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5 PRINCIPLES FOR A PROBLEM-SOLVING CLASSROOM

Gerald Aungst | August 10, 2014 | Strategy | No Comments

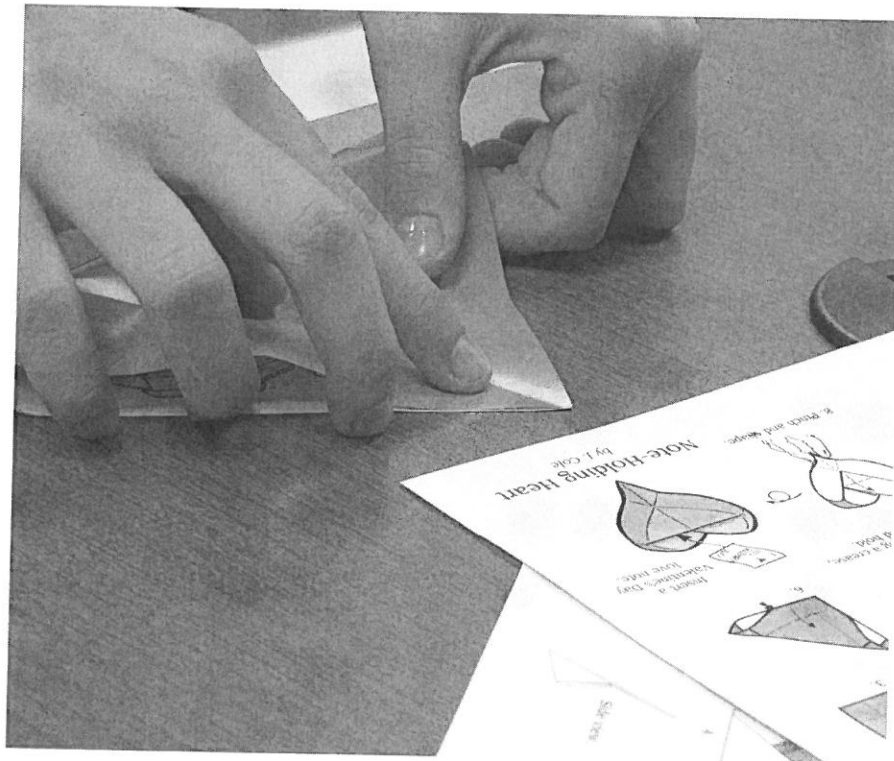


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Districts across the United States are implementing the Common Core State Standards, and they are realigning curriculum for English Language Arts and Mathematics. Unfortunately, some of them are simply purchasing a shiny, new "Common Core Edition" of their existing textbook, most of which aren't any more aligned to these standards than their pre-CCSS versions.

Whatever you may think of the Common Core and its implementation, there is some powerful and valuable stuff embedded within the standards. In particular, the Standards for Mathematical Practice (SMP) contain important guidance about how students should think and work in a math classroom.

The eight SMP describe performances and habits of mind that we want students to exhibit.

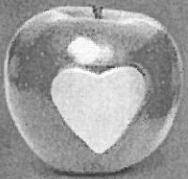
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Although they can and should be explicitly taught, if this is done in isolation, the Practices will suffer the same fate as the algorithms and definitions we teach, becoming just one more thing that students have to remember by rote but will have difficulty applying and transferring to new situations.

The Practices will thrive, however, if they are learned in an environment designed to support them. The framework below consists of five principles for creating a culture of problem solving. A classroom culture built on this framework will allow your students to grow into mathematical thinkers and sophisticated problem solvers.

