Embedding the Common Core State Standards or Other Rigorous Standards Into Academic, Career/Technical and Elective Courses

SREB

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The availability of rigorous core state standards has made it essential for academic and career/technical educators to develop a full understanding of their impact on instruction. Leaders and teachers are seeking strategies and tools that will impact middle grades schools, high schools and technology centers. The Southern Regional Education Board is active in ensuring educators are well-versed in rigorous core state standards and are able to use instructional techniques designed to help students master the standards for future success in college and careers.

Identify Strategies to Move New Core State Standards Into Classroom Instruction, Assignments and Assessments

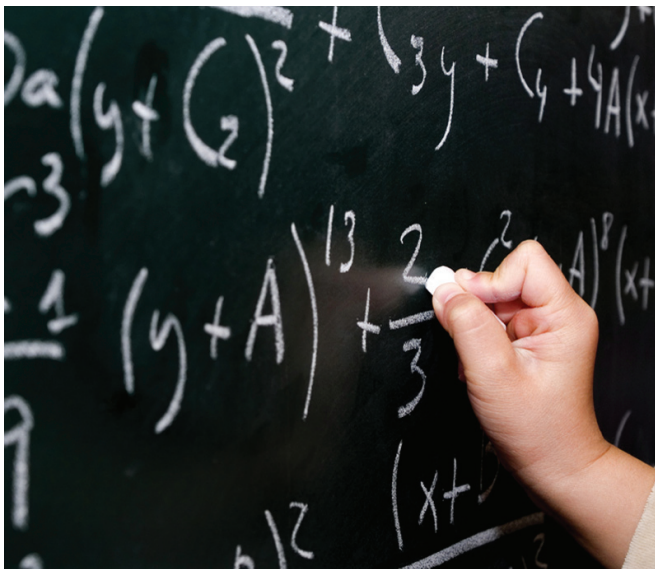
Mathematics Practices Exposed: Teachers Bring Rigorous New Standards to Life in Career/Technical Classrooms

In an era when standards are front and center in education, career/technical education (CTE) provides rich opportunities for students to deepen their understanding of major mathematics concepts and skills. The eight Standards for Mathematical Practice are designed to help students develop problem solving, abstract reasoning and conceptual understanding skills and should be used by career/technical (CT) teachers.

"SREB believes high-quality CTE is a valuable part of students' educational experiences," said **Kathleen McNally**, SREB mathematics consultant. "SREB also respects, appreciates and advocates blending academic and career/technical curriculum and instruction to give students a better understanding of content."

The adoption and implementation of the Standards for Mathematical Practice have provided opportunities for CT educators to articulate mathematics processes and to think more in-depth about their projects and assignments. SREB asked CT teachers from *Technology Centers That Work (TCTW)* and *High Schools That Work (HSTW)* schools to consider what their students do (actions, procedures and practices) to exemplify the eight practices and to share lessons and activities that have succeeded in the classroom.

Ted Archer, mathematics instructor at **Cumberland County Technical Education Center** in Bridgeton, New Jersey, collaborated with other teachers to gather lessons and activities from a variety of career fields of study. These instructional



strategies have been grouped by mathematics practice and the career area(s) in which they are appropriate. Teachers will find these practices helpful in incorporating standards into CT studies.

Mathematics Practice 1: Make sense of problems and persevere in solving them.

- Laying out prices for projects using only the materials supplied ***(welding)***
- Analyzing the client consultation ***(cosmetology)***
- Troubleshooting, cause and effect ***(automotive and engines)***
- Mock scenarios ***(health care)***
- Decipher manuals and troubleshoot problems. Why is there mold? Why is there a draft? ***(HVAC)***
- Bubble diagrams ***(architecture)***

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- Flow charts, graphic organizers ***(electronics and pre-engineering)***
- Problem solving protocols ***(various fields)***

Mathematics Practice 2: Reason abstractly and quantitatively.

- Knowing past practice ***(welding)***
- Picturing what the client wants — visualization, hair color problem solving ***(cosmetology)***
- Case-based scenario ***(dental)***
- Vital signs and how to interpret them ***(health)***
- Why do computers use binary code? ***(computer repair and networking)***
- Yield = serving size ***(culinary)***
- Pythagorean Theorem — why it works ***(carpentry)***
- Line of best fit, scatter plots ***(marketing)***
- Hydraulic testing, calculating force ***(automotive)***
- Load testing ***(architecture)***
- Graphing sales into an equation of a line ***(business)***

Mathematics Practice 3: Construct viable arguments and critique the reasoning of others.

- Irreversible hydrocolloids — ratios of gypsum products (dental)
- Estimate time with temperature ***(cosmetology)***
- Job costing and applicable codes ***(plumbing)***
- Critiquing diets and menus per patient needs ***(health)***
- Choosing farm-raised versus wild-caught salmon ***(culinary)***
- Engineering ethics ***(engineering)***
- What draws you into a website? Audio, time, color ***(web design)***
- Profit — using percentage and break points, arguing your work ***(business)***
- Ratio of transmission depending on tire size, fuel, etc. ***(automotive)***
- Why are there different ratios for paint? ***(auto collision)***

Mathematics Practice 4: Model with mathematics.

- Designing a storage rack prototype ***(welding)***
- Applying hair color and processing ***(cosmetology)***
- Periodontics and heart disease ***(dental)***
- Food safety case study — errors made ***(culinary)***
- Choosing paint mixing application ***(auto body repair)***
- Graphing and charting, inventories ***(health)***
- Job costing, repair orders, flat rate times ***(automotive)***
- Wheel alignment ***(automotive)***
- Profit and loss statements ***(business)***
- Using Excel spreadsheets — equipment, startup ***(culinary)***
- Machining locations using angles, cutting speeds ***(precision machining)***

Mathematics Practice 5: Use appropriate tools strategically.

- Reading a tape measure ***(welding)***
- CAD software, architect scale, levels, blueprints ***(CAD)***
- Gram scale, millimeter ruler, metric measuring tools ***(dental)***
- Use of color wheel to mix color ***(cosmetology)***
- Portion, mixing, measuring tool ***(culinary)***
- Blueprint reading ***(HVAC, construction)***
- Use meters to confirm power usage and amp flow ***(electrical)***
- Using slope-intercept to manufacture/program for parts ***(CNC machining)***
- Measuring temperature, measuring volumes of liquids, reading blood pressure ***(health)***
- Hip curve, French curve, L-shape, tape measure, pattern paper ***(fashion)***

Mathematics Practice 6: Attend to precision.

