Summit Technology Academy

Upon entering Summit Technology Academy (STA) in Lee's Summit, Missouri, visitors see a large banner displaying the Academy's mission statement: *Summit Technology Academy is a pre-professional learning environment that prepares college-bound students for a highly competitive 21st-century workforce.*

The Academy offers rigorous programs of study that blend classroom instruction with real-world, hands-on experiences at local businesses, city offices, engineering firms, data centers, and biomedical labs. It enhances the high school experience and prepares students for college and careers aligned to their aptitudes and interests.

"A shared-time center can work hard to adopt policies and procedures that will improve the school, but the real improvement takes place in the classroom. It is up to all STA staff to create a culture that focuses on continuous improvement," said Elaine Metcalf, center director. In 2012, the Southern Regional Education Board (SREB) recognized STA as one of three Technology Centers That Work (TCTW) sites in the nation to receive the Platinum High Achievement Award. The award is presented to centers that deeply implement the TCTW school improvement design, teach students a rigorous curriculum, and meet high achievement standards.

The Setting: A Look Inside

STA occupies a 40,000 square-foot space among several high-tech companies in what was once a utility company plant. The approximately 380 students attending the shared-time center in 2012-2013 came from 12 school districts, including rural, suburban, and urban high schools. While most students arrive by bus for the morning or afternoon sessions, some drive themselves up to 35 miles each way to attend. Seventy-five percent of students classify themselves as white, 18 percent as black, 5 percent as Native Hawaiian or other Pacific Islander, and 2 percent as Asian. Approximately 8 percent receive free or reduced-price lunches.

STA is operated by the Lee's Summit R-7 School District and opened in 1998 with 21 students, a staff of four, an engineering program, and a computer repair program. STA was formed to combine resources in a fast-growing suburban school district. Offering high-tech programs at a central off-campus location was economically more feasible than duplicating efforts at each of the high schools in the district and surrounding areas.

In 2012-2013 STA had a staff of 14, and offered eight programs of study. (See Table 1.) The programs have evolved with

Table 1: 2012 STEM Program Offerings at Summit Technology Academy	
PROGRAM	**CAREER PATH**
Digital Media Technology	Arts and Communication
International Studies	Business Management and Technology
IT/Network Essentials	Business Management and Technology
Pre-Professional Nursing	Health Services
Digital Electronics/CIM	Industrial and Engineering Technology
Engineering Design and Development	Industrial and Engineering Technology
Pre-Professional Educator Cadet	Human Services
Medical Interventions/Biomedical Innovation	Natural Resources/Health Sciences

SREB | Technology Centers That Work

a strong focus on science, technology, engineering and math (STEM). The additional programs are a result of the administration looking at data that showed growth in STEM-related jobs in the Kansas City region in occupations such as computer science, engineering and the physical sciences.

A Need for Change

To meet 21st-century workforce demands, keep pace with the growing STEM-related jobs, and prepare students for college and careers, STA had to formulate a plan. Couple this with the increased high school graduation requirements beginning with the class of 2010, STA had to devise measures that would ensure a value-added approach to career/technical (CT) programs of study. STA was not immune from skeptics who thought career/technical education (CTE) was for students who were not heading to college. It was an image issue that led the leadership of STA to pursue a national model for evaluating programs and connecting student performance with school and classroom practices and expectations.

Becoming a TCTW Site

Since many of the 18 area high schools that send students to STA were part of the SREB's High Schools That Work (HSTW) network, STA turned to SREB in 2009 for help with implementing its TCTW model and adopted the TCTW Key Practices and Conditions for Continuous Improvement to guide its school advancement efforts. (See Appendices A and B.)

STA begin looking at data to evaluate programs and develop a plan for improvement. The school's teachers and director completed several self-assessments and a TCTW teacher survey to determine some baseline perceptions. SREB staff came to STA to conduct site development workshops to kick off the new school year. The SREB staff visited again a few months later to conduct classroom observations and additional workshops. It was this type of high-quality professional development focused specifically on data that helped STA staff learn to use data to make decisions.

