

Best Practices Newsletter

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Literacy and Math Strategies That Prepare Students for College and Career



Reading, writing and analyzing text in math, science, or career and technical education (CTE) classes — not typically what students, or teachers for that matter, expect to encounter. But that’s beginning to change as more schools embed literacy standards and strategies into assignments in all subjects. The Literacy Design Collaborative (LDC) incorporates challenging literacy standards into middle grades and high school content areas within a variety of academic disciplines, not just English/language arts courses.

The Mathematics Design Collaborative (MDC) provides schools with instructional tools needed to help teachers understand and implement the college- and career-readiness math standards effectively while allowing them the flexibility to select topics and adapt assignments to their specific instructional plans. MDC is about formative assessment, allowing students to engage in “productive struggle” to make sense of math concepts.

Teachers are able to identify misconceptions, learn from what students do or do not know and build on that to determine how to change instructional strategies to help all students master rigorous standards.

This newsletter explores how schools are raising student achievement and teacher self-efficacy through implementation of the LDC and MDC frameworks.

Using LDC to Increase Students’ Literacy and Subject Area Achievement

LDC and CTE: Begin With the End in Mind

Getting students’ reading and writing skills up to standards for college and careers should not be the responsibility of the English/language arts teachers alone. All content teachers have a responsibility.



Career and technical education (CTE) teacher **Michelle Abernathy** fully buys into this practice. She is a family and consumer science career development teacher at **Mount Ida High School** in Mount Ida, Arkansas.

“My life goal is to graduate students who have goals for their own futures and are career ready with employable skills.” How does Abernathy ensure these goals come to fruition? Her answer was clear — implementing the Literacy Design Collaborative (LDC) framework and keeping the end goal at the forefront when it comes to her students.

Abernathy acknowledged when first introduced to LDC her frustration included not fully understanding how she was a teacher of literacy and feeling she was already limited on time to teach her own content. She soon discovered literacy is immersed everywhere in her content area. “I have been assigning writing but needed to increase responsibility of the students.” Reflecting further Abernathy noted her students’ exam scores were not where they needed to be; thus, she began using the LDC framework in effort to increase student achievement.

Through a series of self-created and vetted modules, Abernathy was able to increase the level of rigor and critical thinking in her classes while easily managing the content she has to teach. Students utilized literacy strategies to engage in and learn her specific CTE content. The modules have built-in opportunities for student debate, challenging students to support their discussions with concrete evidence from texts and other assigned documents. Students have been challenged to write and evaluate products that were presented to authentic audiences, and students have been exposed to a variety of texts and modes of writing.

Writing a Children’s Story

One of the modules she designed for her child development class challenged students to write a children’s story for a specific age group. If a student met the requirements of a four on the rubric, then he or she was given the opportunity to read and share the story at an elementary school. In turn, the elementary students were also charged with the task of evaluating the stories shared using a simplified rubric that provided immediate feedback to the author.

This module allowed Abernathy’s students to explore specific content and evaluate key issues in child development. As the students wrote the children’s stories, they had a clearer understanding of who their audience was.

All the modules created have supported Abernathy’s overall goal of equipping her students with employable skills and helping them reflect on their future goals.

For Abernathy, beginning with the end in mind and using the LDC framework positively influenced her instructional practices and increased student achievement. Exam scores from the Arkansas State Competency Test for Career and Technical Education highlighted this growth in her classroom. In year one of LDC, the average in her child development class was 77 percent and 72 percent in food and nutrition. Year two of LDC revealed further success with class average scores increasing to 85 percent in child development and 80 percent in food and nutrition.

“When I look at self-discovery and clarify what I want, this is what I want. When I begin with the end in mind, I want you to understand that my goal is to have my students read to understand and write to be understood.”

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Art and LDC: No Graffiti Unless You Write!

Art teacher, **Allison Thompson**, with the **Raymondville Independent School District** in Raymondville, Texas decided to take the plunge into the Literacy Design Collaborative (LDC). Thompson incorporated LDC modules and mini-tasks into her art classes for a high-needs high school population near the border with Mexico.

As a result of developing LDC modules Thompson reported, “Student dialogue, writing samples and art focus have all improved with the LDC approach. And no one gets to spray graffiti art features or create an art project for our school until they have written in my class and shared their writing with their peers and me.” **Dixie Lee**, Raymondville’s SREB LDC coach said, “One of the reasons Allison was so successful in implementing LDC in art classes had to do with the effective ways she was able to engage, revise and extend learning.”

First, to get the students engaged, Thompson developed a module revolving around modern day graffiti art, a topic all of her students found relevant and true to their lives. She asked, “Is Graffiti art work or vandalism?” She showed videos about the topic. The students explored different artists and types of vandalism by reading selected texts and video clips. Students then used their new art-related content knowledge and their readings of primary and secondary sources about the module topic to write an argumentative essay.

Reading Assignments

Some of the primary readings resonated with the art students and included *Graffiti: Street Art or Vandalism?* by Edgar Allen Beem; a *New York Amsterdam News* article, “City Proposal May Put Graffiti Art at Risk”; “Graffiti vandalism can have deadly consequences — OTHER VIEWS” by Delaware County Daily Times Editorial Board; and “Graffiti: Is it art or vandalism?” written by Larry Humber in the *The Art Newspaper*.

Writing Assignments

Second, now that the students were hooked, Thompson designed lessons in her LDC instructional ladder that involved having students write complete sentences related to the task, using sentence starter words like “although,” “unless” and “if.” The result: sentences like “Although LDC seems like a lot of work, it seems to be worth the effort; Unless I fail at LDC, it will be worth the effort I put into it; and If I do fail at implementing LDC, I will learn from my mistakes and try again.”

Her students began to write longer and longer sentences, paragraphs and ultimately essays as they got used to the idea of writing in an art class. Clearly, the fact that her students were hooked on the topic made the writing they produced more interesting and relevant to their daily lives.

Peer Review

Next, after the art essays were written, Thompson devised a musical chairs peer-revision activity that got students up and moving. The directions for this activity were: When the music starts, move from table to table. Dance if you feel the need! Laugh! Be loud! When the music stops, you will have two to five minutes to revise the stated paragraph. The exercise provided thoughtful, helpful feedback to improve students’ papers before they handed them in.

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Modules and Teaching Tasks, the Backbone of LDC

The principal component of the Literacy Design Collaborative (LDC) framework is the module — a subject-specific reading and writing assignment, or “teaching task,” with an instructional plan that is taught over a two- to four-week period. The framework aligns with the skills students will need to be successful in school, college and careers.

