[v]
- The average achievement of 17-year-olds remained relatively unchanged from 1971 to 2008.[vi]
- SAT reading scores declined consistently and mathematics scores showed minimal gains from 1972 to 2010. Writing has declined consistently since its introduction in 2006.[vii]
- The achievement of advanced students has remained unchanged, while average achievement has remained stagnant or declined.[viii]
- Many graduates lack higher-order thinking skills and other 21st-century skills, as evidenced by the decline in student achievement on tests of creativity.[ix]

U.S. Department of Education grants and initiatives such as Race to the Top and Investing in Innovation are supporting states, districts and schools to improve graduation rates and students' college and career readiness. This challenge could not be timelier. A 2010 Georgetown University report predicts that by 2018, the nation will fall short by three million in the number of degreed workers needed. By that time, 101 million jobs will require some form of postsecondary education, while only 61 million jobs will be available for high school graduates and dropouts, primarily in low-wage or declining occupations. To succeed in this new economy, high school graduates must have college- and career-ready skills in reading, mathematics and science. As the Georgetown University report notes, "**Postsecondary education or training has become the threshold requirement for access to middle-class status and earnings in good times and in bad**. **It is no longer the preferred pathway to middle-class jobs — it is, increasingly, the *only* pathway**."

While more than 1,000 shared-time technology centers exist in the United States, these centers for the most part have gone unrecognized for their potential to help students understand the crucial link between what they learn in the classroom and how it can apply in the job market. Once students have this eye-opener, there is a greater potential for improved graduation rates and career readiness. Because these programs have such great potential to ensure more graduates are prepared for the new economy, school improvement efforts should include — and often focus on — career/technical education (CTE) by upgrading programs, increasing rigor and holding all students to higher standards.

Shared-time and full-time technology centers are valuable resources that offer a different approach to learning. These centers give high school students access to skills and technical training needed for today's job market — opportunities that are unavailable to students in most high schools. Yet despite school improvement efforts, states often fail to engage centers in revising and strengthening the curriculum to meet students' educational needs. **Technology centers should be in the forefront of efforts to revitalize, reinvigorate and modernize CT programs**. **They are positioned to tap into students' interests to provide career pathways that will result in meaningful employment and further education**.

Eleven Technology Centers Improving Achievement

To help students see a connection between the classroom and their future educational and career goals, the Southern Regional Education Board (SREB) launched *Technology Centers That Work* (*TCTW*). This improvement design assists shared-time and full-time technology centers in improving academic and technical achievement and producing graduates who can succeed in high-skill, high-wage jobs. Based on the *High Schools That Work* (*HSTW*) design, *TCTW* has been customized to suit the unique needs and challenges of technology centers.

This report explores specific practices that have enabled 11 *TCTW* sites to increase reading *and* mathematics achievement and to prepare students for postsecondary studies and careers. **Identification and an understanding of practices that have led to success at these shared-time centers can guide future improvement efforts to better tap the potential of CT in improving outcomes for all students**.

Forty-five *TCTW* sites participated in the *HSTW* Assessment[1] in both 2008 and 2010. While 28 sites experienced an increase of at least five percentage points in reading or mathematics, this report focuses on 11 centers that increased students' mean scores in both reading and mathematics by at least five points — the equivalent of one-half of a grade level — between 2008 and 2010. This study examines the factors that may have contributed to the improved increases in student achievement.

While the majority of students at the 11 centers are white (84 percent), the minority student population is diverse. A slight majority of students (54 percent) are from high socioeconomic backgrounds.[2] More students are male, although the gap between the percentages of male and female students decreased from 2008 to 2010. The centers are distributed among rural, town and suburban settings, with none located in urban areas. (See Table 1.)

This research brief features actions and achievements of 11 centers in six states in the *TCTW* school improvement network:

Central Nine Career Center	Indiana
Carthage Technical Center	Missouri
Arcadia Valley Career Technology Center	Missouri
Hunterdon County Polytech	New Jersey
Wayne Technical and Career Center	New York
Canadian Valley Technology Center	Oklahoma
Wes Watkins Technology Center	Oklahoma
Western Area Career and Technology Center	Pennsylvania
A.W. Beattie Career Center	Pennsylvania
Middle Bucks Institute of Technology	Pennsylvania
Lancaster County Career and Technology Center	Pennsylvania

1 The *HSTW* Assessment is based on the National Assessment of Educational Progress (NAEP) and consists of achievement tests in reading, mathematics and science. Students who meet the *HSTW* readiness goals on these tests (set at the Basic level) likely are prepared for postsecondary studies without needing remediation in that subject or likely able to pass the subject-specific sections of employer exams for entry-level positions. The assessment also includes a transcript study of the students' course-taking patterns and a survey of the school and classroom experiences that demonstrate what and how students were taught, what was expected of them, and how much effort teachers exerted in teaching and students exerted in learning. The *HSTW* Assessment provides information that helps school leaders and teachers connect student performance with the courses they take and the quality of their school and classroom experiences. *TCTW* centers also participate in a teacher survey tailored to the unique experiences of technology center teachers. The survey contains questions about the centers' mission, high expectations and extra help, guiding and supporting students, curriculum content and engaging students in learning, transitions, and leadership and professional development.

Table 1 Demographics of 11 Technology Centers		
	2008	2010
Number of Students	587	595
Number of Teachers	233	288
Student Race/Ethnicity		
White	84%	84%
Non-White	16	16
American Indian/Alaska Native	3	2
Asian	2	1
Black or African American	3	2
Hispanic or Latino	4	6
Native Hawaiian or Other Pacific Islander	<1	1
Multiracial	4	5
Socioeconomic Status[1]		
High	53%	54%
Low	47	46
Gender		
Male	65%	58%
Female	35	42
Geographic Location[2]		
Rural	--	27%
Town	--	27
Suburb	--	45
City	--	0

1 Parental education serves as a proxy for students' socioeconomic status (SES). A student who has at least one parent who has completed at least some college is classified as having a moderate to high SES. Conversely, if neither parent has pursued any postsecondary education, the student is classified as having a low SES.

2 National Center for Education Statistics (NCES) locale codes were used. The following three codes were collapsed into one "rural" category: Rural, Remote; Rural, Distant; and Rural, Fringe. Three codes were collapsed into the "town" category: Town, Remote; Town, Distant; and Town, Fringe. Three codes were collapsed into the "suburb" category: Suburb, Small; Suburb, Midsize; and Suburb, Large. Three codes were collapsed into the "city" category: City, Small; City, Midsize; and City, Large.

Source: 2008 and 2010 *HSTW* Assessments, SREB

The 11 centers maintain a diverse selection of CT programs. (See Table 2.) The largest concentrations of students are in the fields of Agriculture, Food & Natural Resources; Architecture & Construction; and Health Science. While the distribution of students in CT concentrations remained fairly consistent from 2008 to 2010, four fields experienced moderate growth or decline. Health Science and Science, Technology, Engineering and Mathematics (STEM) grew moderately. Architecture and Construction and Manufacturing declined moderately.