Revealing Data

Too Many STA Graduates in Remedial Courses

After graduation, STA students are tracked for enrollment into remedial course work at the local community college. Students take the COMPASS exam or submit ACT scores to determine placement into remedial courses or into regular college-credit courses. In 2009, 43 percent of STA students were placed in remedial courses at the community college compared with 41 percent in 2012. (See Table 2.) While the percentage of students in remedial courses fluctuated from year to year, the data do confirm a need to change.

A Drop in Enrollment Due to Increased Graduation Requirements

The Missouri State Board of Education raised the standards and increased the number of units required to graduate beginning with the class of 2010. The number of units in electives decreased from 10 ½ units to nine units. (See Table 3.)

Table 2: STA Students Placed in Remedial Courses After Graduation				
	2009	**2010**	**2011**	**2012**
Number of STA students enrolled at community college	45	43	40	37
Percentage of STA students enrolled in at least one remedial course	43%	28%	50%	41%

Source: Metropolitan Community Colleges 2009-2012

While no one could argue with the need for higher standards for graduation, it did present problems with students being able to access CT courses.

As a result of the increase in core credits, the enrollment in CT courses in general declined around the state. STA had to come up with a solution. Advisory teams and administrators looked at the daily bell schedule, travel time, access to credits, and other key pieces of information. The "aha moment" came when looking at the access to credits lost for students traveling to and from STA. **The Missouri State Board of Education requires a set number of minutes**

of instruction in relation to credit earned. By merely changing the start and end times at STA, it allowed sending schools to bus students to the Academy on time. Students no longer lost class time and potentially credits due to travel.

Every program at STA also incorporates virtual learning; each student is required to do independent assignments online after the school day. Students do independent study projects or respond to discussion questions posed by their teachers. This also provides more access to credits.

Table 3: Comparison of High School Course Graduation Requirements		
CURRICULA AREA	**CLASS OF 2008**	**CLASS OF 2010 AND BEYOND**
Communication Skills	3 units	4 units
Social Studies	2 ½ units	3 units
Mathematics	2 units	3 units
Science	2 units	3 units
Fine Arts	1 unit	1 unit
Practical Arts	1 unit	1 unit
Physical Education	1 unit	1 unit
Technology	½ unit	0
Personal Finance	0	½ unit
Health	½ unit	½ unit
Electives	10 ½ units	9 units
TOTALS	**24 units**	**26 units**

Source: Missouri Department of Elementary and Secondary Education

Lifelines That Fueled Progress

Still, to add value its CT programs of study, the academy needed a stronger school improvement plan focused on student achievement. The staff became a professional learning community striving to improve student performance in the classroom and beyond. The Academy identified three "lifelines" that fueled its success:

- Expand opportunities for students to access a rigorous academic core and a CT concentration as part of students' personal plans of study.

- Provide more emphasis on literacy, mathematics, and science across the curriculum at STA.

- Develop a culture of engagement that would be evident upon entering the school and the classroom.

Lifeline 1: Expand opportunities for students to access a rigorous academic core and a CT concentration as part of students' personal plans of study.

To address this lifeline, a group consisting of STA staff, guidance counselors, principals from sending schools, and district leaders was formed. It looked at data from the HSTW recommended curriculum. It also looked at transcript analysis data that addressed whether students were accessing rigorous academic courses in addition to CT studies.

HSTW Recommended Curriculum:

- four college-preparatory English courses that emphasize reading, writing and presentation skills
- four college-preparatory mathematics courses, including Algebra I, geometry, Algebra II and a higher-level mathematics course such as trigonometry, statistics, pre-calculus, calculus or Advanced Placement mathematics
- three science courses, with two college-preparatory biology, chemistry, anatomy/physiology or physics/applied physics
- three college-preparatory social studies courses
- four courses above the academic core in either a CT, academic or blended academic and CT concentration or concentration in mathematics/science or the humanities

The 2010 HSTW implementation data revealed two areas that needed addressing when comparing STA students to students at high-scoring TCTW sites with similar demographics: literacy as related to writing assignments and numeracy as related to solving problems in real-life situations. The data showed only 29 percent of STA students were completing the HSTW recommended curriculum in English/language, compared with 67 percent in high-scoring sites. (See Table 4.) Sixty-four percent of STA students completed the recommended curriculum in mathematics, compared with 78 percent at high-scoring sites. This became the focus of professional development days. As a result, several new strategies emerged, such as establishing online courses, a summer school program, and areas of focus.