The LDC module comprises four sections: 1) What task? 2) What skills? 3) What instruction? 4) What results?

Section 1: What task? LDC provides teachers with collections of “template tasks,” or templates that are used to design challenging and engaging teaching tasks for students. In each module, the teaching task (what students are asked to do) drives the decision in the next module steps.

Section 2: What skills? Teachers identify and define the precise skills that their students will need to develop to complete the module’s teaching task.

Section 3: What instruction? Teachers build an explicit instructional plan through which they engage students in “mini-tasks” that develop their literacy skills and guide them toward completing the assignment. Student work generated from the mini-tasks provides teachers with important information about which skills students have acquired and which skills need more time and practice so that students will be successful on the final product.

Section 4: What Results? After teaching the module, teachers score the resulting student work against the LDC rubric and analyze the results. The LDC framework also includes an opportunity for teachers to design and give a summative assessment related to the teaching task.

Two High School Teachers’ Perspectives Implementing LDC modules

“Even though it might not seem like it due to the strict module template, modules are open to teacher creativity,” said **Kathryn Rasberry**, who teaches AP and general English 10 classes and mythology at **Shades Valley High School (SVHS)** in Birmingham, Alabama. “I found that I was still able to incorporate fun, meaningful activities in my lessons while still remaining focused on the task, and the truly brilliant part of LDC is the fact that I don’t have to teach my curriculum and a module. LDC modules are not meant to be additional work for

teachers. They are simply an alternative mode to teach the standards already addressed in our curriculum,” emphasized Rasberry.

“LDC has made me more aware of the purpose of my lessons. It forced me to be conscientious of the end result and the progress my class was making in reaching our module goal. The module makes sure we don’t leave out steps or skip necessary skills our students need in order to be successful,” said Rasberry.

“LDC worked wonderfully in my class. I found that being up front with students about the expectations for the module really set the stage in my class. Students then took responsibility for their learning more so than I had seen all year.”



Angela Watson, a physical science and chemistry teacher at SVHS, said the process of teaching an LDC module was easy. “I was able to easily adapt my usual teaching style to fit within the LDC framework. Because of the module design, the work I was already doing was simply reorganized into a more task-oriented process. The curriculum fits right into the module layout.”

Watson also noticed “a shift in students’ thinking” and said, “The points of success for LDC implementation in my classroom were students’ ownership of their work and a deeper understanding of the science concepts being taught.”

Students' Scores Climb

In spring 2014, Alabama administered a new system of assessment and accountability which aligns teaching and testing in all grades. Based on college- and career-readiness standards, the ACT end-of-course (EOC) exam assessed students in English, reading, math, science and writing.

Rasberry and Watson shared 55 students whom they taught using LDC strategies. Rasberry reported 47 percent improved their EOC exam scores from fall 2013 to spring 2014, and 56 percent improved their Global Scholars Performance (GSPT) results.

The GSPT is administered three times a year and reports performance in vocabulary knowledge and acquisition, critical reading, and comprehension skills in fiction and nonfiction passages of different lengths.

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LDC Transforms Social Studies Teacher



Incorporating more writing into his classes was a little scary for **Grisham Lenard**, a teacher at **Lee Junior High School (LJHS)** in Monroe, Louisiana. After all, he was a social studies teacher and a football coach. "I wasn't trained as an English teacher," said Lenard. "I didn't know how to grade it."

In 2013, literacy coaches from the Southern Regional Education Board (SREB) trained Lenard in using the Literacy Design Collaborative (LDC) strategies, teaching tasks and modules to prepare his lessons. "Before I started using LDC, I planned lessons on Sunday." Now it's front-loaded and it takes about two weeks to plan a lesson. "LDC for me is all about backwards design," (planning with the end in mind) noted Lenard.

He learned these steps involved in creating a great teaching task:

- Start with backwards design.
- Limit your focus to a single question or main theme.

- Develop a time-sensitive plan for implementation.
- Address content essential to the discipline.
- Make effective use of the template task's writing type (argumentation, information/explanation or narrative).
- Select reading texts that use and develop academic understanding and vocabulary.
- Design a writing prompt that requires sustained writing and effective use of ideas and evidence from reading texts.
- Establish 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.

Along the way Lenard involved students in the process by explaining why he selected a certain teaching task, presenting the task and critical questions to students, explaining the rubric and how students' work would be graded, and providing students with a readers' checklist so they would know what assignments they would be responsible for.

Even though the majority of LJHS students were from low-income families, Lenard did not shy away from assigning rigorous texts. "The tougher the text, the more you get out of them. They are gonna learn more," insisted Lenard.

LDC Module: Breaking Up is Hard to Do

Grisham's first module was "Breaking Up is Hard to Do — Resistance, Rebellion, Revolution." The task prompt was: "Were the 13 American colonies justified in declaring independence from Great Britain? After reading primary and secondary historical texts and various arguments for and against independence, write an essay in which you argue the causes of whether or not the colonists were justified in declaring independence from Great Britain and explain the effects of their decisions. What conclusions can you draw? Be sure to acknowledge competing views and support your position with evidence from the text."

One of the first things Lenard had to tackle was vocabulary. He said students were so used to googling a word to find out its meaning that they didn't know how to use the dictionary. He collected dictionaries from around the school. When the students didn't know the meaning of words in texts, he would have them highlight the words and they would look them up together.

He required students to read paragraphs and write notes on what each paragraph was about. Most importantly, he would ask students to write a summary at the end on what a document is about.

College-Ready Writing: Policies, Practices

Barrie Harvey, an assistant professor at the University of Cincinnati Blue Ash College, touts the work of the Literacy Design Collaborative (LDC) in helping to make students college and career ready. LDC requires students to do authentic writing assignments in high school in response to complex reading assignments. The LDC process emphasizes writing to communicate and enables teachers in all disciplines to create mini-tasks and writing assignments that scaffold learning so that students practice the kinds of reading and writing done by the professionals in their fields of study.

Any discussion of college readiness in writing requires a definition of the term. What is college readiness? And what policy does a college use to determine if a student is college ready? Colleges generally rely on standardized exams to determine if students are ready to accomplish college-level work. Colleges may also look at a student's writing portfolio or scores on grammar and composition placement exams to evaluate college readiness.

After this process is over, Lenard said students would basically have their essay written.

Impact of LDC Strategies on Students

Lenard said his students learned:

- how to read and annotate primary source documents
- how to become more active readers
- what it means to write like a historian
- how to present an argument and defend their position
- how to debate a topic

One Teacher's New Approach

"I've almost stopped using multiple choice tests. I use short answer tests," said Lenard. He also said LDC changed how he designed lesson plans and assessments; addressed and taught the content he wanted students to learn; approached having students complete writing assignments in classes; and increased the amount of writing required of students.