1. **Conjecture.** In a traditional mathematics classroom, the primary goal is for students to get the right answers to questions and exercises. In a classroom where conjecture is encouraged, students ask most of the questions, and the answer to a question is very often another question. Inquiry is important, as is a little-used skill known as "problem-finding."
2. **Collaboration.** In a traditional classroom, students work alone, and the emphasis is on an individual's skill fluency. Problem solving classrooms are all about the "we". Think *The Avengers*, not the Lone Ranger (though even he had Tonto). Group work is far more prevalent in a problem-solving classroom than individual work, and students are encouraged to share ideas, answers, and ask for help. Though there is a time for individual performance, in a problem solving culture, the other students are cheerleaders instead of competitors (see #5).
3. **Communication.** In a traditional classroom, communication is primarily one way: the teacher explaining a procedure or algorithm to students. In a problem-oriented classroom, students must learn to communicate frequently about problems and how they solve them. They focus on vocabulary, writing, and metacognition. The core of mathematics communication is the formulation and support of mathematical arguments. English Language Arts standards will be mentioned here, since they should interact with math standards.
4. **Chaos.** Though this sounds sketchy, it is simply encapsulating the idea that real math work is messy. In a traditional classroom, neatness and order rule the day. Students must learn a procedure and then replicate it with mechanical precision. Real problems, on the other hand, require experimentation, false starts, mistakes, and corrections, sometimes over and over again. Thomas Edison famously said, about the path to finding the right filament for his light bulb, "I have not failed. I've just found 10,000 ways that won't work."
5. **Celebration.** In a traditional classroom, recognition is given for right answers and high grades. In a problem-solving culture, anything that leads towards a solution is celebrated: finding one small step of a complicated problem, thinking of an innovative approach even if it doesn't pan out, or even making a spectacular mistake and asking for help. Effort is rewarded over achievement, reflecting Carol Dweck's work on growth and fixed mindsets.

Building a problem-solving culture mathematics classroom

- **Never end with the answer.** Instead, ask follow up questions like "Why do you think so," and "Are there other possible answers?"
- **Have students explain problems solved by someone else.** This moves them past the pressure to get the right answer and allows them to focus on the process and the rationale.
- **Use non-routine problems.** Give students many problems that have multiple solutions, or even problems that you yourself don't know the answers to. Two good sources to start with: MathPickle and Stella's Stunners.
- **Try "Three Before Me."** Require students to confer with at least three other people

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5 Principles for a Problem-Solving Classroom

before they ask you for help. Note that the three other people do not necessarily need to be other students. It could be someone they have connected with online, or an expert resource.

- **Have a "Paper-Free Math Day."** Students must solve problems through verbal communication and collaboration. Document only what is absolutely necessary to record solutions.

Interested in learning more? I recently conducted a webinar, *Creating a Culture of Problem Solving in Your School or Classroom*, co-hosted by NASSP, NAESP, and School Leadership Briefing.



Your Rubric Is a Hot Mess; Here's How to Fix It.

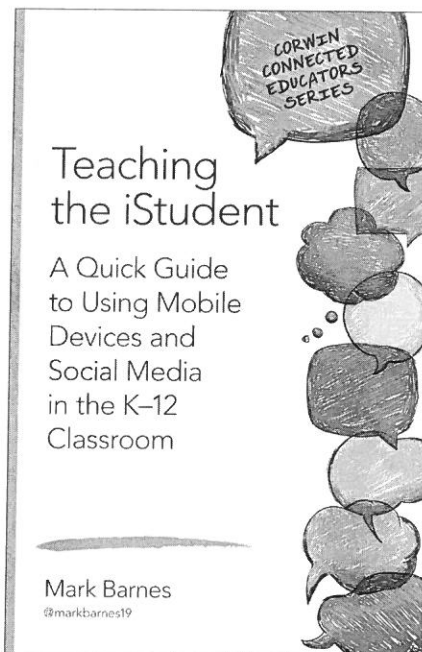


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Gerald Aungst has more than 20 years experience as a professional educator, specializing in digital technology, mathematics, and gifted education. In his various roles as a classroom teacher, gifted support specialist, administrator, curriculum designer, and professional developer, he has worked to create a rich and vibrant learning culture. He is also passionate about improving learning opportunities for all students. Gerald is a founder of AllAboutExplorers.com and ConnectedTeachers.org.

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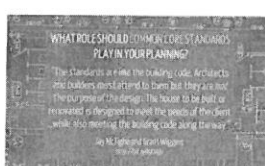
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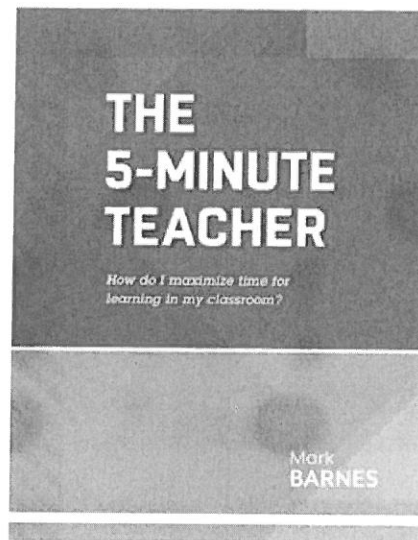
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