- Proper units, conversions, Latin names, prefix and suffix ***(health and agriculture)***
- Confirming layout from blueprints ***(welding)***
- Haircutting degrees — 45, 90, 180 ***(cosmetology)***
- Model of dental office ***(dental)***
- Applications and angle of all tools ***(cosmetology)***
- Not using LED readers ***(computer repair and networking)***
- Does the answer align with print tolerances and appropriate measuring methods? ***(machining)***
- Following recipes correctly — oven temperatures, baking chemical leveners ***(culinary)***
- Specific gravity, temperatures, weights ***(health)***
- Centerline measures, slope with one-quarter inch per code ***(plumbing)***
- Placement of an image, scaling ***(graphic communications)***

Mathematics Practice 7: Look for and make use of structure.

- Fabricating big items one piece at a time; scale ***(welding)***
- Radiographic imaging ***(dental)***
- Function of eggs in a cake — calories ***(culinary)***
- Topology design of network ***(computer repair and networking)***
- Using principles and elements of design ***(graphic communications)***

- Thread cutting, depth cuts ***(machining)***
- Ohm's Law ***(electronics)***
- EKG patterns, waveforms ***(health)***
- Capacitive reactance related to frequency ***(pre-engineering)***
- Volume, cylinders, engine displacement, aspect ratio ***(automotive)***
- Orthogonal views, blueprints ***(CAD)***
- Aperture and shutter scale ***(photography)***

Mathematics Practice 8: Look for and express regularity in repeated reasoning.

- Practical customer clinic — use of color formulation ratios ***(cosmetology)***
- Clock concept — geometric charting ***(dental)***
- Recipe formulas and repeating mixing action ***(culinary)***
- Subnet labeling ***(computer repair and networking)***
- Miles per hour, miles per gallon, precision measuring tools ***(automotive)***
- Stud distance on center, nailing, board feet calculations ***(construction)***
- Converting bases, calculating resistance, parallel and series circuits ***(electronics)***
- Follow averages to predict future earned business income. ***(business)***
- Proportional reasoning ***(various career areas)***
- Shortcut for structure load calculations ***(pre-engineering)***
- Calculating slope, same calculations to construct rafters as stairs ***(construction)***
- Medication administration formula, EKG instruction ***(health)***

"Career/technical teachers and the assignments and assessments that they provide to students are valuable resources in fully implementing the Common Core State Standards for mathematics," McNally said. "Collaboration between academic and career/technical teachers is key to uncovering the depth of mathematics through authentic applications. This process demands earnest discussion and cooperation as well as time to work through differences in language or terminology and points of view."

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Rigorous, New Literacy and Mathematics Standards for Middle Grades Schools, High Schools and Technology Centers

Students in Grades Six Through 12 Develop 'Reading to Learn' Skills in Academic Courses

The Common Core State Standards or other rigorous standards call for students in kindergarten through grade five to learn literature standards, informational text standards and foundational skills as they **learn to read**. Students in grades six through 12 are expected to learn literature standards and informational text standards as they **read to learn**. Reading to learn is also known as "disciplinary literacy," since each academic discipline requires specific background knowledge and provides unique challenges in reading comprehension.

"As students read more complex disciplinary texts, they should experience a reasonable amount of productive struggle," said **Jeanette Hodges** of Taylor Mill, Kentucky, an SREB literacy provider for the *High Schools That Work (HSTW)* and *Making Middle Grades Work (MMGW)* school improvement initiatives. "Sometimes students need to read the text a number of times to do a close analysis."

Navigating through disciplinary texts involves students acquiring content-specific and general academic vocabulary, connecting ideas, understanding text patterns and building background knowledge. Teachers in the academic disciplines of science, math, history/social studies and literature in grades six through 12 can use techniques that will increase students' skills in reading to learn.

Mathematics — Direct students reading in mathematics classes to focus on graphic illustrations, use of bold print, definitions, examples, explanations, summaries, marginal notes and diagrams.

Science — Assign scientific *research reports* that include headings, figures, tables, diagrams, maps, drawings, photographs, reference notes and end notes. Develop *science vocabulary*, especially Latin and Greek roots and meanings in everyday discourse, versus highly specialized meanings, conceptual relationships, abstract ways of thinking, and classifications. In *science text structures*, include organizational patterns that emphasize cause and effect; sequencing and extended definitions; scientific reasoning and inquiry; problems and solutions; and logical links between data, findings, previous related research and widely accepted theory.

"In order to be equipped for the 21st-century skills demanded by college and careers, students must learn to blend reading, writing and thinking skills..."

Jeanette Hodges, SREB

History and Social Studies — Use historical documents (societal, economic and political); informal debates; analysis of multiple sources (primary sources, film, interviews, newspaper articles, published proceedings, artistic representations and speeches); understanding of actions and reactions; understanding of points of view, connecting causes to events and events to consequences; and understanding connections of ideas and prior knowledge.

Hodges recommended the following actions for schools that want to increase the level of "disciplinary literacy" or "reading to learn" in the curriculum:

- **Provide staff development** to help teachers use tools designed to assist them in the planning necessary to make reading and writing assignments integrated in the mastering of content knowledge.
- **Make it possible for teachers to work in departments** to develop strategies for engaging students in reading grade-level content.
- **Ask teachers to go beyond the textbook to engage students broadly in other disciplinary reading**. Ask teachers to look at planning and strategies that will enable students to read complex texts.
- **Ensure that teachers are assigning increasingly complex texts** and have students cite evidence from their readings in their writing. To do so, teachers need to develop text-dependent questions for close readings of texts.

"Implementing the Common Core State Standards requires a paradigm shift," Hodges said. "In order to be equipped for the 21st-century skills demanded by college and careers, students must learn to blend reading, writing and thinking skills. This may involve multiple readings of grade-level or above grade-level texts to gain deep understandings. Who better to lead students in this literacy effort than those expert in their respective disciplines?"

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Gain Specific Strategies and Tools to Embed Literacy Standards Into English/Language Arts, Science, Social Studies and Career/Technical Courses

The Literacy Design Collaborative Comes Alive in New Orleans Schools

Content teams of teachers from four New Orleans public schools piloted the Literacy Design Collaborative (LDC) model in 2011-2012. During extended professional development, they created their own modules, solved logistical problems and planned for schoolwide implementation during the current school year.

Rigorous core state standards are the "what" in preparing students to be ready for college and careers. The LDC model is "how" to get students to participate more actively in their own learning to meet higher literacy standards.

The LDC model contains 29 template tasks. "Teachers in the New Orleans pilot learned how to convert an LDC template task into a teaching task by filling in the texts that students are to read, the writing they are to produce and the content they are to address," said SREB school improvement consultant **Anne Simmons**.

A teaching task is a major assignment to be completed by students over a period of 10 days to four weeks to encourage reading and writing in major content areas. Teachers also assign students Level 2 options to make the task more demanding and to differentiate instruction.