Table 2
Students' CT Concentrations

	2008*	2010*	Change (percentage points)
Agriculture, Food and Natural Resources	7%	9%	+2
Architecture & Construction	16	12	-4
Arts, Audio/Visual Technology and Communications	6	6	0
Business, Management & Administration	3	5	+2
Education & Training	2	4	+2
Finance	0	1	+1
Government & Public Administration	1	0	-1
Health Science	8	14	+6
Hospitality and Tourism	7	4	-3
Human Services	7	7	0
Information Technology	9	6	-3
Law, Public Safety, Corrections and Security	5	7	+2
Manufacturing	12	6	-6
Marketing, Sales and Service	1	0	-1
Science, Technology, Engineering & Mathematics	0	4	+4
Transportation, Distribution and Logistics	8	6	-2
Other	7	10	+3

* Percentages are based on students who reported a career concentration.
Source: 2008 and 2010 *HSTW* Assessments, SREB

The 11 centers increased student achievement by an average of 13 points in reading, 13 points in mathematics and 14 points in science from 2008 to 2010. (See Table 3.) The centers also experienced a gain of 15 points in the percentage of students meeting the college- and career-readiness goal[3] in reading, 16 points in mathematics and 14 points in science. The scores mean that more than one-half of 12th-graders at these centers were college- and career-ready in 2010, up from approximately one-third in 2008.

These centers not only improved overall student achievement — they also improved student achievement within each student group. (See Figure 1.)

3 The *HSTW* readiness goals for reading, mathematics and science are set at the Basic level on each test. Students who meet these goals are likely prepared for postsecondary studies and careers.

Table 3
Changes in Achievement

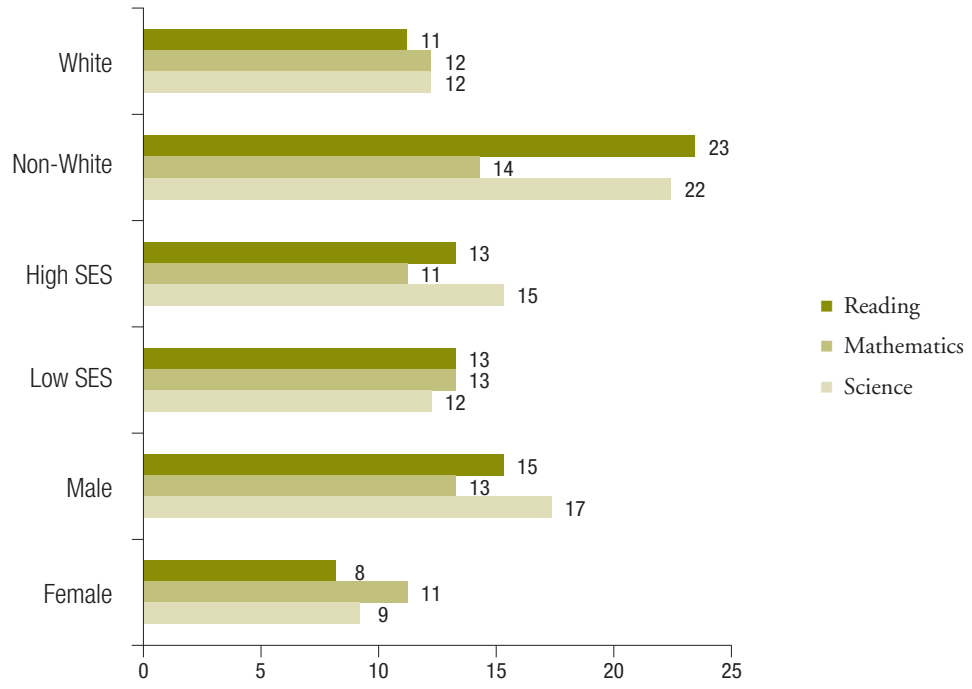
	2008*	2010*	Change
Mean Scores*			
Reading	237	250	+13 points
Mathematics	239	252	+13
Science	241	255	+14
Percentage of Students Meeting Readiness Goals			
Reading	41%	56%	+15 percentage points
Mathematics	38	54	+16
Science	41	55	+14

* **The *HSTW* Assessment subject tests are scored on a scale of 0 to 500. The *HSTW* readiness goals are 250 in reading, 257 in mathematics and 258 in science.**

Source: 2008 and 2010 *HSTW* Assessments, SREB

Increases in mean scores ranged from 8 points in reading for female students to 23 points in reading for non-white students. Non-white students, whose achievement historically trails that of white students, made larger gains than white students in all three subject areas over the two-year period.

Figure 1
Changes in Mean Scores from 2008 to 2010 by Group



Source: 2008 and 2010 *HSTW* Assessments, SREB

Success Factors

Analysis of *HSTW* assessment data revealed seven factors as possible contributors to the achievement gains in reading and mathematics at the 11 centers:

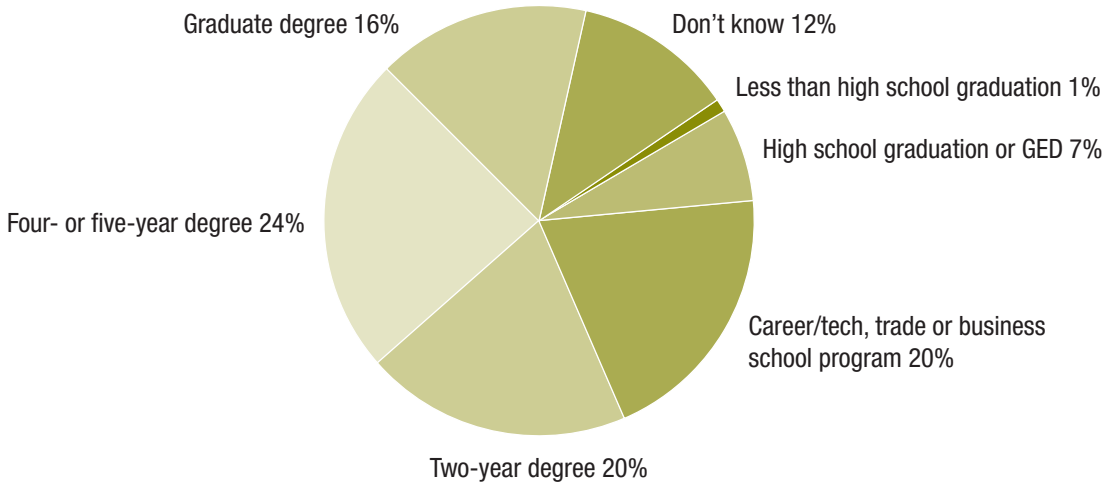
- A clear mission and creating a culture of continuous improvement
- Rigorous academic curriculum
- Intellectually demanding and engaging instruction and assignments
- Integration of academic and technical content and skills
- High expectations
- Parental support, guidance and focus on the importance of high school
- Targeted professional development

Success Factor 1: A Clear Mission and Creating a Culture of Continuous Improvement

Technology centers can and should lead the way in developing innovative, challenging and advanced CT programs of study to prepare students for postsecondary studies and high-demand, high-skill, high-wage careers. The mission of every technology center should be to prepare students for both a career and further study. Such preparation opens doors by providing choices to students.