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Readiness Exams Don't Reveal the Whole Story

Harvey points out that even when nationally accepted readiness exams indicate that a student is ready for introductory composition; the exams are not always accurate.

LDC focuses on personal and academic writing that requires students to do research and use sources. While these criteria sound like reasonable expectations for a composition student, data from the Citation Project, which analyzed almost 2,000 citations from the papers of college students across the country, reveal that student work does not meet with expectations.

The study found plagiarism, poor summarization and paraphrasing, and indications that students did not read more than the first page of cited materials. Exams suggested students were ready for college, but students had graduated from high school without the skills they needed to do college work.

In accounting for the Citation Project results, Harvey agreed with W. Earl Britton's 1965 summation that students write "the wrong thing, for the wrong reason, to the wrong person, who evaluates it on the wrong basis." Most after-college writing is meant to communicate new information to an authentic audience. In other words, it is specific to the writer's profession or discipline. Most high school writing communicates to the teacher, who already knows the information, that the writer has learned the information well enough to write about it.

Writing to Communicate Versus Writing to Learn

While writing to learn and writing to communicate are not mutually exclusive, Harvey asserted, "If we want to teach writing in the disciplines, we must emphasize writing to communicate. As long as students feel they are writing only to you, there will be a divide."

Writing tasks and structures differ among the professions, and one of the purposes of education is to prepare students for professional life. According to

Making Middle Grades Matter: Using LDC Tools and Strategies

"LDC has completely changed the way our teachers and students think about reading and writing," according to **Robin Beams**, lead LDC teacher at **Kenneth D. King** Middle School in Mercer County, Kentucky. "Middle grades matter," said Beams. "It's the time when students have to really get serious about becoming independent learners. They have to know how to find out about complex topics on their own and formulate arguments supported by research in every subject area. They won't

Harvey, "College is just four extra years of apprenticeship before careers." Students preparing for careers in business and engineering need to know how to analyze a problem and propose a solution, while students preparing for careers in liberal arts need to know how to synthesize research from several sources. Students who are preparing for careers in the sciences and social sciences need to know how to write about conclusions they draw from various data sources.

Different professions also require different writing structures. While literary and historical analyses require a thesis-first structure, business proposals and engineering design papers require a problem-solution structure. Science and social science professions use the Introduction-Methods-Results-Discussion (IMRD) structure for writing. Professionals write to communicate information to other professionals, who expect their colleagues to adhere to the writing norms of their discipline, norms which educators can embed in their practices and pedagogy.

According to Harvey, "How we write reflects how knowledge is made in a discipline. Therefore, science teachers must teach students to read and write like scientists, while math teachers must teach students to read and write like mathematicians. A discipline's writing reflects that discipline's values." High schools must align their policies, practices and pedagogy to give students the kinds of experiences and instruction that will make them college and career ready.

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be prepared for high school otherwise." The Literacy Design Collaborative (LDC) tools and strategies have launched King Middle School on a journey of improvement that has not only changed school climate, but also raised student achievement.

According to Beams, who teaches eighth-grade language arts, three years ago King Middle School was going nowhere. The sixth- through eighth-grade campus of

675 students in rural Harrodsburg, Kentucky, wasn't a failing school, but it wasn't improving, either. "We were stagnant," said Beams. "We could tell our students' achievement scores — and our enthusiasm for teaching — were heading in the wrong direction. When we received a 'Needs Improvement' rating in 2011, we knew we had to try a new path. The time was right."

Journey to Success

King joined with 15 middle schools to form the Kentucky Middle Grades Schools of Innovation (KMGS), a project supported by the Kentucky Department of Education and directed by SREB. Since 2011, the project has delivered training and follow-up coaching in LDC, the Mathematics Design Collaborative (MDC), guidance/advisement, career counseling and leadership. "LDC was the first component of the project to be implemented," said **Jennifer Watson**, project director.



Beams credits Principal **Terry Gordon** with picking the right people to lead the initiative. In addition to Beams, sixth-grade social studies teacher **Jason Bryant**, seventh-grade science teacher **Angela Keys** and fine arts teacher **Erica Ashford** were tapped to learn LDC methods and teach them to colleagues. "I have to admit I was a little reluctant at first," said Bryant. "I didn't think of myself as a reading or writing teacher." Gordon knew, however, that if he could get the skeptical Bryant on board, the respected teacher-leader would be a powerful LDC advocate.

King staff took other positive steps early on. The district provided enough time for teachers to plan together as they developed LDC tasks and modules, protecting team and individual planning times even when budgets were tight. They also arranged for department and grade-level retreats and after-school workshops to increase LDC knowledge and gather resources.

During the journey, building and district administrators set clear expectations that LDC would be adopted schoolwide while empowering teachers to be the experts on how LDC is implemented with fidelity. Gordon and the LDC leadership team set a tone of "evaluate and improve." Teacher-leaders used their own work as models for colleagues, sharing the strengths and flaws in their classroom-tested modules. Gordon reviews everyone's modules and gives feedback for improvement. The commitment to accountability for sustaining LDC extends to the central office and to the students themselves. District administrators attend every training session, visit classrooms daily, and meet regularly with their SREB coach.

King has gone from achievement in the 54th percentile to the 68th percentile in Kentucky after two years of practicing LDC lesson design and delivery. King recently received a "Progressing" rating, missing "Proficient" by only two points.

In the 2012-13 school year, a sixth-grade girl's LDC-generated essay was chosen as a winner in a NASA-sponsored national contest. The following year, students submitted the products of their LDC research on the county's water quality for state science awards. More importantly, staff equates LDC with high school success.

"My former students are telling me that some of their high school projects are 'no big deal' because they already know how to attack a writing task and do research," said Beams. King has continued with more advanced LDC training over the past three years, now LDC is a way of doing business at King.

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Meeting the Rigor of the College- and Career-Readiness Standards

With the college- and career-readiness standards (CCRS) front and center in education, the Literacy Design Collaborative (LDC) provides rich opportunities for teachers to help students deepen their understanding of rigorous college concepts and skills. **Susan Herrington**, master teacher, and **Michelle Tureau**, literacy integration specialist, at **West Baton Rouge Parish** in Port Allen, Louisiana, have figured out a unique way of collaborating with other teachers to design, analyze and rewrite mini-tasks for science, social studies and English/language arts modules. This ensures the mini-tasks meet the instructional rigor of the college- and career-readiness standards.