Online Courses — To address decreased access to CT courses, the Lee's Summit R-7 School District developed three required graduation courses in an online format — personal finance, health and American history. By allowing students to take online courses in addition to the normal seven credits per year earned in face-to-face classroom courses, students' schedules were freed up to take STA courses in their junior or senior year.

The STA director and teachers promoted the courses at area sending schools, open houses, student tours, counselors meetings, etc. Caution had to be taken, because online learning is not the right choice for every student. **A profile of the type of student that is most successful in an online environment was developed. "A student who has good time management skills, reads instructions completely, and communicates questions or concerns to the instructor in a timely manner can easily be successful in an online environment," said Lisa Oyler, STA information technology teacher.** This profile became the standard for counselors and academic advisers to use when determining which students should enroll in an online course. Since online course offerings began in 2010, enrollment at STA has climbed from 220 students to 346 students.

Summer School Offerings — A team of STA teachers worked with the director to draft a proposal for a half-credit course called Introduction to STEM Careers (iSTEM) as part of the regular summer school offerings. STA teachers were challenged to write units of study specific to their curriculum area that included lessons that addressed the Common Core Standards Initiative (CCSI). As the curriculum came together,

Table 4: 2010 HSTW Implementation Summary for STA Compared With Students at High-Scoring TCTW Sites With Similar Demographics		
Selected Indicators	2010	HIGH-SCORING SITES IN CATEGORY A*
Percentage of students completing the HSTW-recommended curriculum as compared to High-Scoring Sites		
English/Language Arts	29%	67%
Mathematics	64	78

Source: 2010 and 2012 HSTW Student Assessment, SREB

* Schools with a minority enrollment greater than or equal to 30 percent with at least 60 percent of the students reporting that one or both of their parents had some education after high school.

the iSTEM course took shape as a hands-on course with applied mathematics, science and technology embedded in the lessons. The course was promoted to all eighth-grade students who had completed Algebra I with a B- or better grade. The first time this course was offered, there was a waiting list for students to enroll. It has proven to be one of the best strategies for generating excitement among eighth-graders and making them aware of what it takes to access STA courses in their junior or senior years. One of the eighth-grade students in the iSTEM course noted:

"I liked the hands-on project experiences. Of all the things I did, my favorite activity was the soldering project. My least favorite was the dissection of the

heart in the bioscience classroom. The iSTEM course really helped me decide which programs I want to take at Summit Tech when I'm in 11th grade."

Areas of Focus — To boost college readiness, students are required to enroll in higher-level mathematics, English, and science courses in their home high schools. The sending school counselors work collaboratively with STA staff on students' personal plans of study. "Personal plans of study give students a direction in what to take in order to thrive in their area of study. It better prepares them for their classes at STA and at college," said Angela Ottolina, a guidance counselor from one of the sending schools.

In the R-7 school district, all students should have a four-year plan of study around a career path. Thirty-eight career offerings are supported by the school district's comprehensive high schools and shared-time centers. Students must earn four credits in one of the 38 areas. Beginning in the 10th-grade year, students declare an area of focus, then work to complete the four credits before graduation. The four credits could be from academic core courses and/or CT courses. A student can change the area of focus as often as needed. The completion of the area of focus is noted on the official high school transcript.

STA used the area of focus data to develop a coherent sequence of rigorous academic and career courses. One example of a coherent sequence of courses is the Pathway to Engineering program developed by Project Lead the Way (PLTW). This four-year sequence of high school courses introduces students to the scope and rigor of engineering and connects these courses to a sequence of mathematics and science courses. Students completed foundational PLTW courses at the sending schools and progressed to specialized courses in their junior and senior year at STA.