In 2010, 80 percent of students at the 11 centers reported that they planned to complete some postsecondary education by age 30. (See Figure 2.) If these students are to meet their goals, center leaders need to create a culture and a set of learning experiences that support readiness for postsecondary study and advanced training. The centers need to work with their home high schools to create a more cohesive program of academic and technical studies to prepare students to achieve their goals.

Figure 2
Amount of Education Students Think They Will Complete by Age 30



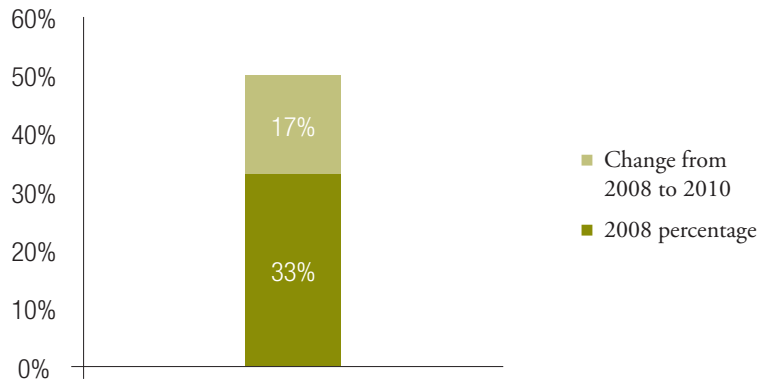
Source: 2010 *HSTW* Assessment, SREB

Some people buy into the myth that CT students will not (or, in some cases, cannot) succeed in postsecondary education and that technology centers should prepare students for basic employment. The fact is that, in this economy and competitive environment, more jobs require certifications and degrees beyond the secondary level. Even students who choose to work immediately after graduation should be equipped with the skills to advance in their career and to pursue further study.

Attitudes at the 11 centers are changing. In 2010, almost two-thirds (62 percent) of teachers said they strongly agree that preparing all students for the dual objective of employment and further study is very important. While this attitude among teachers is in itself crucial, its significance is magnified by the fact that these centers have fostered such an attitude among a large percentage of faculty members, demonstrating that the centers have common and clear goals. The percentage of teachers strongly agreeing that their centers' goals and priorities are clear increased by 17 points between 2008 and 2010. (See Figure 3.)

A total of 288 teachers at the 11 technology centers participated in the 2010 *TCTW* Teacher Survey. Eighty-eight percent of participants were CT teachers and 12 percent were academic teachers. The CT fields that were most represented included Health Science; Transportation, Distribution and Logistics; Architecture and Construction; Manufacturing; STEM; Agriculture, Food and Natural Resources; and Arts, Audio/Video Technology and Communications.

Figure 3
Teachers Strongly Agree That the Goals and Priorities of Their Center Are Clear



Source: 2008 and 2010 *HSTW* Assessments, SREB

The majority of faculty members at the 11 centers have adopted the dual mission to prepare students for employment and further study, and they have made changes to the curriculum and instruction to meet their ambitious goals. From 2008 to 2010, significantly more teachers reported experiencing an intensive emphasis on continuous improvement at their centers. Dramatic increases occurred in the percentages of teachers strongly agreeing that their centers had clear goals, that teachers maintained a demanding yet supportive environment, that the need to teach all students to the same high standards is stressed, that teachers are continually learning and seeking new ideas, that teachers and the director work as a team, and that teachers use data to evaluate curriculum, instruction and student success. (See Table 4.)

By setting a clear mission and creating an environment of continuous improvement, these centers have set the stage for engaging the faculty in a culture of continuous improvement and for working with the home high school in joint efforts to prepare more students for both college and careers.

Table 4
Teachers' Perceptions of Continuous Improvement

Teachers reported:	2008*	2010*	Change (percentage points)
They experienced an **intensive** emphasis on continuous improvement (four to six indicators).	27%	40%	+13
They **strongly agree** that the goals and priorities for their center are clear.	33	50	+17
They **strongly agree** that teachers in this center are continually learning and seeking new ideas on how to improve student achievement.	48	64	+16
They **strongly agree** that teachers and the center director work as a team to improve student achievement in their center.	33	46	+13
They **strongly agree** that teachers use data continuously to evaluate the center's curriculum, instruction and student success.	30	42	+12
They **strongly agree** that teachers in this center maintain a demanding yet supportive environment that pushes students to do their best.	50	62	+12
The director stresses to them **monthly** that they should teach all students to the same high standards.	31	42	+11

Source: 2008 and 2010 *TCTW* Teacher Surveys, SREB

Actions to Create a Culture of Continuous Improvement

Five actions are necessary to change a technology center's culture and to launch the center on a path to improvement:

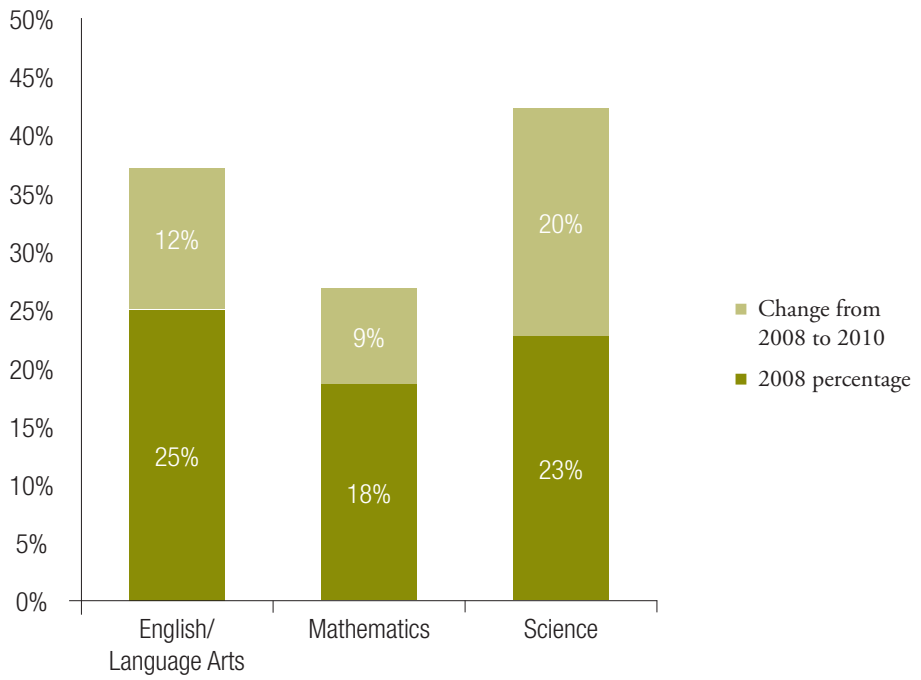
1. Adopt a clear, functional mission statement to prepare students for employment, advanced career training and postsecondary study. Publicize the fact that the leadership team is committed to aligning and benchmarking student assignments and assessments to meet these goals.
2. Develop and focus on a comprehensive center improvement plan. Technology center leaders can create an organizational structure and process where teams of faculty members can collaborate with other teachers to determine what to teach, how to teach it, what students are expected to learn, and how to assess what they have learned. They can also collaborate on how faculty members relate to each other, to students, to the home high school, to families and to the community.
3. Gain faculty support by including teachers in the planning and the execution of center improvement efforts.
4. Support teachers by providing time for them to work together in planning blended lessons and projects to help students succeed in challenging CT and academic studies. Provide relevant and timely professional development to equip teachers with the knowledge and skills to implement improvement plans.
5. Use data to set goals, guide decision-making, measure progress and make adjustments to improvement plan strategies. Holding open discussions based on data will help gain faculty support and provide clear goals for school improvement.