High Schools That Work (HSTW) and *Making Middle Grades Work (MMGW)* literacy provider **Jeanette Hodges** listed characteristics of a "great LDC teaching task:"

- Addresses content essential to the discipline, inviting students to engage deeply in thinking and literacy practices around that issue
- Makes effective use of the template tasks' writing mode (argumentation, information/explanation or narrative)
- Selects reading texts that use and develop academic understanding and vocabulary
- Designs a writing prompt that requires sustained writing and effective use of ideas and evidence from the reading texts
- Establishes a teaching task that is both challenging and feasible for students, with a balance of reading demands and writing demands that work well for the intended grade and content

LDC tools are available to help teachers design teaching tasks. They include a bank of reading and writing tasks, a module template, tasks, skills, instruction, results, scoring rubrics, local and national collaboration, and access to a "community" of teachers who have aligned LDC modules to course content and rigorous standards.

Teachers from New Orleans schools shared examples of tasks they developed for their students while learning to use the LDC model in the classroom.

- **Michelle Rolle of McDonogh 35 College Preparatory High School**: **Task 2**: Do honor code systems lead to greater integrity or widespread suspicion and mistrust in a community? After reading "Which of You Is a Witch?," "Why Harvard Has No Honor" and "The Crucible," Act I, Scene 1, write an essay that 1) discusses the merit of practices that involve community members as "accusers" in rule/law enforcement and 2) evaluates the girls' actions in the play.

Be sure to support your position with evidence from the texts. **Level 2**: Be sure to acknowledge competing views.

- **Tim McGary of Architecture Design Engineering Prep High School**: **Task 2**: Should New Orleans be rebuilt in its present footprint? After reading "Thoughts on Rebuilding (And Not Rebuilding) New Orleans" in *Planetizen*, Blogsline.com, NPG Internet Forum and Juggles.com, write a letter to your state representative to address the question. Support your position with evidence from the text(s). **Level 2**: Be sure to acknowledge competing views.
- **Shanera Pinkston of Architecture Design Engineering Prep High School**: **Task 2**: Should electric vehicles replace fossil fuel vehicles in the near future? After reading "Electric Vehicle Pros and Cons: The Good, the Bad and the Green" (http://1800recycling.com/2011/01/electric-vehicle-recycling-pros-cons/) and "The pros and cons of electric cars and plug-in hybrids" (http://www.buffalonews.com/business/moneysmart/article562383.ece), write an editorial that addresses the question. Support your position with evidence from the texts. **Level 2**: Be sure to acknowledge competing views. **Level 3**: Give examples from past or current events or issues to illustrate and clarify your position.
- **Virginia Leveane of Warren Easton Charter High School**: **Task 7**: After researching Latino food culture in the United States (www.foodnetwork.com, www.cocinalatina.com, www.southwestfoodnetwork.com), determine whether there is an accurate interpretation of Tex-Mex food. Write an informational essay that identifies the variations of Tex-Mex foods and argues for a solution in taste. Support your position with evidence from your research. **Level 2**: Be sure to examine competing views. **Level 3**: Give examples from the past or current events.

  Leveane also uses the LDC model to challenge her Spanish III students metacognitively by having them write their answers in Spanish. **Task 2**: (Please write your answers in Spanish.) ¿Que papel desempenan los Latinos en los Estados Unidos basados en sus tradiciones y culturas? Despues de leer "Estados Unidos Nuestra Cultura e Historia" (textbook en Espanol 3 page 2 and Hispanic and Latino Americans, Wikipedia.org), escribir un ensayo que aborda la cuestion y apoyar su posicion con la evidencia de la texto(s). **Level 2**: Asegurence de tener opinions competitivas de la opinion.

  (English translation: What role do Latinos serve in the United States, based on their traditions and cultures? After reading "United States Our Culture and History" (textbook in Spanish III page 2 and Hispanic and Latino Americans, Wikipedia.org), write an essay that addresses the question and support your position with evidence from the text(s). **Level 2**: Be sure to acknowledge competing views.)
- **Anthonise Banks of Warren Easton Charter High School**: **Task 2**: Should employers look at social networks to screen future employees? After reading "Employers Look At Facebook, Too" (www.cbsnews.com) and "45% of Employers use Facebook-Twitter to screen job candidates" (www.oregonbusinessreport.com) and viewing the video at www.cbsnews.com, write an argumentative essay that addresses the question. Support your position with evidence from the text(s). **Level 2**: Be sure to acknowledge competing views. **Level 3**: Give examples from past or current events or issues to illustrate and clarify your position.
- **Audra Ryes of Eleanor McMain Secondary School**: **Task 2**: Should government be allowed to store and study eradicated viruses that are incurable? After reading passages from the *The Hot Zone*, a CDC article and viewing "*Outbreak*," write a letter that addresses the question to the U. S. Army Medical Research Institute of Infectious Diseases. Support your position with evidence from the text(s). **Level 2**: Be sure to acknowledge competing views. **Level 3**: Give examples from past or current events or issues to illustrate and clarify your position.
- **Nia Smith of Eleanor McMain Secondary School**: **Task 2**: Could principles of civil disobedience lead to a resolution of the violent political conflicts in the world today? After reading "Resistance to Civil Government" (Thoreau), "On Nonviolent Resistance" (Gandhi) and "Letter from Birmingham Jail" (King), write an argumentative essay that addresses the question. Support your position with evidence from the text(s). **Level 2**: Be sure to acknowledge competing views. **Level 3**: Give examples from past or current events or issues to illustrate and clarify your position.

"I am very pleased with the work that teachers in the New Orleans Public Schools have done with the implementation of the Literacy Design Collaborative in the pilot year and am looking forward to facilitating expansion of the model in 2012-2013," Hodges said.

"The Common Core State Standards are rigorous, internationally benchmarked and evidence-based," she continued. "In the area of literacy, all students must be able to read, analyze and write about increasingly complex text to prepare for the 21st- century skills that the world of work demands if young people are to be globally competitive. This is a daunting task. Every school represented here has a different school population with a unique set of instructional needs. Still, with the LDC model, teachers have the flexibility to scaffold instruction appropriately to meet the same high standards. This model works!"

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Using the Literacy Design Collaborative Framework to Improve Reading and Writing at a Career/Technical Center

Mercer County Technical Schools (MCTS) in Trenton, New Jersey, offer a wide variety of career/technical (CT) programs focusing on one theme: *The level of student literacy is directly related to the level of student success on the job*.

MCTS is a shared-time technical center serving more than 2,000 students from more than 20 schools in the county. The three MCTS facilities include classrooms for adult evening students. The center joined the *Technology Centers That Work (TCTW)* improvement initiative in 2006 after receiving a shared-time initiative grant from the New Jersey Department of Education (NJDOE).

Superintendent **Kimberly Schneider** and Principals **Sharon Nemeth** and **Lucille Jones** realized the need to improve students' reading and writing skills after analyzing the results of the 2008 *High Schools That Work (HSTW)* Assessment administered to high school students at the center. "It was clear that we needed to take more action in promoting literacy to ensure quality performance in students' career pathways," Nemeth said.

