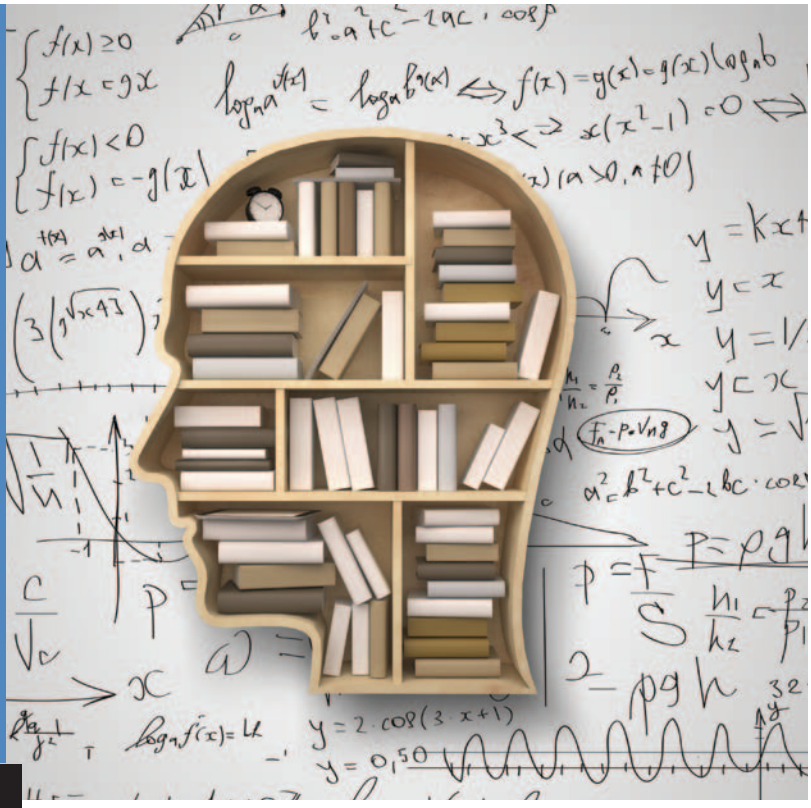
# Math and ELA meet at the Common Core



Common Core

*The Common Core's math and English language arts standards have more in common than you might think.*

**By Nancy S. Gardner and Nicole Smith**

Math and English language arts. Match.com would never put these two together — nor do students, who tend to consider themselves math/science or English/history people. But is there more similarity in these content areas than we assume?

We — English language arts teacher Nancy S. Gardner and math teacher Nicole Smith — investigated this question with respect to the Common Core State Standards. We're sharing our findings in the hope that you, too, will be able to help students make connections between content areas that seem disjointed. There are at least five points at which teaching and learning English language arts and mathematics under the Common Core will be directly transferrable or at least dovetail.

## Similarity #1: Grit

Common Core standards for both English language arts (ELA) and math encourage perseverance, sometimes referred to as grit. Learning to stick with a task, especially a tough one, is not only an important skill for college and career but also a step toward maturity.

One key ELA shift that helps students learn perseverance is the

This article is available at our Kappan Common Core Writing Project web site **kappan common core.org**

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focus on reading complex texts — fiction and nonfiction. Previously, ELA teachers might have chosen easier texts to "help" students. We might even have thought we were differentiating instruction for underprepared students by doing this. We now realize this was a disservice, not only for the unmotivated students who elect to coast through the course but also for struggling students. Now, all students work intentionally through difficult texts, digging deeply into meaning and analyzing vocabulary in context.

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This requires grit. We want all students to have a productive struggle with texts. Sometimes this means more time devoted to shorter passages. For example, we might spend two or three class periods reading and understanding just two chapters of Mary Shelley's *Frankenstein*, ensuring that students are honing critical reading skills and increasing vocabulary as they encounter this relatively difficult text. Nancy scaffolds instruction so students move toward independence in their work.

In the math standards, a major shift requiring perseverance is an increased emphasis on word problems. Most adults will remember endless worksheets and textbook problems with equations that required memorizing the order of operations and other math rules. This made it difficult for students to see connections between the real world and math. What's more, completing page after page of equations may not challenge students to apply their knowledge in different contexts.

Now, instead of telling a student a particular situation can be modeled by a line, a wave, or a parabola, Nicole encourages students to use prior knowledge to make an educated guess about how to start solving a problem. Students are asked to guess, check, and explore alone and then compare solutions with classmates to try and find a solution. This requires a deeper level of understanding. It is tougher than following a memorized algorithm to a solution.