Success Factor 2: Rigorous Academic Curriculum

All CT fields have a foundation in academic studies — English/language arts, mathematics, science and social studies. CT students need to be able to read and interpret technical materials, use mathematics to solve problems in the workplace and employ scientific inquiry to address technical problems. Research shows that CT students who complete a rigorous academic curriculum are significantly more likely to meet college- and career-readiness goals than students who do not complete a rigorous academic curriculum.[xi]

Leaders and teachers at the 11 centers understand the importance of a challenging academic curriculum to prepare students for a range of postsecondary opportunities. The centers increased the percentages of students completing a rigorous curriculum in English/language arts, mathematics and science[4] by 12, 9 and 20 points, respectively, from 2008 to 2010. (See Figure 4.)

Figure 4
Percentages of Students Completing a Rigorous Academic Curriculum



Source: 2008 and 2010 *HSTW* Assessments, SREB

While the centers continue to have less than 50 percent of students completing a college-preparatory academic core, they made considerable progress in the two-year period. As technology centers work to prepare students for both college and careers, they need to help students understand the effort required to achieve a goal. Often, students are unaware of the courses they must take to be prepared for both college and careers. Technology center teachers can help students plan to take the right courses to meet postsecondary goals.

The 2010 Assessment showed that 48 percent of students took challenging courses in high school. When asked why they took challenging courses in high school, the majority of these students reported that challenging course would prepare them for their goals beyond high school, demonstrating an understanding of the link between high school learning and future success. These students recognize the importance of rigorous academic courses to their future, no matter what their intended path may be. (See Table 5.)

4 The *HSTW*-recommended academic curriculum includes four college-preparatory English/language arts courses, four college-preparatory mathematics courses (Algebra I and higher) and three lab-based science courses.

Table 5 Why Students Took Challenging Courses in High School	
Reason	Percentage of Students, 2010
They will prepare me for my goal(s) beyond high school.	51%
I like being challenged.	45
My teachers or counselors encouraged me to take them.	43
My parents encouraged me to take them.	38
They contribute more points toward my grade point average (GPA).	31
Other	22
My friends took them.	19
They are necessary for admission to college.	18

Source: 2010 *HSTW* Assessments, SREB

The fact that nearly one-half of these students reported that they like being challenged underscores the need for technology centers to provide students with access to rigorous academic and CT courses that engage them in productive struggle. It is clear that these students are ready to be pushed to meet high standards and want to prepare for postsecondary pursuits. Other common responses were that teachers, counselors or parents encouraged students to take challenging courses. The 11 centers and the community see the importance of rigorous academic courses and actively encourage students to complete such studies.

The 52 percent of students who reported that they did not take challenging courses in high school were asked why they did not take such courses. (See Table 6.)

Table 6 Why Students Did Not Take Challenging Courses in High School	
Reason	Percentage of Students, 2010
They are not necessary for my goal(s) beyond high school.	30%
Other	29
They are too difficult.	25
Nobody encouraged me to take them.	23
I don't understand the point of taking such courses.	20
I don't want to work that hard.	17
My teachers or counselors recommended that I not take them.	13
My friends are not taking them.	5
My parents recommended that I not take them.	5

Source: 2010 *HSTW* Assessments, SREB

The most common response was that such courses are not necessary to reach post-high school goals. Yet 73 percent of students who avoided challenging courses said they planned to complete some education beyond high school. **Unfortunately, these students have been misinformed about the importance of taking challenging courses to achieve their goals**. Forty-seven percent of these students plan to complete a CT or trade program or obtain a two-year degree. Challenging courses are important, even for these students.

After "other" reasons, the two most common responses were that such courses are too difficult and that nobody encouraged them to take challenging courses. These finding show that, just as many students who took challenging courses had been encouraged to do so, students who did not receive support or encouragement to take challenging courses were unlikely to complete such courses. Every teacher at a technology center plays a critical role in ensuring that students take the rigorous courses needed to be successful in postsecondary pursuits.

Actions to Ensure That More Students Complete a Rigorous Academic Curriculum

The effort to ensure that more technology center students complete a rigorous academic curriculum begins with center leaders and teachers, who must understand why students should take challenging courses. CT teachers need to realize that too few students are entering postsecondary studies or entry-level jobs in their chosen career fields because of weak academic skills and content in those fields. Candid conversations can enlighten CT teachers to the need for students to complete a more demanding academic curriculum, to succeed in such a curriculum and to receive support from teachers in doing so. The 21st-century economy requires that students gain the academic tools necessary for continued learning in further education and on the job.

Technology centers face a unique challenge in increasing the number of students who take challenging academic courses because they typically see students for only part of the school day. This challenge compels technology centers to work more closely with home high schools to ensure that more students complete a college-ready academic core. **It is worth the effort for technology centers to work with sending schools to develop seamless programs of study that make learning more meaningful for students**. Four actions will guide technology centers in raising students' academic knowledge and skills:

1. Teach academic courses at the technology center. While doing so would require a structural shift, it would allow technology centers to keep students at the center all day and to give students more control over their programs of study. It would enable centers to focus more attention on academic integration by allowing academic and CT teachers to work together to integrate academic content and skills into CT courses and to embed authentic work problems into academic courses. Centers need to ensure that students receive guidance and extra help to succeed in more rigorous courses. Keeping students at the center all day also increases instructional time by eliminating bus travel during school hours.
2. Develop hybrid courses for academic credit. Technology centers can develop hybrid courses that satisfy both academic and technical requirements. Such courses ensure that students are taught academic content that meets state standards in order to receive academic credit. Any hybrid course developed and offered by a technology center should be vetted by an external group to ensure that 1) content standards are equal to those of traditional courses, 2) the instructor is qualified and has completed appropriate training to teach the course and 3) students perform as well on end-of-course assessments as students enrolled in traditional courses.
3. Work with feeder high schools to develop rigorous, cohesive programs of study. Technology center leaders, teachers and counselors can work with students, parents and feeder high schools to delineate the expectations. They can define the CT courses that students will take at the technology center and the academic courses that students should take at the home high school. Well-developed programs of study help students understand the courses they must complete to be prepared for college and careers. Additionally, technology centers can offer exploratory courses to help ninth- and 10th-graders identify their interests in CT pathways and to demonstrate the importance of taking rigorous academic courses to supplement learning in technical classes.