Diverse Approaches in the Past

In the past, students had received their primary instruction in literacy at their home high schools or in prior high school programs (in the case of adult students). The approaches were as diverse as the students. "More than 40 percent of MCTS students are special-needs students, but they are determined to continue their education in high-wage technical fields preparing for postsecondary education or careers," Nemeth said. Despite efforts by the administration to reorganize programs and instruction by aligning with the *TCTW* Key Practices, the 2010 *HSTW* Assessment showed that students needed more assistance with reading and writing to be prepared to communicate in the workplace.

In fall 2010, MCTS participated in a program sponsored by the NJDOE to embed academics into CT instruction. SREB consultants worked with teams of teachers to design instruction that would embed literacy, mathematics and science into career/technical education (CTE). During the following year, SREB offered training in the newly developed Literacy Design Collaborative (LDC) model. A core group of eight teachers received training in how to use LDC template tasks linked to common core literacy standards for content areas. The entire staff at MCTS received a one-day orientation to the model.

MCTS students are recognizing and benefiting from the increased emphasis on reading and writing in CT studies. Their performance and attitudes toward instruction as measured by the *HSTW* Assessment have shown increases since 2010.

Coaching for Teachers

Throughout the year, SREB provided non-evaluative coaching for the core teachers on template tasks, instructional modules and strategies for teaching CT students to read complex materials and complete written assignments based on research. The training focused on instruction in the content areas and implementation of the New Jersey Content Standards for Career and Technical Education.

The new assignments engaged students in doing real-world reading and writing in their chosen career pathways. To illustrate gains after staff development, take the example of students in an **automotive class**. In the past, they responded to an uninspiring assignment to do a "repair ticket" for a car by writing vague tickets that contained numerous spelling, punctuation and grammar errors. The teacher changed the assignment by using an informational template task that involved the students as auto technicians taking pride in their work. The new assignment: **After researching informational texts, write a work order for a car repair that includes the 3 C's (customer's complaint, cause of problem and correction to problem). Be sure to cite evidence to support your approach to correcting the problem**.

To complete the new assignment, students must reference their automotive texts, supplemental readings, a teacher demonstration and instructional videos and use a specific format to address car repairs. Students who previously refused to write or wrote brief, sketchy sentence fragments have started explaining their work more professionally and in greater detail. Students often work together to complete a report. English-language learners work with other students to make sure they express themselves correctly and complete their reports.

Research Related to Career Fields

With emphasis on performance in career-embedded writing, students at MCTS began to make stronger connections between reading in their course work and writing in their chosen fields. The use of Internet research became a valuable tool for students to gather information beyond classroom texts. For example, students in a **health and child care** class are synthesizing information from

textbooks and Internet research. The teachers guide students' research as they prepare essays using a template task: **After reading the text and other research, write an essay that compares/contrasts the three theories of Erikson, Piaget and Vygotsky**. **Be sure to support your essay with evidence from the text and other research materials**. "Students who struggled with reading in their home schools are now researching and comparing leading theorists in the field of child behavior," Nemeth said.

School leaders at MCTS are emphasizing literacy in all 21 shared-time programs spanning 10 career clusters. Teachers attend workshops to "unpack" the career content standards and the common core standards in literacy and math to redesign curricula with a greater emphasis on academic performance. Classroom observations include looking for teachers' instruction incorporating the Common Core State Standards and other rigorous standards as well as standards from the content areas.

The MCTS leadership team and SREB consultants formulated a new approach to a district literacy plan that emphasizes the use of LDC instructional modules that will be embedded in the curriculum for every course taught at the center. The team developed a plan that emphasizes the use of complex, informational texts and analytical writing that reflect the common core literacy standards through the use of LDC modules. The plan then embeds the previously recommended literacy goals of writing weekly in every class, completing research projects in every class, literacy instruction in every class, rigorous instruction and increased reading.

The new literacy plan went into effect in 2012-2013. It requires all teachers to develop and implement a minimum of two LDC instructional modules per grading period for each course taught. A second cohort of teachers will receive intensive instruction and coaching in the LDC model during the 2012-2013 year. Monthly curriculum meetings will be held for teachers to receive assistance in designing instructional modules.

MCTS students are recognizing and benefiting from the increased emphasis on reading and writing in CT studies. **Their performance and attitudes toward instruction as measured by the *HSTW* Assessment have shown increases since 2010**. **For example, the percentage of MCTS high school students scoring at the Proficient or Advanced level in reading grew from 9 percent in 2010 to 16 percent in 2012**. **Between 2010 and 2012, the percentage of students reporting a moderate or intensive emphasis by the school on literacy across the curriculum increased from 46 percent to 56 percent, on high expectations for student achievement from 48 percent to 80 percent and on integrating academic studies into CT courses from 63 percent to 73 percent**.

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The Literacy Design Collaborative (LDC) is a totally new way of thinking about and preparing all students to have the literacy skills they need to be college- and career- ready. It is not a program. It is not a random selection of curriculum ideas; it is a literacy framework connecting common core standards with secondary English/ Language Arts, social studies, CTE and science classrooms.

Unlike mathematics, secondary literacy is not a discipline. It is "homeless" in that it belongs to everyone and no one. Literacy is used in secondary classrooms, but it is not taught in a systematic way. Prior attempts to teach secondary literacy focused on the strategy of reading and writing across the curriculum. In this design, educators first laid out course content, then attempted to layer literacy strategies on top of content, all too often in a haphazard way.

The LDC flips this strategy on its head, laying out the literacy design first and then adding content on top of a solid literacy foundation. LDC merges literacy with content as a "both-and" strategy, supporting coherence in both systems rather than just one. The goal is to establish an aligned system for teaching literacy that supports college-ready literacy across core disciplines, a formative system that will work in grades six through 12, or up to the college ready cut point.

Technology Center Embeds Reading and Writing Across the Curriculum to Assist Career/Technical Students in Meeting Literacy Standards

Every teacher at **Burton Ramer Technical Career Center** at Oswego County Board of Cooperative Educational Services (BOCES) in rural Mexico, New York, is expected to integrate reading and writing strategies into instruction to support the learning of career/technical (CT) content. As a result of this philosophy, B. Ramer Tech is making major strides in preparing CT students to meet common core standards in literacy.

Forty percent of students at B. Ramer Tech are special-needs students, with over 50 percent in some CT classes. The 2008 *High Schools That Work* (*HSTW*) Assessment revealed that only 25 percent of B. Ramer Tech students met the *HSTW* reading readiness goal.

The standards-based instruction required by the B. Ramer Tech lesson planning template helps students work toward mastery of the Common Core State Standards or other rigorous standards.