Herrington said one must start with this question when working on aligning mini-tasks and CCRS, “How would you complete this statement: LDC mini-tasks support CCRS by?” Tureau and

Herrington have teachers brainstorm their answers and then record and analyze a specific standard such as:

CCRS reading standards — Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

Determine a central idea of a text and analyze its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.

After identifying the CCRS the module is targeting and the matching mini-tasks to be used, Tureau and Herrington recommend that teachers follow a four step process to ensure alignment:

1) What College-and Career-Readiness Standard is being addressed?

(Determine the focus standard for the mini-task.)

2) Does the Skill include the rigor of the CCRS?

Mini-Task Skill: (Identify the skill, “Ability to . . .” and reword to include the language of the standard.)

3) Does the Mini-Task meet the rigor of the CCRS/Skill?

Mini-Task Instructional Strategy: (Embed the actions of the standard students will demonstrate during instruction.)

Prompt: (Objective, mirrors the language of the skill/standard)

Product: (Student work)

4) If not, what could be modified to increase the rigor?

Instructional Strategy: (Explains the strategy used to ensure the rigor of the standard is actively being addressed.)

Tureau and Herrington reported, “After being involved with LDC for several years we have found that developing this step-by-step process has really helped our LDC teachers design modules with much better accuracy and more successfully match the rigor of the required standards to the module task and mini-tasks within the module.”

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LDC: Bridge to a Grant

Effective teachers are always looking for more ways to make their classes interesting and engaging. But that can be costly. Many teachers spend some of their hard-earned cash on books and other supplies. But their personal funds can only go so far. Individuals can seek a grant to find funding needed to differentiate instruction and expand instructional opportunities.

Diana Richardson is an English teacher at Alamogordo High School in New Mexico and has worked with SREB's High Schools That Work (HSTW) school improvement initiative for nearly three years. HSTW trainers coached her in using the Literacy Design Collaborative (LDC) framework to increase students' achievements in reading and writing.

She did so with success, but Richardson soon surmised writing a grant is similar to creating an LDC module. They are written with the end product in mind — a need to be met. A module comprises four sections: What tasks? What skills? What instruction? What results? When writing a grant, teachers must consider what goal (tasks and skills), what instruction (what more do you need to provide the best possible instruction to meet your academic goals?) and what results (what will be the outcome of the improved instruction? In other words, how will the money help?

Richardson wrote a grant proposal and received \$5,000 from the French Award for the Improvements of Secondary Education. She used the money to purchase books, e-readers and audible books for her classes.

Richardson outlined **six steps to building an LDC-based grant proposal**:

Step One — Get started and create a wish list.

Teachers need to establish a wish list that might include technology, materials, software/hardware, teacher training, professional development and guest instructors/speakers.

Look for opportunities for growth to add to your wish list. Possibilities could include finding materials that assist with scaffolding and differentiation of instruction — providing individual students the best suited avenues to learn and acquire content, skills and mastery. That would include assessments and teaching materials.

Step Two — Do your homework. Find someone to write the check.

Richardson said look at local businesses organizations; many have money budgeted to support the community. Do Internet searches. Target educational grants and find something that looks like a good fit. Networking and social media provide good opportunities to get the word out that you're seeking money to help with school improvement and classroom activities.

Step Three — Tell your administrator when you write a grant.

Be sure the school or district can support what you are asking for in the grant. For example, is the software going to be able to work with your existing hardware? If you plan to have a guest speaker or instructor, what steps are required to have that person in your classroom? If you need to write a purchase order to pay for things, who will hold the money? If you are asking for money for professional development, be sure you can get professional leave.

Step Four — Write the grant proposal.

Be creative. You're trying to convince someone to give you their money. You have to be a salesman and a professional, Richardson said. Be descriptive. Be sure to temper enthusiasm with professional language, and "don't try to baffle them with bull," she quipped. Define acronyms and remember that everyone reading your proposal might not be in the education field.

Be honest and open about what you are already working with. Hiding your assets will not help your cause. Explain your needs within the context of what you have right now and how the money will improve on that.

Identify ways the money will benefit everyone. The more you can show how the money will benefit others outside of your discipline, the more apparent the need becomes. Will you share the training? Will this provide more time for classes to use the computer lab? Will the materials/products/etc. be available to other people?

Step Five — Find proofreaders.

Have at least two proofreaders, preferably from outside your discipline. Asking someone who teaches art or music to read your mathematics proposal sounds crazy, but if that person can't understand why you need the money, or understand what you are going to do with it, there is a good chance that someone on the proposal committee will feel the same way. Have at least one person read the proposal who is a grammar guru.

Step Six — Organization is essential.

Pay careful attention to organization throughout the process — before, during and after.

Before: Keep data about what was going on before the grant: short-cycle testing, annual testing, student feedback.

During: Keep copies of all financial records — purchase orders, receipts, etc. Keep all assessment data in one place. Make copies of computer-generated data as often as possible, and always be prepared to access your data for a progress report.

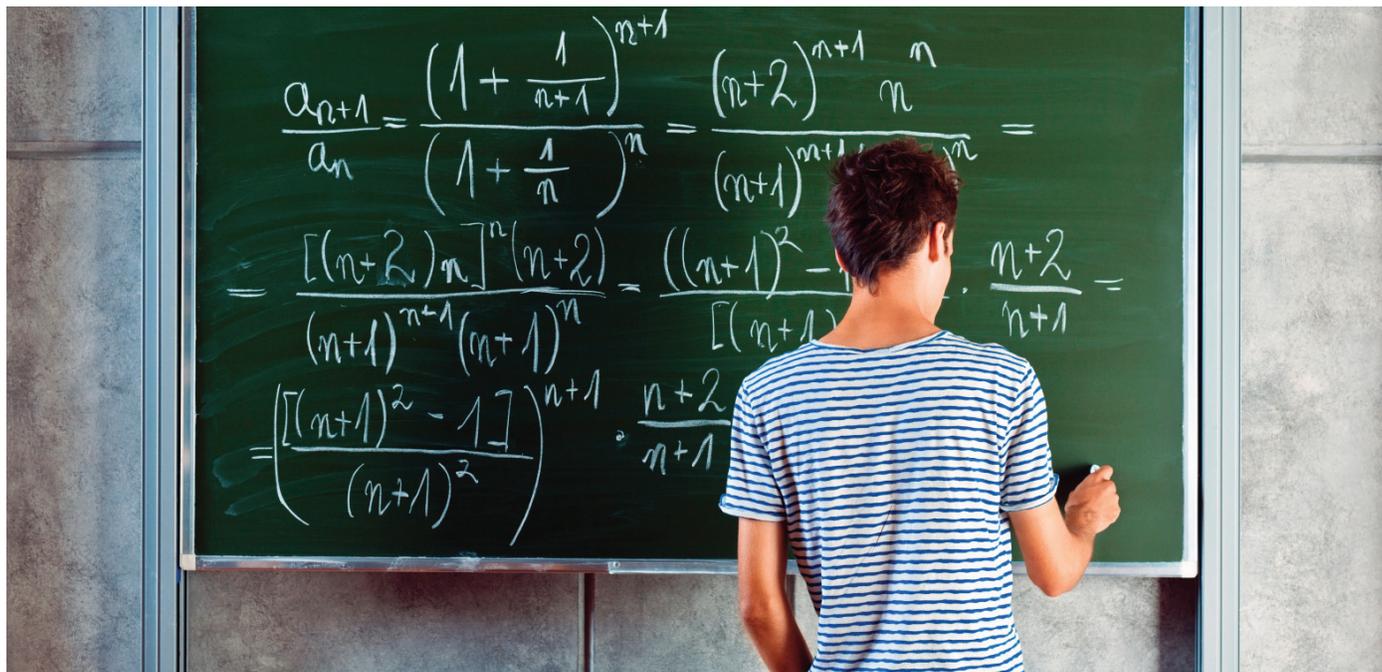
After: Provide qualitative and quantitative measures. Quantitative data may include exam results, grades or completion percentages. Qualitative data may include reflections on the good, the bad and the ugly; teacher/student journals; and student interviews.