4. Provide opportunities for students to take Web-based courses. Web-based courses can help technology centers meet the challenge of providing access to academic courses. Scheduling conflicts and other challenges can prevent students at some home high schools from taking rigorous academic courses. Web-based courses allow students to enroll in such courses at convenient times. Additionally, these courses enable students to continue attending the technology center in grade 12 by eliminating conflicts that prevent them from completing graduation requirements. Technology centers can offer Web-based courses in academic subjects that will improve students' learning in chosen programs of study. Many states support virtual schools that offer rigorous academic courses.[5]

Success Factor 3: Intellectually Demanding and Engaging Instruction and Assignments

Teachers at successful technology centers can heighten academic and technical learning by using intellectually demanding and engaging problems to relate learning to students' interests. Such assignments require students to solve problems, troubleshoot, experiment, invent, design, think critically, collaborate, communicate, connect abstract concepts or processes to authentic work, plan, prioritize, research, and synthesize information and ideas.

The 11 centers saw an increase between 2008 and 2010 in the percentages of students who said they completed intellectually demanding assignments. (See Table 7.) More students reported making journal or lab manual entries, having challenging assignments, using computers or related technology and completing a project requiring research and a written plan.

Table 7
Intellectually Demanding Assignments

Students reported:	2008	2010	Change (percentage points)
They make journal or lab manual entries that record their class work **at least weekly**.	24%	35%	+11
They have challenging assignments **at least monthly**.	67	75	+8
They use computer software or other technology related to their career/technical areas to complete assignments **at least weekly**.	33	41	+8
They complete a project that requires research and a written plan before completing the task **at least once a semester**.	73	75	+2

Source: 2008 and 2010 *HSTW* Assessments, SREB

Teachers at the 11 centers ensure that their assignments require students to use higher-order thinking and academic skills. In 2010, almost one-half of students reported that their teachers expected them to apply academic knowledge and skills in their CT areas and to use technical knowledge and skills in new situations. Approximately one-third of students reported that they were required to use mathematics to solve complex problems related to their career fields, predict outcomes, develop a logical argument, complete an extended project and make inferences. Only one-fifth of students said they had to develop and test hypotheses. (See Table 8.)

5 For more information, visit http://www.sreb.org/programs/EdTech/SVS/SREB-SVS.asp.

Table 8 Intellectual Rigor of Career/Technical Assignments	
Students reported:	Percentage of Students, 2010
They apply academic knowledge and skills to their career/technical area.	46%
They apply technical knowledge and skills to new situations.	46
They use math to solve complex problems related to my career/technical area.	36
They predict outcomes based on observations or information provided.	35
They develop a logical argument for their solution to a problem or project.	31
They complete an extended project that requires planning, developing a solution or product and presenting the results orally or in writing.	31
They make inferences from information provided to develop a solution for a problem or project.	30
They develop and test hypotheses.	19

Note: These items were not included on the 2008 survey.
Source: 2010 *HSTW* Assessment, SREB

Although more work is needed to integrate these skills into regular instruction and assignments, the data revealed that one-third to one-half of students at the 11 centers are receiving the type of instruction that is largely absent from CT courses in comprehensive high schools or technology centers.

In the same way that students reported having more rigorous assignments, more teachers in 2010 than in 2008 said they required students to complete tough assignments and received encouragement to do so. (See Table 9.)

Table 9 Rigor of Assignments			
Teachers reported:	2008	2010	Change (percentage points)
They require students to work on open-ended problems for which there is no immediately obvious method of solution **at least weekly**.	24%	39%	+15
They **strongly agree** that they are encouraged to give their students challenging assignments.	59	71	+12
They require students to design a research investigation, implement it and prepare a written report that summarizes and interprets their findings **at least once a semester**.	44	56	+12
They require students to solve problems students are likely to encounter in the real world **at least weekly**.	78	89	+11
They require students to develop a strategy for solving a problem that is occurring or could occur in a work setting **at least weekly**.	57	66	+9
They require students to work in cooperative groups or teams to deepen understanding of content **at least weekly**.	43	51	+8

Source: 2008 and 2010 *TCTW* Teacher Surveys, SREB

More teachers reported that they assigned students to work on open-ended problems, design and carry out research investigations, solve authentic problems, develop strategies to solve problems and work in cooperative groups. The percentage of teachers who strongly agreed that they are encouraged to make challenging assignments also grew between 2008 and 2010.

Actions to Promote Intellectually Demanding and Engaging Instruction and Assignments

Five actions are necessary to change a technology center's culture and to launch the center on a path to improvement:

1. Provide professional development on frameworks and hierarchies of cognitive complexity such as Bloom's Taxonomy of learning objectives or Webb's Depth of Knowledge levels. Help teachers rework existing assignments to make them more intellectually demanding.
2. Create problem-based workplace scenarios that involve multi-step solutions. Join with business and industry partners to write the scenarios and connect them to college- and career-readiness academic and technical standards.
3. Create rubrics and scoring guides to define quality work on the assignments.
4. Encourage business and industry partners to evaluate student work and lend their expertise. Ask students who do not meet standards to redo the assignment, using feedback from the evaluators.
5. Ask students to reflect after each assignment. Consider how they have increased their intellectual qualities of higher-order thinking, problem solving and critical thinking.
6. Provide workshops to help teachers develop authentic reading and writing task assignments. Use a template that addresses various levels of rigor.
7. Arrange for workshops to help teachers develop multi-step problems embedded in their career field that require the use of several mathematics skills and tools.

Success Factor 4: Integrating Academic and Technical Content and Skills

Integrating Reading and Writing Into CT Instruction

The 11 centers are dedicated to integrating academic and technical content and skills into CT instruction and assignments. Between 2008 and 2010, these centers experienced substantial increases in the percentages of teachers who reported that they received assistance from staff members at their center in developing lesson plans to embed academic content and skills into CT assignments. More teachers also reported that their center has a method to assist them in planning lessons to help students master the academic content embedded in career/technical assignments and that their center emphasizes academic standards. (See Table 10.)

Table 10 Teachers' Experiences With Integrating Academic and Technical Content and Skills			
Teachers reported:	2008	2010	Change (percentage points)
Their center has a staff member who assists them in developing lesson plans to teach the reading, mathematics and/or science content embedded in the career/technical assignments they give students.	43%	73%	+30
Their center has developed a method for assisting them in planning lessons, assignments and assessments that help students master the academic content embedded in the career/technical assignments, projects and problems assigned to students.	49	74	+25
They **strongly agree** that their center emphasizes academic standards (English/language arts, mathematics and science) to ensure students' success in postsecondary studies and careers.	33	53	+20
They **strongly agree** that their center emphasizes skills in reading, mathematics and science that are embedded in the problems, projects and tasks students are assigned.	46	59	+13
They give students assignments designed to address the reading, mathematics and/or science content embedded in career/technical assignments **at least weekly**.	58	71	+13

Source: 2008 and 2010 *HSTW* Assessments, SREB

More teachers in 2010 than in 2008 reported that they integrate reading and writing into CT instruction. (See Table 11.) **These centers more than doubled the percentage of teachers who reported requiring students to read books or articles and demonstrate understanding of the content at least weekly**. More teachers give writing assignments, require students to read and discuss several pieces, complete writing assignments typical of their field and use a journal to write about things they have learned.