Learning Focuses by Career Pathways

ARTS AND COMMUNICATIONS PATHWAYS

Architectural Design
Communications
    Debate/Forensic Concentration
    Journalism/Publications/Video Production
    Concentration
Fine and Applied Art
International Studies
Performing Arts
    Choral Music Concentration
    Theatre Concentration
    Instrumental Music Concentration
    Film/Audio Production Concentration
Advanced Studies
Sports Medicine

BUSINESS MANAGEMENT AND TECHNOLOGY PATHWAYS

Accounting
Administrative Professional (Two-Year Assoc. Degree)
Business Administration (Four-Year Degree)
Information Technology
Marketing
Network Administration

HUMAN SERVICES PATHWAYS

Culinary Arts
Education
    Early Childhood/Elementary Concentration
    Secondary/Postsecondary Concentration
Protective Services
Public Service
Social Services
Social Sciences

HEALTH SERVICES PATHWAYS

Health Services Professions
(O.J.T Two-Year Degree, or Technical Program)
Health Services Professions
(Four-Year or Terminal Degree)
Electronics
Engineering
Fabrication/Manufacturing
Mechanical/Automotive Technology

INDUSTRIAL AND ENGINEERING TECHNOLOGY PATHWAYS

Construction Trades
Drafting and Design (CAD)

NATURAL RESOURCES PATHWAYS

Animal Science
Agriscience
    Farm Management Concentration
    Landscape Design/Horticulture
    Concentration
Environmental Studies
Food Science

Lifeline 2: Provide more emphasis on literacy, mathematics and science across the curriculum at STA.

Emphasis on Literacy

The staff created a learning community centered around this lifeline. While all of the STA teachers know that CT fields have a foundation in academic studies, it became apparent that students needed more practice in literacy to raise achievement. Each teacher was challenged to set a SMART (specific, measurable, attainable, relevant, and time-based) goal that focused on deepening students' understanding of technical content and skills and create a set of action steps needed to accomplish the goal.

A SMART goal developed by an engineering teacher involved students writing a major research paper at least once a semester. The teacher embedded literacy strategies that required students to read technical and career-based books and articles on a regular basis. The skills of summarizing, paraphrasing, and categorizing were carried out on a weekly basis.

Literacy across the curriculum is also emphasized in the nursing program. "In nursing education, students must stay up-to-date on new practices," said Tracy Colon, nursing teacher at STA. "Nurses are expected to make decisions based on evidenced-based practice. To increase our students understanding of this process, I included professional journal reviews typed in APA format [publication manual of the American Psychological Association] as part of our curriculum. Students must read, summarize and react to a professional article in an APA formatted paper," she concluded.

Emphasis on Mathematics

Through an on-site TCTW workshop, STA teachers and mathematics teachers from the sending schools formed professional learning communities focused on building authentic anchor project units. The anchor project fully integrated mathematics concepts into CT classrooms. For example, the pre-professional nursing teachers at STA worked with a sending school mathematics curriculum specialist to incorporate medical mathematics concepts into the simulation experiences of the nursing students. By using a lesson plan template, the teachers identified the mathematics concepts that caused students the most trouble. Through collaboration, the STA nursing teachers learned some simple strategies on how to teach percentages to students during a drug dosage calculation unit. In turn, the mathematics teachers learned the relevance of teaching percentages by assessing vital signs and determining intake and output as part of patient care.

Students proved their comprehension by scoring higher on the summative assessments in the medical mathematics unit. Once the "why" behind the calculations was disclosed, students had a better understanding of the concept and could clearly do the work required of them. **After the professional development workshop ended, one of the sending school mathematics teachers said, "The most helpful idea that came from the Enhancing Mathematics Achievement through CTE workshop was learning how easy it was to integrate career/tech assignments into my geometry class."**

Emphasis on Science

STA adopted the PLTW national curriculum for biomedical science in 2010. Teachers use inquiry-based science instruction instead of rote memorization of facts. Students design their own innovative solutions for the health challenges for the 21st century. They work through open-ended problems to design experiments, analyze data, and draw conclusions. Teachers act as facilitators as opposed to instructors providing answers. This type of instruction grabs students' attention and draws them into the scientific process.

Lifeline 3: Develop a culture of engagement that would be evident upon entering the school and the classroom.

"We are not going to let students sit in class as a by-stander," said director Metcalf. "They are going to be engaged," she added. Teachers promote intellectually demanding assignments to keep students engaged. Teachers design authentic assessments that allow students to work on open-ended problems, develop strategies to solve the problems and work in cooperative groups. Teachers use research-based assessment strategies and design lessons backwards to help students meet the learning targets.