Real data equal more money. Researchers know failure is an opportunity. When something doesn't work people tend to want to bury it in the sand. Keep data to provide insight – and don't be afraid of failure, insisted Richardson.

Success on the other hand provides a track record. Every success, large or small, is worth keeping data about. If you have six students who rarely attend class, and don't participate, and three of them found a particular LDC module to be interesting, this is a great opportunity to discover what made a difference for them. Qualitative and quantitative data are there to tell the story of what you are doing.

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Using MDC and Formative Assessment Lessons to Build Math Understanding



For too many years, teachers have limited instruction to step-by-step procedural math. Procedural fluency is important but so is the ability to reason and apply math concepts to solve complex problems. Often students become lost in solving multi-step problems. The Mathematics Design Collaborative (MDC) provides teachers with a valuable assessment tool — the

formative assessment lesson (FAL) — to help them know if students truly understand the college- and career-readiness math standards they have been taught. Students participate in individual and group learning activities and brainstorm to find ways to solve problems. They go through productive struggle so they understand not only the “hows” of math, but also the “whys.”

Achievement in Math Can Be Fun

Linda Barnes is 25-year veteran math teacher and has taught eighth-grade Algebra I and geometry at **Oden High School** (OHS) in Arkansas for 20 years. Despite her years of experience, the first taste of FALs left her confidence shaken. “As I walked away from that three-day training, I thought I had chosen the wrong career,” she said.

But two years later, Barnes said FALs have not only transformed the way she teaches, but have also improved student learning and engagement. FALs allow teachers to recognize what students understand and allow them to adjust teaching so students learn to reason with math and apply concepts to multi-step problems. FALs allow students to engage in productive struggle and think through problems.

Oden High School (OHS) is a small, rural school serving 114 students in grades seven through 12 in west central Arkansas and is currently ranked 15th in the state. The student body comprises 45 percent male and 55 percent female students, with 89 percent identifying themselves as white, 2 percent Asian, 1 percent Hispanic, and 9 percent two or more ethnicities. About 67 percent of students are classified as economically disadvantaged.

Barnes said the first time she implemented a FAL, it took a week to prepare, and what was supposed to be a 20-minute lesson took three days to implement.

But she wasn't fazed. Preparing for the second FAL took less time than the first, and preparation for the third FAL took even less time still, she said. She knew her students were engaged because students who usually did nothing were suddenly alert, talking about problems, asking questions and fully participating in group activities.

Students Tackle FALs in Groups

Grouping was key to keeping her students involved in the classroom, Barnes said. Students were arranged in homogenous pairs based on their abilities. By combining students this way, low-end students could not pass off the work to high-end students and were instead compelled to struggle with the material until they understood the concepts.

In employing the FALs, Barnes implemented several strategies to ensure students were thinking deeply about the problems they encountered. In class, students did open-word problems, with procedural work done at home. This way she ensured her students were connecting procedural methodology to word and real-world problems.

Students also conducted plenary discussions in front of the class, where they explained not only how they arrived at their conclusion, but why. "A student's way of thinking is not wrong, it's just different," she said, explaining that students need to arrive at the answer on their own, even if they take the long way to get there. Another group activity required students to write out their thinking on chart paper on the wall so they could see their thought process.

With only 43 minutes of teaching time each day, Barnes learned she could not implement 10 FALs in Algebra I and cover all the standards by the end of the year. This, however, turned out to be a good thing. "By doing the FALs, kids can take what you've taught them and think through those problems on tests without covering all the content," she said. In other words, fewer standards results in deeper learning.

Barnes' Math Students' End-Of-Course Exam 2013-14 Results

	PROFICIENT OR ADVANCED
Algebra I	100%
Geometry	93
Eighth-grade benchmark	64

Student Scores Soar

After the second year of implementing FALs in her three math classes, Barnes' students' scores at the end of the 2013-14 school year dramatically improved:

"The way we are teaching math now is the way we should have been teaching math all along," Barnes said.

Teachers are not abandoning teaching techniques, she explained. They are shifting their focus and engaging students in meaningful learning to ensure students experience math for themselves.

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Best Growth in Math

Over the past four years, students at **Mt. Pleasant High School** (MPHS) have made remarkable progress in math. The school has earned bragging rights for achieving the greatest math improvement in its Tennessee district as determined by end-of-course exam scores in Algebra I and Algebra II. The teachers and principal credit the Mathematics Design Collaborative (MDC).

MPHS serves some 350 students in grades nine through 12 in the rural community of Mt. Pleasant, Maury County, in southern Tennessee. Demographically, the school is 78 percent white, 19 percent African-American and about 3 percent Hispanic; 73 percent are classified economically disadvantaged. Nineteen percent are special-needs students.

With assistance from the Southern Regional Education Board (SREB), MPHS began implementing the MDC instructional framework in 2011. **Angela Hoath**, an Algebra I teacher, shared some of her teaching strategies at SREB's 2014 College- and Career-Readiness Standards Networking Conference in Nashville, Tennessee.

She said formative assessment lessons (FALs) play a central role in constructing units that meet appropriate rigor and balance between procedural and conceptual learning. Chunking content enables students to make the connections called for by the college- and career-readiness standards and was a key strategy for students' successes. This meant not following the textbook exclusively but using it as one of many resources.