Teaching perseverance depends heavily on the questioning skills of the teachers. With enough opportunities and the right tools, we believe students can understand the text or problem. In addition, the right answer comes from processes that guide students through the text or the problem. Teachers need to understand the how and why of good questions so they can help students dig deeply and avoid superficial responses. Teaching perseverance calls for teachers not only to celebrate right answers but also the process of arriving at feasible answers. And, most of all, we must celebrate students who make mistakes and then try again. That's true grit.

## Similarity #2: Supporting claims

Another plank of the Common Core that is common to ELA and math standards is using reasons or evidence to support arguments, more commonly known in both sets of standards as claims. The word claim is significant. In English, we used to talk about a thesis; in science or math, teachers might have referred to a hypothesis. Using the term claim in both content areas better helps students see connections across those areas and sharpen skills they need in all their studies.

The ELA standards now call on students to return to the text again and again for support or proof — clear evidence straight from the text. In the past, ELA teachers would ask questions that prompted students to make personal connections with texts or to identify similarities between two different texts ("This story reminds me of my grandmother" or "Janie and Elizabeth are similar because they are both independent females"). But this wasn't helping students read critically. If a student has to find support in the text, he will read it closely, like a scientist studying cells under a microscope or an archaeologist digging for artifacts.

How does this play out in the ELA classroom? If we are having a discussion, students now have to provide proof of their points rather than just say "I like this" or "I disagree." They must point to a character's line in a text or some data from an informational text (including charts, pictures, and/or maps) to support their reasoning. In claims-based writing assignments, we require direct evidence and often ask students to provide counterclaims as well. Students not only write traditional pieces of analysis about literary texts, but they also research informational texts related to the literature and then discuss and create a written product using evidence from both literature and informational texts. For example, a study of *Hamlet* might also include readings from Freud on melancholia or Elisabeth Kubler-Ross' stages of grief. While reading *The Odyssey*, students might read articles on post-traumatic stress disorder (PTSD). Students might be asked to write claims-based answers to such questions as, "Is Hamlet a victim of melancholia?" or "Is Odysseus suffering from PTSD?" Students must use specific evidence

**Both of these disciplines emphasize using tools strategically and capably.**

from the texts to prove their claim.

In math, supporting claims can take the form of showing work or completing a proof. Mathematical proofs are nothing new to students of geometry. Proofs require students to use theorems and postulates to show why a given statement must be true. Like the argument of a lawyer in a courtroom, a proof is not complete until the final statement is shown to be the only reasonable conclusion, given the facts and evidence laid out by the presenter. The standards intentionally bring the reasoning skills of geometric proofs, previously reserved for 11th- and 12th-grade students, to all levels of math. This means students start to articulate *why* a given answer must be true — or *how* a logical conclusion can be reached — long before 11th grade, when students were traditionally required to use proofs. Elementary and middle school students are guided each year to ask deeper questions and use reasoning skills to find the logic in their computations. Third and 4th graders are asked to show how they understand 64 divided by 4 is 16.

Adults know choices are rarely as simple as one right or one wrong answer. Often adult situations involve choosing the best possible solution in light of given circumstances or resources. In both math and ELA, the focus shifts from finding the *what* answer to *how* to find the best answer and *why* that answer is best. The conversation may even continue to include whether there is a best answer. In this manner, students are stretched to go beyond superficial understanding.

## Similarity #3: Precision

The standards in both content areas insist on precision. In ELA, we press for precision in grammar and word choice in student writing — and also ask students to pay attention when they read to specific word choices authors have made.

For example, if the author uses the word catastrophe rather than problem, how is this significant? What is the effect of this one word? When we write, one word can make a profound difference in how our text is interpreted. After all, in a world where we often communicate in 140 characters, choosing the *right* word is extremely important. The same, of course, is true of grammar. A single punctuation mark can affect meaning: "Let's eat, Grandma" as opposed to "Let's eat Grandma."

We've always studied grammar and usage in English class. But the standards help us concentrate on the *why*. In the past, many ELA teachers relied heavily on worksheets and drills. The Common Core standards encourage us to take a different approach. Word choice and punctuation aren't just isolated components; they are integral to meaning and purpose. So we push students to identify how and why grammar or word choice matters in a particular text. Again, ELA students are required to use grit as they formulate their own words and phrases correctly, often revising their work several times in order to find just the right word and punctuation to achieve the intended effect.