Ron Camp, Burton Ramer Technical Career Center

As a member of *HSTW*, the center formed a literacy team that received six days of professional development in embedding literacy across the curriculum. From that training and follow-up coaching as a member of *Technology Centers That Work (TCTW)* in 2012, the center developed a comprehensive literacy plan based on the *HSTW/TCTW* model calling for students to engage in intensive literacy activities.

- Read the equivalent of 25 books a year across the curriculum.
- Write weekly in all classes.
- Use reading and writing strategies to enhance learning in all classes.
- Develop research papers in all classes.
- Complete a rigorous language arts curriculum taught like college-preparatory/honors English.

Ron Camp, director of CT education, provided $1,000 per program to purchase reading materials for B. Ramer Tech students to check out of the classroom. Next, the literacy team set a goal to have students read a minimum of two books or 200 pages of technical text in 2010-2011.

The center allowed every teacher to set his or her own course for achieving the reading goal. **Lori Giverson**, certified nursing assistant teacher, provided an array of books from which students could choose. She asked students to take 10 minutes to read the first two pages of a book before making a final selection. The task was to read a complete book by the end of the quarter. Giverson supplied summary templates, making-connections charts and graphic organizers to help students keep written records of their reading. Students read silently for 20 minutes each Monday and Friday and ended the quarter with a writing project. "After students created life-size outlines of their bodies, they pinned note cards to each body part to summarize what they had learned from reading," Giverson said. "Then they shared the information verbally with the other students."

Results of Emphasis on Reading

The 2010 *HSTW* Assessment showed that 56 percent of B. Ramer Tech students met the reading readiness goal. In 2012, 68 percent of students met the goal. The center has set a goal for 2012-2013 to have each student read at least three books.

Getting Students to Write More

Teachers assigned B. Ramer Tech students to complete a minimum of 24 journal or log prompts. Each CT teacher developed writing prompts specific to the content taught. A journaling notebook was printed specific to each CT area. Some notebooks — like those of **Craig Mahon**'s construction students — were in the form of work logs. Mahon asked students to complete a benchmark checklist and write about some productive action they took in the shop or classroom each day. Students also outlined their goals for the coming week. "I modeled journal writing for the first few entries to familiarize students with expectations and demonstrate that teachers are also writers," Mahon said.

Other teachers asked students to write daily on a topic related to the concept being studied in class. In addition to writing in their journals, students wrote about the books and career-related articles they were reading. Students also completed a minimum of 24 expository writing prompts related to their content areas.

Results of Emphasis on Writing

After engaging in the writing initiative, 87 percent of B. Ramer Tech students reported on the 2012 *HSTW* Assessment that their CT teachers sometimes or often stressed writing. This represented an increase of 11 percentage points between 2010 and 2012. The center has set a goal for each student to complete at least one expository writing prompt related to the student's content area per week in 2012-2013.

Involving the Entire Faculty in Improving Literacy

During training, the literacy team learned more than 20 strategies to enhance reading and writing in lesson plans and developed a common lesson planning template to reflect strategies being used in lessons. "Teachers need to model and intentionally teach reading and writing strategies," Camp said. "After the team modeled strategies during faculty meetings, the teachers practiced the strategies with their students and then reported on successes and challenges at the next meeting."

- **Sara Falco** shared the success of culinary arts students, who used poster activities and graphic organizers to improve literacy skills. Students used reading and writing strategies to demonstrate knowledge of content vocabulary, the defrosting and cooking processes, and the cross-contamination of foods.

- **Lori Hoyt** asked science students to write 20-word summaries by generating interactions between schemata and texts (GIST).

Faculty meetings were used for collaborative instructional planning rather than information dissemination, which was handled through memos and handouts. Teachers learned to embed many strategies:

- Alpha Boxes — On a plain sheet of copy paper, a grid of boxes is created with four columns by seven rows. Each box is labeled with one alphabet letter with two boxes empty. After reading an assigned text, students fill out the grid with at least one key idea, main concept or domain-specific vocabulary word that begins with each letter of the alphabet, A through Z.
- Concept Definition Maps — Using this form of graphic organizer, students analyze vocabulary terms and write the key components of the concept. Example: If the vocabulary term is autoimmune disease, the students may list the diseases that comprise that category of disease, body parts affected by the diseases, symptoms, treatments and prognosis.
- Frayer Models — An adaptation of a concept map, the Frayer Model places the concept or vocabulary word in the center of the page. In the four quadrants surrounding the word, students list the essential characteristics, non-essential characteristics, examples and non-examples of the term.
- K-W-L — Abbreviated from Know-Want to Know-Learned, this instructional strategy is completed before and after reading or teaching of the material. Students fill out "What I Know" and "What I Want to Know" beforehand and "What I Learned" after the reading.
- Cornell Notes — This adaptation of two-column notes provides a format for condensing and organizing notes. Students label the left-hand column "Questions/Key Words" and the right-hand column "Notes." A "Summary Box" is included at the bottom of the page to encourage students' thoughtful reflection and summarization of the content.

Improving the Quality of Research Projects

As teachers focused on requiring students to complete at least one formalized research project (paper, demonstration or product) related to a content area, they realized that students did not understand the research process and lacked information on how to document their findings. Teachers taught the necessary skills before students completed their projects, which they presented to community representatives.

- **Nursing assistant students** created personal health history brochures based on their research and shared the projects at their pinning ceremony.
- **Fire safety students** did research on the cost of purchasing personal protective gear for a company of 30 firefighters in rural New York. Students explained the plan and their equipment choices at a meeting of the local town council.

Although the center does not offer English/language arts credit in all CT programs, leaders approached the last component of a comprehensive literacy plan by expecting all teachers to conduct classes with the rigor of college-preparatory/honors classes. The *HSTW* and *TCTW* initiatives identify one characteristic of a rigorous language arts class students work toward mastery. The standards-based instruction required by the B. Ramer Tech lesson planning template helps students work toward mastery of the Common Core State Standards or other rigorous standards (CCSS). During the second semester of 2012, teachers identified and integrated the CCSS in literacy and technical subjects into two unit plans.

Results of Increased Rigor

Pass rates on 2012 industry exams at B. Ramer Tech indicate that a majority of students are mastering course content.

- **Nursing Assistant** students achieved a 90 percent pass rate on the New York State Certified Nursing Assistant written exam. The rate increased from 23 percent in 2010.
- **Early Childhood Education** students earned a 100 percent pass rate on the National Occupational Competency Testing Institute (NOCTI) Early Childhood Education and Care-Advanced assessment. The rate in 2010 was 74.9 percent.
- **Computer Systems and Networking- Cisco** students showed an increase from a zero percent passing rate in 2010 to 54 percent in 2012 on the Cisco Certified Entry Networking Technician (CCENT) assessment.

Additionally, the 2012 *HSTW* Assessment showed positive changes in students' educational experiences.