Essential lessons for each unit include starting with a "hook" that essentially gives motivation for learning and incorporating at least one hands-on cooperative exploration lesson in the unit. FALs were thoroughly studied, and about two-thirds of the way through the unit they were selected to move learners forward.

For example, one FAL Hoath used was Interpreting Distance-Time Graphs. Even though the content targets eighth-grade standards, Hoath's Algebra I students needed exploration with multiple representations of linear functions. Matching time-distance relationships

represented as stories, graphs and tables enabled students to view slope as a constant rate of change in the context of real-world scenarios. The lesson is designed to help students make connections expected by the college- and career-readiness standards: comparing walking/running rates and direction changes to steepness and direction of lines and the corresponding constant differences in table values.

Hoath used three management strategies during the lesson: whole-class introduction, collaborative task and whole-class discussion. During the whole-class introduction, Hoath had the special education teacher display selected mini-white board responses (some correct, some incorrect) on the Smart Board to generate discussion and to reach class consensus on equivalent results that correctly answer the question. This also allowed Hoath to understand what caused the incorrect responses.

Hoath indicated collaborative tasks and homogeneous grouping greatly impacted students' abilities to stay focused on math. She also conveyed the importance of student presentations and summarization during the whole-class discussion. She said using a camera helped facilitate students' sharing their thinking processes.

Student Buy-In

Hoath said she observed students looked forward to doing FALs. Some renamed them the "fun activity lessons," and some claimed the content seemed more relevant after FALs were performed.

Student buy-in was clear based on their own comments. One student said, "We get to help each other. Sometimes hearing an explanation from another student is easier to understand than from the teacher." Another said, "I like the group work." "FALs make me feel smart," said yet another student. It is evident the FAL structure is motivating students to take ownership of their learning and serve as resources for one another based on their end-of-course scores in Algebra I and Algebra II.

Getting Results

Summary of MPHS End-of-Course Scores, Algebra I and Algebra II

ALGEBRA I	BELOW BASIC	BASIC	PROFICIENT	ADVANCED	OVERALL PROFICIENCY
2010-2011	39%	33%	17%	11%	28%
2011-2012	27	33	27	13	40
2012-2013	7	41	34	18	52
2013-2014	12	18	47	23	70

ALGEBRA II	BELOW BASIC	BASIC	PROFICIENT	ADVANCED	OVERALL PROFICIENCY
2010-2011	48%	35%	15%	2%	17%
2011-2012	37	39	21	3	24
2012-2013	14	36	39	11	50
2013-2014	4	16	61	19	80

“FALs work! We have results,” concluded Principal **John Gunn**. He noted FALs encourage best practices, assist teachers in appropriate content and rigor and help guide instruction.

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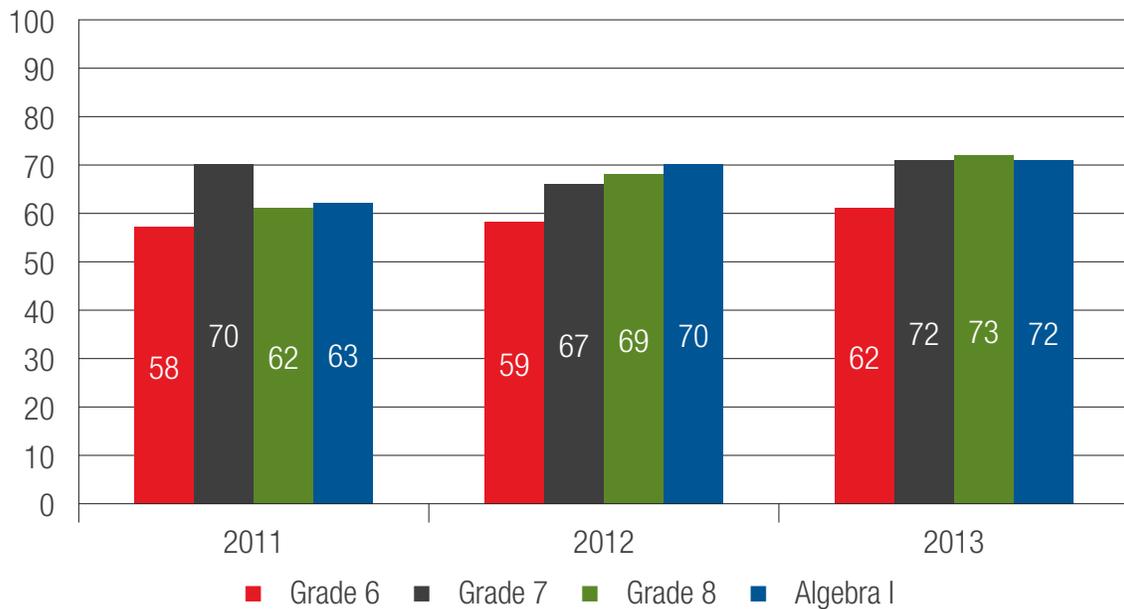
Meeting College- and Career-Readiness Math Standards

Before the **Hinds County School District in Mississippi** began implementing the Mathematics Design Collaborative (MDC) framework and using its instructional strategies to trigger student engagement, state exam scores indicated overall student achievement for middle grades students averaged around 50 percent Proficiency. After three years of working with the Southern Regional Education Board (SREB) and MDC,

Mississippi state exam data indicate the overall math achievement of Hinds County middle grades students increased to an average 70 percent Proficiency.

In addition, students are successfully implementing formative assessment lessons (FALs) and tasks and are more engaged in making sense of math. A further benefit: As learning became more enjoyable and meaningful, classroom discipline improved.

Hinds County School District: Middle Grades Math Achievement



Three-Year MDC Plan to Prepare Teachers, Schools and District

Year One

MDC is a process, not a program, and Hinds County began its three-year journey with MDC in the 2011-12 school year. It's a small, rural school district in Raymond, Mississippi comprising 11 schools serving over 6,600 students in grades pre-K through 12. The racial makeup is 62 percent black and 38 percent white. Sixty-five percent of the district's students are eligible to receive free or reduced-price lunches.

At the start of the 2011-2012 school year, a sixth-, seventh- and eighth-grade teacher from each middle grades school and an algebra and geometry teacher from each high school were chosen to implement MDC. These teachers received professional development and eight to 10 additional days of on-site coaching and support from SREB.

Four professional development days were held with all middle grades and high school math teachers, facilitated by SREB math consultant **Debbie Lemon**. The sessions provided teachers effective daily strategies to support the conceptual teaching of math; engaged teachers in formative assessment lessons (FALs); and clarified how MDC tools would be used in the classroom.