Table 11 Teachers' Experiences With Integrating Reading and Writing in CT Instruction			
Teachers reported:	2008	2010	Change (percentage points)
They require students to read an assigned book or article and demonstrate understanding of the content **at least weekly**.	20%	48%	+28
During a typical month, they assign **at least three** writing assignments of at least one page to their students.	40	58	+18
They require students to read several pieces on the same topic and discuss the different points of view **at least monthly**.	22	37	+15
They require students to complete writing assignments typical of the type of writing associated with the career field (e.g., reports, memos, technical manuals, business plans, etc.) **at least weekly**.	26	39	+13
They require students to use a journal to write about things they learned **at least weekly**.	35	47	+12

Source: 2008 and 2010 *TCTW* Teacher Surveys, SREB

These increases in reading and writing assignments from teachers also were reflected in students' reports of their classroom experiences. More students in 2010 than in 2008 reported that they experienced reading and writing in CT courses. (See Table 12.) Nearly 80 percent of students in 2010, compared with 69 percent in 2008, said their CT teachers sometimes or often stressed reading. More students also reported using computer skills, reading and interpreting technical books and manuals, discussing or debating topics, and reading career-related articles.

Table 12
Students' Experiences With Reading and Writing in CT Classes

Students reported:	2008	2010	Change (percentage points)
They are required to use reading skills in their CT classes **at least weekly**.	--*	66%	--
They are assessed on their ability to apply reading skills in their CT classes.	--*	68	--
Their CT teachers **sometimes or often** stress reading.	69	79	+10
They use computer skills to complete an assignment or project in their CT classes **at least weekly**.	35	43	+8
They read and interpret technical books and manuals to complete assignments in their CT classes **at least weekly**.	39	43	+4
They discuss or debate topics with other students about what they read **at least weekly**.	25	29	+4
Their CT teachers **sometimes or often** stress writing.	68	72	+4
They read a career-related article and demonstrate understanding of the content in their CT classes **at least monthly**.	57	60	+3

*These items were not included in the 2008 Student Survey.
Source: 2008 and 2010 *HSTW* Assessments, SREB

These data show that students are exploring the language of a technical field and are reading and writing documents that are critical to mastering a technical field.

Defining Embedded Literacy in Career/Technical Studies

Technical literacy — the ability to read, understand and communicate in the language of a career field — is increasingly important in the workplace. Unfortunately, most CT programs fail to emphasize reading and writing skills. Every CT teacher should embed six key literacy skills into their assignments and activities: 1) summarizing, 2) paraphrasing, 3) categorizing, 4) inferring, 5) predicting and 6) recognizing vocabulary. Three ways to know if Literacy has been embedded into CT studies when:

- students are required to use reading, writing, and study skills and other habits of success to master technical content.
- the teacher deliberately identifies and integrates reading and writing task assignments into classroom activities.
- assessments require students to read and interpret technical materials and to write extended responses that involve the appropriate use of technical language and literacy skills.

Integrating Mathematics Into CT Instruction

More teachers in 2010 than in 2008 reported that they integrated mathematics into career/technical instruction. (See Table 13.) The percentage of teachers that required students to use mathematics to solve real-world problems rose 21 points between 2008 and 2010. More teachers require students to create notebooks that define mathematics career-related terms; read mathematics materials and demonstrate the relationship to technical content; and develop and analyze tables, charts and graphs.

Table 13
Teachers' Experiences With Integrating Mathematics in CT Instruction

Teachers reported:	2008	2010	Change (percentage points)
They require students to use mathematics to solve a real-world problem found in the community, work setting or CT class **at least weekly**.	41%	62%	+21
They require students to create a written notebook that defines mathematics terms in the way they are used in a career field **at least once a semester**.	18	34	+16
They require students to read mathematics-related materials and demonstrate how they relate to career/technical content **at least weekly**.	30	41	+11
They require students to develop and analyze tables, charts and graphs **at least weekly**.	17	25	+8

Source: 2008 and 2010 *TCTW* Teacher Surveys, SREB

More students also reported that they used mathematics in CT courses in 2010 compared with 2008. (See Table 14.) *HSTW* Assessment data revealed an increase in the percentage of students who said they used mathematics to complete challenging assignments in their CT classes in 2010. More students also reported that their CT teachers often stressed mathematics. In 2010, more than half of students reported that they were required to use mathematics skills in CT classes at least weekly, and nearly 70 percent reported being assessed on the ability to apply mathematics skills in career/tech classes.

Table 14
Students' Experiences With Mathematics in CT Classes

Students reported:	2008	2010	Change (percentage points)
They are required to use mathematics skills in their career/technical classes **at least weekly**.	--*	54%	--
They are assessed on the ability to apply mathematics skills in their career/technical classes.	--*	69	--
They use mathematics to complete challenging assignments in their career/technical classes **at least weekly**.	27	34	+7
Their career/technical teachers **often** stress mathematics.	42	46	+4

*These items were not included on the 2008 Student Survey.
Source: 2008 and 2010 *HSTW* Assessments, SREB

Embedding Mathematics Practices Into Authentic Projects

CT teachers can use these eight steps to embed mathematics into their CT courses.

1. Identify and describe an authentic project for each nine-week period that will require students to use mathematics practices and tools.
2. Use the Common Core State (or other rigorous) Standards in mathematics to identify specific knowledge and skills that students are expected to apply and understand to complete the project.
3. Identify the Common Core State (or other rigorous) Standards in literacy, 21st-century skills and habits of success that students will be expected to apply in advancing their mastery of mathematics and technical content and skills. Identify materials to be read, records to be kept, reports to be written, the quality of work expected and the appropriate behavior of individuals and teams.
4. Develop an assessment of the mathematics and technical knowledge and skills expected of students upon completion of the project. Describe re-teaching strategies for students who fail to demonstrate mastery. Indicate the benchmark level that would be acceptable to demonstrate mastery at the Proficient level.
5. Conduct a pre-assessment of students' current knowledge and skills related to mathematics, technical content, technology and tools embedded in the unit. Determine how students will be pre-assessed for current levels of knowledge and skills in each of four domains — mathematics, technical content, use of technology, and other skills and habits essential to success.
6. Develop a series of instructional activities, assignments to engage students in understanding mathematics and technical content, and the use of technology tools to enhance student learning. Some of the planning will involve bridging the gap between the language of the career field and the language of mathematics to help students understand the languages of the workplace and formal mathematics and to see how they are connected without abandoning either one.
7. Decide how the mathematics faculty will engage students in relating mathematics processes and tools to the authentic work of the career field. This work will help connect math with the language of the CT pathway. Planning will include the use of formative assessment lessons and collaborative activities by mathematics teachers to provide opportunities for students to make sense of the mathematics embedded in the project.
8. Describe how students will demonstrate their understanding of mathematics and technical knowledge and skills through completion of the project, assignments and assessment.