- Fifty-seven percent of students reported that they read an assigned book and demonstrated understanding of the significance of the main ideas at least monthly (an increase of 10 percentage points since 2010).
- Sixty-nine percent of students reported that they read a career-related article and demonstrated understanding of the content in their CT classes at least monthly (an increase of 17 percentage points since 2010).
- Fifty-six percent of students reported that they made journal or lab manual entries that recorded their class work in their CT classes at least weekly (an increase of 29 percentage points since 2010).
- Eighty-seven percent of students reported that their CT teachers sometimes or often stressed writing (an increase of 11 percentage points from 2010).

"We have succeeded in raising student achievement, but we realize that effective literacy programs don't just happen," Camp said. "They require pre-planning and constant support. We expect to revisit the literacy plan each year to reflect on the practices we are using and to set goals for the future."

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Specific Strategies, Tools and Lessons Advance Mastery of Rigorous Standards in Mathematics, Science and Career/Technical Courses

Teachers Keep Mathematics Students 'On the Move' in Learning the Eight Common Core Standards for Mathematical Practice

Teachers **Gloria Williams** and **Alicia Scott** of **Creekside High School** in Fairburn, Georgia, believe in interactive mathematics classrooms featuring strategies that engage students in learning. Williams teaches CCGPS Coordinate Algebra, while Scott teaches Accelerated GPS Algebra and GPS Geometry.

Collectively, these activities address the eight Common Core State Standards for mathematical practice:

- **Rhythm, Rhyme, Results** (http://educationalrap.com/music) provides educational music in the hip-hop genre for mathematics, science, language arts and social studies classes. The website sells lyrics sheets and various versions of the music, including instrumental-only for karaoke sing-along. It also offers free original versions of the tunes. "Don't Be Negative" is an integer lesson available on Rhythm, Rhyme, Results. Every song on the CD comes with an activity to get students up and moving.
- **Mathematics In a Box** is an activity that integrates reading, writing, speaking and listening in an interactive mathematics classroom. The purpose of the activity is to use structured steps to solve equations. Students are asked to solve three types of equations: absolute value, rational and radical. Students receive a grid for writing the steps for solving the equations and the reasons for the steps. After students determine the steps together, they write a paragraph explaining how they solved the equation. "This is another activity to get students out of their seats and actively engaged in learning math," Williams said.
- **How Do They Fit?** is found in Engaging Activities for Mathematics 6-12 (www.learningfocused.com). Students in this activity use mathematics concepts to put together a mathematics puzzle. Groups of two or three students receive a puzzle with answers/questions on all four sides of each piece. Students match corresponding answers/questions to form a square. "There is no sitting around in this activity," Scott said. "Students are engaged throughout the lesson."

Why Teach This Way?

Williams and Scott give two major reasons for teaching mathematics by engaging students actively in learning.

- It allows students to take ownership of their learning.
- It allows teachers to address student understanding of the lessons in a small group.

Scott taught the same group of students in honors mathematics in grades nine and 10. End-of-course exam scores for these students showed an increase from 37 percent in 2011 to 44 percent in 2012 in exceeding standards. As a result, the percentage simply meeting standards decreased from 61 percent in 2011 to 54 percent in 2012.

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More Than Just Games: Engaging Activities for Mathematics Students

When **Carlsbad High School** (CHS) in Carlsbad, New Mexico, began its journey with *High Schools That Work* (*HSTW*) in 2009, new principal **Mark Driskell** identified a key problem — mathematics instruction. He thought more than 30 percent of students should score at least Proficient on the state mathematics assessment.

Driskell visited all mathematics classrooms as he sought to discover what he and his teachers could do differently to raise mathematics achievement. "The first thing I noticed was that all mathematics classrooms looked the same," he said. "Teachers were at the front of the classroom doing problems while students sat in rows and watched." He learned that teachers used textbooks as their primary guides for instruction and were under-utilizing the state mathematics standards.

Through *HSTW*, Driskell was able to engage SREB consultant **Leslie Texas** to guide the CHS mathematics department. She conducted quarterly coaching sessions and provided feedback after observing mathematics classrooms.

Teachers agreed to focus on two key areas — curriculum revision and engaging instruction. They reviewed the New Mexico state standards and their assessment blueprint to determine what was taught in each course and which mathematics concepts should be introduced, mastered and maintained at each grade level.

After teachers completed the needed curriculum revisions, the SREB consultant worked with the mathematics faculty to identify ways to involve students more actively in learning in the classroom. She also reviewed the school's curriculum resources to determine which key concepts would be used

within a month of each coaching session. This allowed the coach to present both content and engaging strategies to teachers during coaching visits. Teachers were asked to work together using cooperative grouping and brain-based strategies. During the first year, CHS teachers used human graphs, paired learning activities and calculator-based investigations.

As teachers moved into the second year of working with *HSTW*, many were ready to develop their own classroom activities. **Tonya Carrell**, head of the mathematics department, designed practice activities such as the games MATHO and Go Fish to allow students to practice mathematics concepts in meaningful ways.

The MATHO game is based on the concept of Bingo. Pairs of students receive MATHO grids. The teacher provides 25 answers to mathematics problems. Students are asked to place the answers strategically on their cards. After all cards are completed, the teacher randomly selects a problem for students to complete. Each pair works the problem and marks the answer on the card. When students complete the work, the teacher places a check mark on each card to ensure that each pair has completed the problem. After checking all responses, the teacher selects another problem for students to work. The game continues until a pair of students has five connecting answers on the card. Bingo!

MATHO

M	A	T	H	O

GO FISH

Students are grouped in teams of four. Each team receives a set of cards. Half the cards contain mathematics problems, while the others contain solutions. Students shuffle and deal five cards to each team member. Students check for matches within their hands and must work any problems they were dealt. The second phase of the game is played like traditional Go Fish; however, students can ask only for answer cards from their teammates. For example, "Does anyone have x + -4?" The game continues until all students are out of cards. Winners are the ones with the most matches.

Carrell shared her math activities with the department and is working to develop additional games. "Students love playing games with mathematics problems," Carrell said. "They talk about math and help each other become better at working problems."

While it has been hard work, the department is able to see benefits of their efforts. **For the past two testing cycles, CHS has seen consistent increases in mathematics achievement**. **In fact, 46 percent of CHS students scored Proficient or Advanced during the last testing cycle, in 2011-2012, compared with 34.5 percent in 2009-2010**. "Both Hispanic and economically disadvantaged student groups improved approximately 10 percentage points in math during the past three years," Driskell said.

As CHS moves forward in mathematics, teachers have participated in introductory workshops on the Mathematics Design Collaborative. "They are excited about working with the formative assessment lessons and tasks and have already identified how to use these resources in the curriculum," Driskell said.