FALs focus on student understanding of math concepts, allowing collaborative learning, effective questioning, engaging students in productive struggle and problem-solving strategies. They assist teachers in determining what changes in content and instructional strategies are needed to enable students to master college- and career-readiness standards.

Teachers and building-level administrators were engaged in FALs as they completed classroom simulations as students. The process provided opportunities for teachers to discuss obstacles and misconceptions that students might encounter when solving problems, and create strategic questions to provide assistance and feedback.

Building-level administrators attended every professional development session and participated in conversations with teachers regarding the challenges of engaging students in productive struggle. The need to change how math was being taught in Hinds County classrooms became evident as the district moved toward implementing college- and career-readiness standards.

Year Two

Superintendent, **Delesicia Martin** developed a year-two plan to provide structure for administrators and teachers to focus on engaging students in making sense of math. Administrators participated in instructional rounds with teachers implementing MDC. All middle grades and high school mathematics teachers correlated the college- and career-readiness standards with the Mississippi framework. Lemon assisted teachers in aligning the transition curriculum with FALs and problem-based tasks.



All middle grades and high school mathematics teachers new to the district received two days of MDC initial training before the start of school. A lead teacher who successfully implemented FALs in year one assisted Lemon with continued professional development and modeled lessons for teachers. Four days of districtwide professional development continued in addition to on-site support and coaching through year two.

Administrators were required to attend all professional development sessions and work collaboratively with Lemon during classroom observations. Martin stated, “The change teachers are asked to make through implementation of the MDC process requires administrators to become instructional leaders in their schools. They need to know what productive struggle and effective questioning look like regardless of the subject being taught.”

Year Three

To continue the focus on MDC in year three, lead teachers who demonstrated success with FALs were chosen from each school to assist in implementation. They assisted in professional development for all math teachers, directed professional learning communities, and collected required data from teachers at each school. The lead teachers were released for half days four times during the year and were provided a stipend for their leadership in the schools. District pacing guides and nine-week benchmark assessments were developed and implemented to assess student progress throughout the year.

Lemon maintained the Hinds County School District has been successful in implementing MDC because of the support of Superintendent Martin and school administrators. The district continued to make MDC the focus for math improvement and did not introduce other initiatives to distract from focusing on the strategies. Lemon adds Martin fully supported teachers by providing professional development, lead teachers for on-site support and materials needed to implement the MDC process effectively. She required all administrators to remain informed and involved through district professional development attendance and participation, and they were required to visit classrooms and debrief teachers after each visit.

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Changing the Math Game So More Students Will Play

As a young teacher in her early 20s, **Danielle Shea** was excited to have a principal who encouraged teachers to think outside of the box and often encouraged teachers to “change the game of school so more students can play.” Years went by. Standards changed. Shea moved to other schools. Almost a decade later, Shea found herself a veteran teacher who had lost sight of that vision and was feeling burned out. She began to question whether teaching was the right career for her. She wanted to regain her joy for teaching.

Now a math teacher at Central Gwinnett High School in Lawrenceville, Georgia, Shea began training on Mathematics Design Collaborative (MDC) strategies in October 2013. “After the first day of training, I went home and changed my lesson plans,” Shea said. She was excited about teaching for deep understanding and using engaging lessons. “It was the MDC training that helped me remember what good teaching looks like,” she said.

During the 2013-14 school year, Shea implemented 12 formative assessment lessons (FALs) from the Mathematics Assessment Project (MAP) (<http://map.mathshell.org>) during her accelerated Algebra I and accelerated geometry classes. MAP develops formative lessons and summative assessment tasks to support college- and career-readiness standards, emphasizing the vital mathematical practices they may require.

“The MDC model has given me a way to see not only if my students understand, but see how and what they understand,” Shea said. “It has been exciting to see my students learning, and exciting to teach.”

Shea also changed the structure of her day-to-day activities, creating lessons to engage and challenge her students. “I examined my instructional strategies to move my teaching away from lecturing toward critical thinking and 21st-century skills,” Shea said. These strategies include planning questions while creating lessons plans and thinking of possible student responses to those questions; using different forms of questions that require more than a “yes” or “no” from students; infusing units with Dan Meyer’s “Three Acts of a Mathematical Story” (<http://threeacts.mrmeyer.com>), a popular website on teaching methods; and planning for 21st-century skills such as collaboration, communications and creativity.

At the end of the school year, **Shea’s efforts proved worthwhile. She had a 97 percent pass rate on the end-of-course exam for her accelerated Algebra I students, an increase of 12 percentage points from the year before.**

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Engaging Math Tasks for Rigorous Standards

The strategies of the Mathematics Design Collaborative (MDC) are intended to engage students in a productive struggle with math. Dylan Wiliam and Marnie Thompson’s **Five Strategies of Assessment for Learning and the Standards for Mathematical Practice** are the foundational tenets of MDC. To help teachers infuse MDC strategies into their lessons and to help students achieve readiness standards, the Shell Center developed the Mathematics Assessment Project (MAP) Assessment Tasks.

In her “MAP Assessment Tasks: Engaging Math Tasks for Rigorous Standards” session at the 2014 College-and Career-Readiness Standards Networking Conference, SREB Mathematics Consultant **Amanda Merritt** shared several structured activities for utilizing these tasks.

Classroom Activities

Two Folders

The structure for this activity is as follows:

1. Instruct students NOT to open the folder they are about to receive.
2. Give half the students folders with Task A stapled to the front cover and half with Task B stapled to the front cover of another color folder.
3. Allow students five to 10 minutes to work on their tasks.
4. Have each student trade folders with another student who has a different task/color folder.

5. Instruct students to analyze the progress made on the task using the rubric inside the folder. Students should use the feedback form in the folder to write one to three questions that might assist the other student in completing the task. Directions are printed on the form.
 - a. Write one to three questions that might assist this student in completing his or her problem.
 - b. Focus on the big picture.
 - c. You cannot TELL this student what to do.
6. Instruct students to give folders back to the students who worked on the task on the front cover of the folder. Allow students time to complete the task.

This activity focuses on students' critiquing the reasoning of others and functioning as instructional resources for each other. Merritt cautioned participants that students may not know how to provide feedback to move their peers' thinking forward. Students need exemplars for this type of feedback and opportunities to discuss what makes feedback effective. This is not an "overnight" process. It may take some time for students to become proficient at providing effective feedback.