Success Factor 5: High Expectations

Technology centers that make progress in improving student achievement maintain high expectations for all students. They embrace the idea that students who are interested in a career field will make the effort to succeed in rigorous academic and technical courses if they are held to high standards, challenged with intellectually demanding and engaging assignments and given extra help and support to meet high standards. The 11 centers have started a process to hold all students to higher expectations.

More students in 2010 than in 2008 reported experiencing high expectations in their classes. (See Table 16.) Students reported that their courses were exciting and challenging, that their teachers knew the subject and made it interesting and useful and that their teachers indicated the amount and quality of work necessary to earn an A or a B. More students also reported that their teachers set high standards and helped them measure up, encouraged them to do well in school and cared enough about them to ensure that they did the work. This level of teacher expectations, encouragement, care and support is associated with increased student effort and motivation, which lead to increased achievement.

Table 16 Students' Experiences With High Expectations			
Students reported:	2008	2010	Change (percentage points)
Their courses **sometimes or often** are exciting and challenging.	64%	77%	+13
Their teachers **often** know their subject and make it interesting and useful.	40	51	+11
Their teachers **often** clearly indicate the amount and quality of work necessary to earn a grade of A or B at the beginning of a project or unit.	48	57	+9
Their teachers **often** set high standards for them and are willing to help them meet them.	43	51	+8
They **often** work hard to meet high standards on assignments.	39	47	+8
Most of their teachers **often** encourage them to do well in school.	56	63	+7
They **somewhat or strongly agree** that with hard work, they could understand the material being taught in their classes.	85	92	+7
Their teachers **often** care enough about them that they will not let them get by without doing the work.	38	44	+6

*These items were not included on the 2008 Student Survey.
Source: 2008 and 2010 *HSTW* Assessments, SREB

Holding students to high expectations is not just an individual effort. While each teacher has a role to play, a technology center needs to place a collective, center-wide emphasis on raising standards. The 11 centers are taking a collaborative approach. (See Table 17.) From 2008 to 2010, the percentage of teachers who reported working with other teachers to align assignments to college- and career-readiness standards increased 25 points. The percentage of teachers who reported working with other teachers to examine student work and to determine if it meets national industry standards in a content area grew 15 points. Furthermore, the percentage of teachers who reported meeting with other teachers to plan joint instructional activities increased 7 points. This collective approach to raising expectations has resulted in a culture of collaboration among teachers at these centers to engage students in more challenging assignments.

Table 17 Teachers' Experiences With High Expectations			
Teachers reported:	2008	2010	Change (percentage points)
They met with other teachers in their department or center to align assignments and agree upon what student work looks like below, at or above a college- and career-ready level **at least once a year**.	37%	62%	+25
They met with a group of teachers to examine students' work to determine if it meets national industry standards in their content area **at least once a year**.	42	57	+15
They meet as a member of a team of teachers to plan joint instructional activities and to take collective responsibility for student learning **at least once a year**.	71	78	+7

Source: 2008 and 2010 *TCTW* Teacher Surveys, SREB

Actions to Increase Expectations for All Students

- Provide time for teachers to work together to: 1) review student work to determine if it meets national industry standards; 2) align assignments to college- and career-readiness academic and technical standards; and 3) discuss and develop solutions to issues of student engagement, motivation and academic or technical achievement in the classroom.
- Support teachers in achieving success for every student by implementing a policy that requires students to redo work until it meets standards. Such a policy includes re-teaching materials to ensure student mastery of key concepts.
- Collect data and analyze student performance on academic and technical exams on a regular basis to ensure that each student is being challenged.
- Provide professional development to equip teachers with the knowledge and tools to plan engaging and demanding assignments that motivate students to meet higher standards.

Success Factor 6: Parental Support, Guidance and the Importance of High School

Providing high-quality academic and technical instruction is necessary, but it is not the only factor in becoming an effective technology center. Centers need to develop comprehensive guidance and advisement systems that allow students to explore and select courses, certifications and work-based experiences related to their interests and talents and to receive support for their postsecondary education and career plans.

Comprehensive guidance and advisement includes support from the entire community — including parental involvement — for student success, and the 11 centers have demonstrated that they are involving parents, community members and faculty in supporting students. More students in 2010 than in 2008 reported that someone in their family emphasizes the importance of education. (See Table 18.) More students also reported that they have a mentor, that they received help from a mentor in choosing high school courses, that they were encouraged to take a combination of academic and CT courses, that a teacher or counselor talked with them about their post-high school plans, and that they met with college representatives and career representatives.

Teachers play a crucial role in advising students. Through daily or weekly classroom interaction, teachers know students' strengths, weaknesses, interests, talents, aspirations and goals. They are in a good position to help students develop postsecondary plans and select the right opportunities to achieve their goals. From 2008 to 2010, the 11 centers increased the percentage of teachers who reported working as advisers with core groups of students. (See Table 19.) More importantly, these teacher-advisers dramatically increased their function and effectiveness between 2008 and 2010. The assessment revealed significant increases in the percentages of teacher-advisers who worked with a student career leadership organization, informed parents and students about students' readiness to pass employer exams, informed parents and students about students' readiness for post-high school studies, and worked with parents and students to address gaps in achievement.

Strong, consistent counseling and advisement, coupled with opportunities to explore careers and postsecondary studies, encourage students to develop the habits of successful learners and enable students to understand the importance of high school in achieving their goals.

Table 18 Parental Support and Guidance			
Students reported:	2008	2010	Change (percentage points)
Someone in their family often emphasizes the importance of education for them to be successful.	54%	69%	+15
They had an adult mentor or adviser who worked with them for all four years of high school.	47	56	+9
Their mentor/adviser worked with them to develop their course choices for high school and review their selections.	64	73	+9
They were encouraged to take a combination of academic and CT courses.	73	80	+7
A teacher or counselor talked to them individually about their plans for a career or further education after high school.	86	92	+6
They received the most help in planning their high school education plan of studies by grade 10.	63	68	+5
They were **very satisfied** with the help they received at school in the selection of high school courses.	33	38	+5
Someone from a college talked to them about going to college.	79	84	+5
They reviewed the sequence of courses they planned to take throughout high school **at least once a year**.	62	64	+2
They spoke with or visited someone in a career that they aspire to.	80	81	+1

Source: 2008 and 2010 *HSTW* Assessments, SREB

Table 19 Teachers as Advisers			
Teachers reported:	2008	2010	Change (percentage points)
They have a core group of students that they advise.	32%	38%	+6
Of those teachers who advise a core group of students, teachers reported:			
They work with a student career leadership organization.	70	89	+19
They inform parents and students about the student's readiness to pass an employer certification exam **at least once a semester**.	41	58	+17
They inform parents and students about the student's readiness to do post-high school studies **at least once a semester**.	48	59	+11
They work with parents and students on ways to address gaps in achievement **at least once a semester**.	56	65	+9

Source: 2008 and 2010 *TCTW* Teacher Surveys, SREB

The results of the 11 centers' increased emphasis on quality guidance and advisement are evident in students' perceived importance of high school and their experiences with the habits of success. (See Table 20.) The 11 centers increased the percentages of students who reported that they tried to do their best work in school, knew when projects were due, kept notes and handouts for each class separate and actively managed their time to complete assignments. They also increased the percentages of students who reported that it is very important to attend all of their classes, to graduate from high school, to continue their education beyond high school, to study hard to get good grades and to participate actively in class.