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High School and Middle Grades Students Need Conceptual and Procedural Understandings of Mathematics

SREB mathematics consultant **Jason Adair** encourages high school and middle grades mathematics teachers to teach conceptual understanding as well as procedural fluency in preparing students for college and careers.

"Conceptual understanding leads to procedural fluency, but the converse is not true," Adair said. "Procedural fluency does not lead to conceptual understanding." Adair noted that it is not a bad practice to teach procedurally, but it isn't enough for today's students, who need a deeper understanding to meet mathematics standards and real-world expectations.

"If we're going to attend to precision, we had better be procedurally fluent," he said, referring to the sixth standard of the Common Core State Standards (CCSS) for mathematical practice. "Students need to understand math conceptually so that procedures will make sense and they will be equipped to apply them to unfamiliar scenarios."

Problem Solvers

To compete in the global marketplace, American students must be proficient in all eight CCSS mathematics practices. They must be problem solvers who understand mathematics. "In 1970 there weren't many jobs that needed problem solvers," Adair said. "It's different today."

Students who have access to only the procedures of mathematics are learning an ever-increasing number of fixed plans to go from starting points to finishing points. Students who have gained a conceptual understanding of mathematics have built a structure that allows them to move from starting points to finishing points *in an unlimited number of ways*. These students are problem solvers; they have a greater ability to adapt to new tasks.

"If we only give students a formula, who are we helping? The talented students," Adair said. "We are leaving half of our students behind by teaching only procedures."

Adair gave this example: When a teacher says four squared, what is a geometric term doing in the middle of a numbers and operations lesson? "If this lesson is just about procedures, students memorize that four squared means four times four," Adair said. "Frequently, students who rely just on procedures will miss this question because they do four times two. In saying four squared, teachers can connect to geometry, because students should be picturing a square that is four units by four units. This connection to a concept that students have learned in the past builds a deeper understanding of the mathematics and causes students to rely less on procedures."

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Mathematics Design Collaborative: Using Formative Assessment Lessons in Geometry

A partnership between SREB and Arkansas is making it possible for schools in the **Rogers Public Schools** (RPS) district in Rogers, Arkansas, to implement formative assessment lessons (FALs) aligned with the Mathematics Design Collaborative (MDC). The MDC represents partnerships to support transition to Common Core State Standards (CCSS) for mathematical practice.

Mathematics teachers **Mark Bauer** of **Rogers High School** and **David Conaway** of **Rogers Heritage High School** implemented five FALs in geometry courses during one semester of 2011-2012. Both teachers were able to use the lessons with remedial, grade-level and advanced geometry students to capture a representative sample of how the approach works with all students in the classroom.

Throughout the semester, the two teachers participated in a facilitated implementation process with SREB leaders and coaches. The process included classroom visits to see the lessons in action as well as webinars and conference calls. The RPS teachers joined teachers implementing the process at other Arkansas schools at a workshop where they could share their experiences and gain strategies from their colleagues.

Assess Themselves

Formative assessment lessons provide opportunities for teachers and students to assess themselves to modify and improve their teaching and learning activities. Bauer and Conaway said the lessons allowed them to observe and listen to student thinking on mathematics to a greater degree than ever before.

"When we create a 'culture of why' by teaching students to reason, we will see wonderful things in our classes."

David Conaway, Rogers Heritage High School

The two teachers identified prerequisites for implementing formative assessments with fidelity:

- Build highly effective questioning strategies.
- Establish a formative assessment environment.
- Engage in intense planning with colleagues.

"I realized I needed to complete a formative assessment lesson at least one week prior to bringing it to the classroom," Bauer said. "That's because the lessons are deeply conceptual and students who are engaged in the productive struggle come up with lots of things that surprise you. It worked best for me to meet with another teacher to identify any misconceptions the students might have about the lesson and to prepare to answer them. Working with another teacher gave me another point of view and I was better prepared as a result."

Conaway said pre-planning allowed the teachers to anticipate where students might struggle. "Pre-planning gave us time to develop formative feedback questions that would nudge students forward without taking away the growth they would gain from the struggle."

Need for Questioning

Both teachers were confident of their questioning strategies but found they needed to ask pertinent questions to sustain student discourse during collaborative activities in the classroom. "When students 'hit the wall,' we realized quickly that questioning may be the most difficult part of the process," Conaway said.

"My instruction benefited from answering students' questions with new questions that would lead them to the answers," Bauer said. "The goal is to get students to ask themselves the questions when they are stuck."

The fact that the FALs were already aligned to the CCSS for mathematical practice made implementation easier in terms of planning and alignment, both teachers said. "The lessons are great because they are ready to use," Bauer said. "I don't have to look up the standards or make PowerPoint presentations. All of that is done for me. I just have to read through the lesson and work everything so that I'm prepared for students' questions."

The two teachers welcome the opportunity to serve as a resource for colleagues as they continue to grow and build capacity in their respective schools. "We both have had other teachers observe us during the process," Bauer said. "All geometry teachers in the district will implement the same FALs in fall 2012 and several will do so in the spring. We are training these teachers during in-service time."

The process of creating "experts" works well with the lowest performing students, Bauer said. "It allows them to shine and receive positive feedback from other students and the teacher." Bauer noticed no significant change in advanced classes but saw an 11 percent increase in semester exam averages for students in remedial classes — with no significant changes in demographics.

Conaway looks to the future: "The depth of reasoning that we are bringing to students is so new that they will need to experience it through a few years of math classes before the patterns are truly ingrained," he said. "When we create a 'culture of why' by teaching students to reason, we will see wonderful things in our classes."

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Using Formative Assessment Lessons to Advance New Mathematics Standards

Mathematics teacher **Leona Martin** of **Wickes High School** (WHS) in Wickes, Arkansas, uses formative assessment lessons (FALs) in the classroom. The lessons are part of the Mathematics Assessment Program (MAP) and the Mathematics Design Collaborative (MDC).

WHS enrolls 251 students in grades seven through 12. Demographics in this rural school are 62 percent white students, 33 percent Hispanic students and 5 percent "other" students. Additionally, 9.5 percent of students are considered gifted and talented while 11.5 percent are identified as special education students. A significant 72 percent qualify for free or reduced-price meals.

Martin spent one year changing her instruction to include FALs as part of unit planning. "I asked myself, can students duplicate the steps the next day, the next month and at the end of the semester?" Martin said. "I found that traditional teaching strategies would not equip them to do so."