Three Questions

The structure for this activity is as follows:

1. Instruct students to put down their pencils. As they read the task they are about to receive, students should think about the following questions:
 - a. What am I given?
 - b. What am I being asked to find?
 - c. How do I get started?
2. Hand out the task. Allow students five minutes to read the task and consider the three questions.
3. Ask students to share their thoughts and ideas about the three questions with an assigned partner.
4. Conduct a whole-group discussion in which students share their ideas about the three questions. Create a list on the board with students' answers to the three questions.
5. Instruct students to pick up their pencils and begin working on the task.

"Many teachers express concern over students who struggle to begin a task. These three questions can be used as a scaffold for students," Merritt said.

She explained that as the school year progresses, a class may not need to work through this process as a whole group. These questions are a good resource for students, either on a poster on the classroom wall or as a handout in their notebook. Teachers can use these questions to differentiate their lessons — small groups of students could go through this process while other students begin the task without this scaffold.

Analyzing Student Work

The structure for this activity is as follows:

1. Allow students five to 10 minutes to work on a task on their own.
2. Group students in pairs. Students should share their ideas about the task with their partner.
3. Give each pair a clean copy of the task. Instruct each pair to create a solution path together that is better than their individual solutions, writing only on the new paper. (For management purposes, it is recommended the new copy be on a different color of paper.)
4. Pass out the rubric for the task. Instruct student pairs to use the rubric to analyze their group solution path.
5. Give each pair sample student work provided at <http://map.mathshell.org>. Instruct students to score the sample student work with their partner.
6. Facilitate a whole-group discussion about the sample student work. Ask student pairs to explain the scores they gave each student and the misconceptions these students had.

In this activity, students must make sense of a problem and persevere in solving it before critiquing the reasoning of others. "I love listening to students as they examine the sample student work. Students who you sometimes think haven't learned a concept at a deep level often surprise their teachers with their ability to articulate the mathematics," Merritt said.

The MAP Assessment Tasks website at <http://map.mathshell.org> has tasks for middle grades and high school students. The MAP Assessment Tasks can be found under the "Tasks" tab on the website or under the "Standards" tab. The tasks for each level (grades six through eight and nine through 12) are divided into three categories: Novice, Apprentice and Expert. The Novice tasks were written with the intention that students would

perform math practices two and six. The Apprentice tasks incorporate opportunities for math practices two, three, six and seven. Students could perform all eight Standards for Mathematical Practice with the Expert tasks.

Five Strategies of Assessment for Learning

- 1) Clarifying and sharing learning intentions and criteria for success
- 2) Engineering effective discussions, questions and tasks that elicit evidence of learning
- 3) Providing feedback that moves learning forward
- 4) Activating students as the owners of their own learning
- 5) Activating students as instructional resources for one another

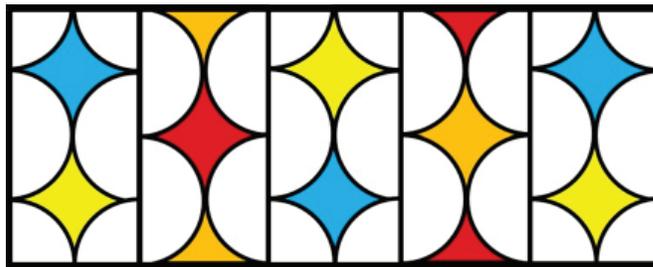
Standards for Mathematical Practice

- 1) Make sense of problems and persevere in solving them.
- 2) Reason abstractly and quantitatively.
- 3) Construct viable arguments and critique the reasoning of others.
- 4) Model with mathematics.
- 5) Use appropriate tools strategically.
- 6) Attend to precision.
- 7) Look for and make use of structure.
- 8) Look for and express regularity in repeated reasoning.

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Desperately Seeking Sources

As their understanding of college- and career-readiness standards increases, teachers are always looking for resources that will engage students in a productive struggle with math, contends SREB Mathematics Consultant **Amanda Merritt**. “As someone who used engaging tasks in her own classroom years ago, I like to share with teachers some of the resources I used as well as others developed to address the new standards states have adopted,” said Merritt.



The students in Mr. Rivera’s art class have designed a stained-glass window to hang in the school entryway. The window will be 2 feet tall and 5 feet wide. They have raised \$100 for the materials. The colored glass costs \$5 per square foot. The clear glass costs \$3 per square foot. The materials they need to join the pieces of glass together costs 10 cents per foot and the frame costs \$4 per foot. Do they have enough money to cover the costs of the materials they will need to make the window?

Merritt shared several resources with teachers at SREB’s 2014 College- and Career-Readiness Standards Networking Conference during her session, “Desperately Seeking Sources?” She used a problem from www.illustrativemathematics.org to begin the discussion:

Teachers collaborated in small groups, discussing what strategies students might use to begin this problem as well as the key concepts involved. Several small groups shared their ideas that students would need to recognize circumference, perimeter and area formulas as useful when solving this problem.

Teachers then discussed which of the Standards for Mathematical Practice students would perform. Some teachers felt students could model with math by creating equations to represent the cost of each material. Others felt students could construct a viable argument and critique the reasoning of others if the teacher structured the lesson so students would serve as instructional resources for each other.

Merritt shared several other problems rich in the Standards for Mathematical Practice:

- Cellular Growth (www.ccsstoolbox.com)
- Troubles with Tribbles (www.mathbits.com)
- Human Conics (<http://illuminations.nctm.org/>)
- Sum Race (Strategies for College- and Career-Readiness Mathematics: Implementing the Standards for Mathematical Practice, Texas & Jones (2013))
- Graph Medley (A Visual Approach to Functions, Van Dyke (2002))

Merritt explained that any task can engage students in a productive struggle with math. “Any task has the potential to be rich in the Standards for Mathematical Practice,” she insisted. “It is in the lesson design and implementation in which these appear.”

For more rich math problems and tasks, visit these web sites:

- www.insidemathematics.org
- www.parcconline.org
- www.smarterbalanced.org
- <http://threeacts.mrmeyer.com>
- www.graphingstories.com
- www.georgiastandards.org
- www.mathematicsvisionproject.org
- www.mathedleadership.org/ccss/greataasks.html
- <http://mathpractices.edc.org/>
- www.engageny.org/

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This newsletter describes best practices in implementing the High Schools that Work (HSTW), Making Middle Grades Work (MMGW) and Technology Centers That Work (TCTW) school improvement models based on presentations at the College- and Career-Readiness Networking Conference and the 28th Annual HSTW Staff Development Conference in Nashville, Tennessee in summer 2014. For more information about the school improvement models offered by SREB, contact: Gene Bottoms, senior vice president, at gene.bottoms@sreb.org or call (404) 875-9211.