If students are not engaged, there is a plan to draw them in and keep them on track. The teachers created a school-adopted pyramid of interventions; copies are displayed in every classroom. When students do not learn the first time a lesson is taught, teachers have a hierarchy of academic interventions ready to go. The first level of intervention includes reteaching, teacher/student conferences, peer tutoring; the second level includes counselor referral or weekly progress reports; the third level includes parent, student, counselor meeting; and the final intervention involves referral to counselors and administrators from the home high school. Success for every student is the message students get from all angles.

Getting Results

Summit Technology Academy has seen significant improvement by implementing a school improvement plan aligned with the TCTW Key Practices. The improvement is also attributed to new teaching methods and strategies outlined in the lifelines. A snapshot of STA's success shows:

- STA students surpass other schools by more than 10 to 20 points in meeting the HSTW readiness goals.[1] (See Table 5.)

- The percentage of students completing the HSTW-recommended curriculum in English/language arts in 2012 was 57 percent, compared with 29 percent in 2010.

- The percentage of students completing the HSTW-recommended math curriculum in 2012 was 90 percent, compared with 64 percent in 2010.

- The number of STA graduates enrolled in remedial courses decreased to 41 percent in 2012, compared with 50 percent in 2011.

- At least 50 percent of STA students indicated they experienced an intensive emphasis on quality CT studies on the 2012 HSTW Assessment.

Table 5: Percentage of Students Meeting HSTW Readiness Goals in 2012		
INDICATOR	SUMMIT TECHNOLOGY ACADEMY	ALL SITES*
Reading	73%	56%
Mathematics	77	57
Science	67	55

Source: 2012 HSTW Assessment

* Data in All Sites represent all students tested during the 2012 assessment.

Lessons Learned from the Lifelines

While the Lee's Summit School District implemented areas of focus in 2006, it has taken years of promoting the areas of focus to see significant growth in access. STA has seen a 61 percent increase in enrollment since opening its doors. STA attributes part of the growth to teams working collaboratively to solve problems and to the foundational courses put in place at the sending schools. The concept of access to foundational courses as a way to promote enrollment in capstone courses at STA is an important lesson learned.

When STA staff looked at the analysis of high school transcripts, they learned that fewer students were accessing the third college-preparatory science course than in previous years, and they realized more should be done to support a strong guidance and advisement system. Many high school students who take CT courses receive college credit but still have to spend time in remedial courses when they head off to college. The STA staff realized there is a disconnect between secondary and postsecondary education, and students would benefit from greater collaboration between high school and college educators.

STA teachers also agreed that combining a national curriculum with solid instructional and assessment strategies produces higher student achievement. When students experience success in the classroom, it increases their motivation. It's a cyclical process that has fueled higher grades among the STA students.

A Look to the Future

There are several "next steps" planned to continue developing STA as a model school:

Support and Guidance — STA teachers plan to support students' academic and personal success by meeting students where they are in their learning. Plans are to gather data on unit exams, end-of-course exams, certification exams, etc., to see if there is a relationship between student motivation and assessment results. There are also plans to develop a support system for students and parents in transitioning from high school to postsecondary studies and beyond, and plans to offer foundational CT courses as early as the middle grades years.

---

1   The HSTW readiness goals are three achievable goals established as minimum targets for school improvement. The values represent scores at the Basic performance levels in reading, mathematics and science. Students who meet these goals are likely prepared for postsecondary studies and careers.

Integrating Academic and Technical Content — The STA leadership plans to support teachers by: 1) providing time for teachers to plan curriculum maps that align to the external assessments such as the HSTW Assessments, Missouri End-of-High-School Assessments, Common Core State Standards, industry-recognized certifications and credentials, dual credit college final exams, etc.; 2) implementing individualized professional development that addresses what each teacher needs to be an effective teacher; 3) working collaboratively with academic teachers, other CT teachers, or industry mentors; and 4) using an induction model for new teachers that helps them become competent and highly qualified CT teachers.

Collaboration with Postsecondary and Industry Partners — Over the next few years, STA is planning to work collaboratively on an early college program with the University of Central Missouri that includes extensive internship opportunities for students in high-demand, high-wage career fields such as information technology, engineering technology, advanced manufacturing, health care, and energy management. A program known as the Missouri Innovation Campus (MIC) is also in the early stages of formation. The stakeholders come from all levels of education and include industry partners. Not only will the industry partners provide financial support for students seeking a two-year degree and ultimately a four-year degree, but they must also provide internship experience and help determine the competencies needed for college graduates.