FALs include five components:

- Pre-Lesson Assessment (about 15 minutes) — Use this time to group your students, find gaps in their learning, identify common misconceptions and create feedback questions. Use numbers rather than names on students' papers to eliminate preconceived ideas of students' abilities.
- Introduction (10 minutes) — Teachers may refer to the feedback questions for this introduction to the collaborative activity. The introduction can give the teacher greater insight into students' misconceptions; it is not intended to be a whole-class discussion.
- Collaborative Activity — Students are placed in homogeneous groups of two to three per group. They work at their own level. By facilitating the activity, the teacher allows students to find their own way of completing the work.
- Plenary Discussion — This component is a whole-class discussion of the collaborative activity. Students share their solutions and tell how they created them. The discussion produces student "experts."
- Post-Assessment — Each student completes the assessment. The teacher uses three to five feedback questions for this activity.

FALs are available at map.mathshell.org.

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Mathematics Design Collaborative

The Bill and Melinda Gates Foundation has funded the creation of formative assessment sessions (FALs) for grades seven through 10, focused on conceptual understanding and problem-solving. The FALs form the foundation of the Mathematics Design Collaborative (MDC) concept; they are built around a set of rich tasks connected to the Common Core State Standards (CCSS) and are intended to be embedded within a teacher's curriculum. The FALs are designed to engage students in a productive struggle with their mathematics learning.

FALs are intended to be used by teachers at least once a month and aligned to key mathematics concepts. Individual teachers or districts can decide exactly how each FAL will be used. Some teachers could choose an FAL to introduce a mathematics topic while others might use an FAL two-thirds of the way through the topic lesson to raise questions and check for further understanding or some weeks later to consolidate learning of multiple strands within the curriculum.

Engaging Low-Performing Math Students in Preparing for College and Careers

Laura Reed, math instructor at **Windham Regional Career Center** in Brattleboro, Vermont, is responsible for preparing students in the bottom 20 percent for college and careers. Because poverty is a factor in the low achievement of many students, Reed uses instructional strategies that are effective with students from low-income families:

- Use hands-on experiences with manipulatives.
- Assign students to work in small groups.
- Emphasize relevant problem solving.
- Allow students to practice skills until mastery is reached.

"In studying poverty and brain function, researchers have found that stress hormones increase and working memory declines the longer a person remains in poverty," Reed said.

Reed uses scores on the College Board's Accuplacer test to measure students' existing math skills. She uses proficiency statements for students in arithmetic, elementary algebra and college-level algebra to make sure they understand the math skills they have acquired and the ones they need to learn. She knows that students will need arithmetic and pre-algebra for the Armed Services Vocational Aptitude Battery (ASVAB), apprenticeships and tech training; algebra to enter a two-year college; and college-level algebra for a four-year college.

Each student receives a course sequence that will enable him or her to acquire the needed math skills for a chosen career cluster. It shows what local colleges, including Vermont Tech, require for a particular major.

Reed's role in the classroom is to make instruction effective. She uses the National Library of Virtual Manipulatives (http://nlvm.usu.edu/) to incorporate strategies such as algebra tiles for a better understanding of math. She also uses CORD textbooks to make math relevant to students. "Students never ask when they are going to use this math again," Reed said. "They know they will be using it the next day."

Reed recommends Advancer: College Readiness (www.advancerlearning.com) to improve Accuplacer scores and to diagnose and track students' progress. "It's easy to use and provides excellent ongoing support," she said. Students take the Accuplacer exam again at the end of the class as a post-test to measure individual levels of college and career readiness in math. For the past six years, 80 to 90 percent of students have attained the college cut-offs for credit-bearing math classes by the end of the course.

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Teachers Collaborate to Offer an Algebra I Support Lab for At-risk Math Students

Many schools struggle to find ways to help freshmen — particularly special education students — experience success in Algebra I. **Lexington High School** (LHS) in Lexington, Missouri, had tried to meet the needs of at-risk students by dividing Algebra I into two courses — Algebra 1A and Algebra 1B. Although the content was delivered at a slower pace, some students still had difficulty learning.

Special-education teacher **Donna Slusher** and math teacher **Cassie O'Brien** of LHS had the idea to offer an Algebra I support lab for students who failed Algebra I the previous year or who had been recommended by their grade eight math teachers for extra help in the ninth grade. The goals would be to help students understand algebra, pass the course, improve end-of-course exam scores and feel good about math. "We wanted to break down the barriers these students had about learning math," Slusher said.

The support lab was scheduled for first period every day during 2011-2012. It gave students an opportunity to review what they were being taught in Algebra I later in the day as well as to preview upcoming materials. "Offering the lab first thing in the morning allowed us to pre-teach skills," Slusher said.

Peer Tutors

As a result, lab students sometimes became peer tutors for students in Algebra I, since they had learned concepts in the math lab earlier in the day. "Many who had been labeled bad students or troublemakers took leadership roles in Algebra I and felt successful," Slusher said.

Lab students began to feel like a "family." They were encouraged to take ownership of their learning and to suggest activities that would help them master the concepts. "We used the students' ideas as often as we could," O'Brien said.

"Offering the lab first thing in the morning allowed us to pre-teach skills — Many who had been labeled bad students or troublemakers took leadership roles in Algebra I and felt successful."

Donna Slusher, Lexington High School

O'Brien and Slusher collaborated on lesson plans for the math support lab. They included many games and activities to engage students in learning. They also used drill-and-practice worksheets twice a week, directed students to online resources and used strategies from *Algebra I Rescue!* Students can also receive assistance with homework during the lab.

Students Benefit

The two teachers felt the lab was beneficial to students, but they wanted to look at scores on the Algebra I end-of-course exam and overall grades in Algebra I. The results were mixed.

The lab served 10 at-risk and special-needs students over a period of a year. Most students in the lab course had been delayed in taking the end-of-course exam the previous year. Of students who took the exam, one student scored higher on the Algebra I end-of-course exam than on the pre-algebra end-of-course exam, two students held steady and one student showed a decrease. In a comparison of grades from the previous year, half of the lab students performed better in Algebra I than in pre-algebra or algebra the previous year, while 30 percent showed a decrease for one semester. However, five of the six students who failed Algebra I the previous year passed after taking the lab course.

O'Brien and Slusher were curious about students' opinions of the math lab. A survey showed that students overall thought the lab helped them perform better in Algebra I. Students liked the hands-on activities, which were fun and engaging. Students wrote that the lab "helped me with lessons I was stuck on" and made it easier to learn because it was a small class. Most students said they would take the lab again.

Based on scores and the student survey, LHS decided to offer the support lab again in 2012-2013. Both teachers are hopeful that increasing the number of authentic learning tasks will cause more students to raise exam scores and course grades. They plan to collect more qualitative and quantitative data throughout the year, create a photo and video journal of lab activities, and develop a resource file.

LHS will also offer support labs for geometry and English 9 and 10 during 2012-2013.

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This newsletter of "best practices" in implementing the *High Schools That Work (HSTW)*, *Making Middle Grades Work (MMGW)* and *Technology Centers That Work (TCTW)* school improvement models is based on presentations at the 26th Annual *HSTW* Staff Development Conference in New Orleans, Louisiana, in summer 2012.