Table 20
Students' Perceived Importance of High School

Students reported:	2008	2010	Change (percentage points)
They often try to do their best work in school.	46%	58%	+12
They often know when projects are due.	65	75	+10
They often keep their notes and handouts for each class separate.	51	58	+7
They often actively manage their time in order to complete assignments.	42	47	+5
It is very important to attend all of their classes.	76	84	+8
It is very important to graduate from high school.	85	93	+8
It is very important to continue their education beyond high school.	66	72	+6
It is very important to study hard to get good grades.	60	65	+5
It is very important to participate actively in class.	59	63	+4

Source: 2008 and 2010 *HSTW* Assessments, SREB

Actions to Implement an Effective Guidance and Advisement System

- Work with sending high schools to help students develop a cohesive program of study that incorporates both college-preparatory academics and rigorous CT courses.
- Determine the gaps between students' course-taking patterns and their goals beyond high school and share the information with students and their parents. This information should give students reality checks and help them see what courses they need to take to meet their goals for further learning and careers.
- Schedule meetings at least annually for teachers/mentors, students and parents.
- Encourage all students to take challenging academic courses to supplement and improve understanding of technical content.
- Provide information about further educational and employment opportunities and assist students in setting goals for beyond high school.

Success Factor 7: Targeted Professional Development

To change technology center and classroom practices so they will support improved student achievement and college and career readiness, centers need to invest in their teachers. Faculty members needed the capacity to use effective instructional techniques, engage students in learning, develop assignments that require students to read and explain complex texts orally and in writing, require students to use mathematics processes and tools to complete assignments, provide extra help and support and serve as teacher-advisers. Good professional development has three characteristics: 1) It is targeted to a specific problem or problems being addressed by the center. 2) It is an ongoing, embedded process rather than a one-time event. 3) It includes follow-up and support to ensure that teachers implement what they learn and receive feedback to improve instruction.

The 11 centers provided significant professional development, including sessions on challenges being addressed by the center. Teachers received the most professional development on teaching reading and writing for learning across the curriculum, using technology in instruction, raising expectations for student achievement, embedding literacy (reading, writing and communication) in CT instruction and adapting teaching methods to the learning styles of different students. (See Table 21.) Other professional development strengthened teachers' skills in involving students in the learning process, using performance assessment, assigning real-world problems, using cooperative learning, doing collaborative planning, using applied learning strategies, aligning assignments to college- and career-readiness standards, and using project-based learning.

Table 21
Professional Development for Teachers

Teachers reported having staff development in the past three years on:	2010
Using reading and writing for learning strategies across the curriculum	93%
Using technology in instruction	91
Raising expectations for student achievement	90
Embedding literacy (reading, writing, communication) in CT instruction	88
Adapting teaching methods to the learning styles of different students	88
Establishing a classroom environment that actively involves students in the learning process	87
Using performance assessment (e.g., presentations, writing, projects, portfolios)	81
Using real-world problems in instruction and assignments	81
Using cooperative learning in instruction and assignments	79
Doing collaborative planning with other teachers	79
Using applied learning strategies to teach higher-level content	78
Aligning assignments to college- and career-readiness standards	77
Using project-based learning in instruction and assignments	76
Using data to improve instruction and learning	76
Embedding mathematics in CT instruction	74
Helping at-risk students master complex content	73

Source: 2010 *HSTW* Assessment, SREB

Table 21 (*Continued*) Professional Development for Teachers	
Teachers reported having staff development in the past three years on:	**2010**
Understanding mathematical concepts underlying their CT field	70%
Using authentic problems and projects in CT instruction	70
Providing effective extra help	70
Developing grading scales and guidelines	68
Using interdisciplinary themes or units	64
Working with students as a mentor or an adviser	63
Designing course syllabi for CT courses	59
Planning joint assignments with academic teachers	58
Implementing a grading policy that requires students to redo work not meeting standards	58
Having students design and conduct research investigations	57
Applying scientific methods of inquiry in career/technical instruction	56

Source: 2010 *HSTW* Assessment, SREB

Leaders at the 11 centers did not just provide teachers with professional development; they also emphasized the importance of professional development and ensured adequate follow-up. The centers showed a 16-point increase from 2008 to 2010 in the percentage of teachers who reported being expected to reflect on what they learn in staff development programs, apply the information in the classroom and share it with their colleagues. (See Table 22.) More teachers also reported that staff development programs were sustained over time and included ample follow-up activities and that staff development experiences resulted in holding students to the current national academic and industry standards.

Table 22 Professional Development Experiences			
Teachers reported:	**2008**	**2010**	**Change**
I am expected to reflect on what I learn in staff development programs, apply it in the classroom and share it with my colleagues.	24%	40%	+16
Staff development programs are sustained over time, with ample follow-up activities that include an expert observing my teaching and giving me ideas for refining instruction to get higher achievement from my students.	13	27	+14
Staff development experiences have resulted in holding their students to the current national academic and industry standards developed for their field.	23	31	+8

Note: Percentages reported are the percentages of teachers responding "a great deal."
Source: 2008 and 2010 *TCTW* Teacher Surveys, SREB

Actions to Provide Effective Professional Development

- Plan professional development topics based on challenges being addressed by the center.
- Provide ongoing professional development rather than one-time events.
- Embed professional development into the school culture and operation. Utilize Web-based resources and other methods to provide cost-effective, just-in-time delivery of relevant topics.
- Create professional learning teams of teachers to address center and classroom challenges. Use the teams to select and provide professional development opportunities and follow-up.
- Convey the message that professional development is critical to the center's success. Make it clear that teachers are expected to use what they have learned in professional development in the classroom and to continue to learn and refine their instructional techniques.

Conclusion

Technology centers are positioned to make a significant impact on high school students. Many students can benefit from the relevance of CT studies, which provide a context for academic studies and introduce an array of meaningful careers for students to pursue. CT studies can engage more students in a rigorous curriculum by tying academics to their goals and make it possible for at-risk students to graduate from high school by helping them understand that they have a future and can do something to prepare for it.

Centers can and should provide quality technical studies. They should lead the way in revitalizing and reinvigorating traditional CT programs of study. By partnering with employers, they can be in the forefront of emerging career fields and technologies.

It is important for technology centers to be innovative, forward thinking and far reaching in providing upgraded programs of study that represent a blend of academic and technical content. Center leaders and teachers need to prepare students for high-demand, high-skill, high-wage career fields in an increasingly global and competitive economy and job market.

This report describes actions 11 technology centers have taken to raise student achievement. While the centers made great progress in a two-year period, they have the potential to be even better. They have improved the school culture and have changed how they approach instruction, academic content and skills, student expectations, guidance and advisement, and professional development. These changes have equipped the centers to continue the ongoing process of improvement and to realize their potential in preparing more high school graduates for the demands of the 21st-century economy. The responsibility rests with technology centers to produce highly skilled CT graduates who are ready to enter both meaningful employment and further education. Technology centers can open doors to the future.

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