Policies and Support for School Improvement

Summit Technology Academy cites several policies and support it is has obtained from the state, the district and the TCTW school improvement initiative:

District Policies That Continue to Support School Improvement

- Financial support from the Lee's Summit School District and Career Education Consortium, as well as out-of-district tuition
- Training and time for teachers to embed Common Core State Standards and other intellectually challenging standards into curricula
- Professional learning communities as a model for collaboration and school improvement

State Policies That Support School Improvement Efforts

- Financial support from CT grants to purchase state-of-the-art equipment and other resources to enhance the learning environment
- Professional development workshops and conferences that support STEM and CT education in Missouri
- Recognition of sites in the Missouri network of schools participating in SREB initiatives

TCTW Policies That Focus on School Improvement Efforts

- Site development workshops that are geared to the specific needs of a shared-time center, such as STA
- Evidenced-based research conducted by SREB that identifies TCTW Key Practices that most impact student achievement
- Recognition of shared-time centers and their students for reaching the mark on student achievement and best practices

Contact: Director Elaine Metcalf at
Elaine.Metcalf@leesummit.k12.mo.us

TCTW Key Practices

TCTW has identified a set of Key Practices that impact student achievement through development of multiple programs of study that prepare students for postsecondary studies and careers. These Key Practices provide direction and meaning to comprehensive school improvement.

High expectations: Motivate more students to meet high expectations by integrating high expectations into classroom practices and giving students frequent feedback.

Program of study: Require each student to complete a plan of study leading them to complete a true concentration in an approved sequence of at least four career/technical courses and an upgraded academic core leading to preparation for postsecondary studies and a career.

Academic studies: Teach more students the essential concepts of the college-preparatory curriculum by encouraging them to apply academic content and skills to real-world problems and projects within their career/technical studies.

Career/technical studies: Provide more students access to intellectually challenging career/technical studies in high-demand fields that emphasize higher-level mathematics, science, literacy and problem-solving skills needed in the workplace and in further education.

Work-based learning: Enable students and their parents to choose from programs that integrate challenging high school career/technical studies and work-based learning and are planned by educators, employers and students.

Teachers working together: Provide cross-disciplinary teams of teachers the time and support to work together to help students succeed in challenging career/technical and academic studies. Integrate reading, writing and speaking as strategies for learning into all parts of the curriculum, and integrate mathematics and science into career/technical classrooms.

Students actively engaged: Engage students in career/technical and academic classrooms in rigorous and challenging assignments using research-based strategies and technology.

Guidance: Involve students and their parents in a guidance and advisement system that develops positive relationships and ensures completion of a career/technical concentration with an approved sequence of at least four courses and an accelerated program of study. Provide each student with an adult mentor who works with him or her throughout high school to assist with setting goals, selecting courses, reviewing progress, and pursuing appropriate interventions as necessary.

Extra help: Provide a structured system of extra help to assist students in completing accelerated programs of study with high-level academic and technical content.

Culture of continuous improvement: Use student assessment, program evaluation data, technology center performance reports, program enrollment, retention and placement reports, college remediation reports, student follow-up reports, and advisory committee input to continuously improve school culture, organization, management, curriculum, and instruction to advance student learning.

TCTW Goals/Conditions for Continuous Improvement

The mission of TCTW is to create a culture of high expectations that motivates students to make the effort to succeed in school. To achieve this mission, TCTW has set several goals for continuous improvement:

- Increase the percentage of career/technical students who meet college- and career-readiness goals to at least 85 percent.

- Increase the percentages of technology center graduates who complete a career/technical concentration and enter postsecondary studies or employment within the field for which they were prepared.

- Increase the percentage of high school students who enter the technology center and graduate on time to 95 percent.

- Advance state and local policies and leadership initiatives that sustain a continuous school improvement effort.

- Work with middle grades schools to guide students in creating programs of study comprising courses that prepare students for high school and technology center work.

- Increase annually the percentage of students leaving the technology center with postsecondary credit or having met standards for postsecondary studies.

- Increase annually the percentage of technology center high school graduates that pass an approved industry certification examination.

SREB