In math, students employ precision and must learn to understand what level of precision is necessary and appropriate for a given task. For example, in elementary school, students may be asked to determine whether centimeters, kilometers, or inches are the most suitable unit of measurement for a particular measuring task. Before leaving elementary school, students are introduced to precision as it relates not only to the unit of measurement but also to the *tool* of measurement. Teachers continue to stress the importance of precision in measurement by encouraging students to explore how an error in rounding can affect small measurements, large measurements, paper measurements, and even 3D measurements.

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Nicole believes a major component of math goals across grade levels is for students to learn that the language of math must be precise. If a student is explaining a proof, it won't do to call the symbol for congruence "the equal sign with the squiggly line above it." In the same way, students should clearly know the difference between radians and degrees. Students who have learned to attend to precision understand that 360 degrees is nearly 60 times the number of radians it takes to go around a circle once.

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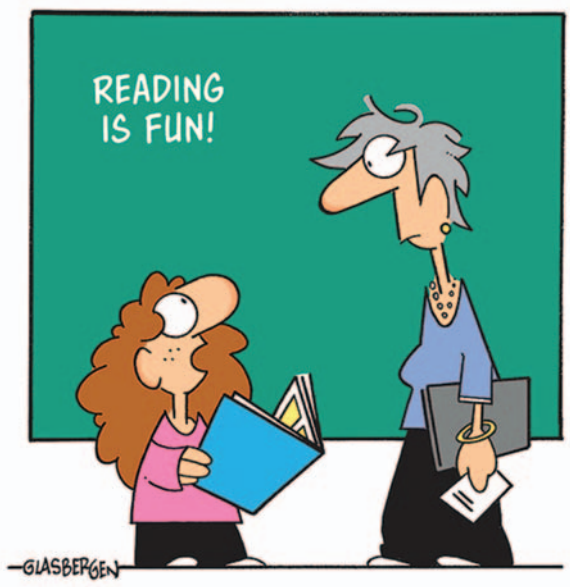
In both ELA and math, students are expected to go further than just understanding the uses of the comma or the difference between mathematical terms like congruence and equality. The importance of precision goes beyond being right, to a deeper understanding of how right or how effective something is or isn't. Solving an application problem in mathematics typically involves first deciding what type of equation to use and then finding a way to solve for x. Solving for a variable shows one degree of understanding, but it is not always enough proof of critical thinking. In the interest of precision and critical thinking, students are expected to list multiple ways to solve a word problem and then debate with classmates about the best way to go about solving a problem.

## Similarity #4: Structure analysis

Analyzing structure in literature and informational texts is critical to becoming a stronger reader and writer because structure affects meaning. We used to insist that students learn the meanings of literary terms and then find the literary devices in the story or poem. However, now we take this a step further by trying to decide why authors use particular images or rhyme schemes. Finally, we explore the effect of these structural choices on the theme and the reader. Why might this particular poem have been written as free verse? What is the effect of the extended metaphor about the staircase? This type of structural analysis hones critical reading skills and asks students to dive deeply into meaning.

When examining informational texts, we often encourage students to analyze the structure of the argument or claim. Using the ideas of logos, ethos, and pathos (forms of argument that rely on logic, authority, or emotion, respectively), students look at the structure of the argument as well as the credibility of the facts. This kind of work helps them practice their critical reading skills so they will be better prepared for the demands of college and career in an environment filled with an overload of digital information.




*"I tapped the page but nothing happened."*

And for budding mathematicians? After cozying up with reasoning, using arguments and perseverance, math teachers coach students into stepping back to look at the big picture as they analyze mathematical structure. With appropriate guidance and background knowledge, students begin to see similarities and seek differences between functions. Teachers guide students to see patterns and learn that certain processes always lend reliable results.

Ideally, at this point students discover that the once-daunting language of mathematical laws, theorems, formulas, and rules are academic-speak for patterns they already have deciphered while seeking solutions in class. This helps students make formulas their own and reach past the superficial level of memorizing a formula. Deeper thinking about structure also helps students write their own equations to model real-life situations.

## Similarity #5: Using tools strategically

Finally, both disciplines emphasize using tools strategically and capably. For ELA, the digital world bombards us with so much information that information literacy has become more important to help students sort through their research-based assignments. In addition, we want them to learn to use digital media (including social media) properly and effectively so their communication is clear and purposeful. Similarly, in math classes, students must learn to use the appropriate tools carefully and purposefully. A cursory online search can produce the answer to virtually any given algebraic equation. It is a modern-day challenge for students to first define a problem and then use all the appropriate tools to find the solution and explain the reasoning behind the solution.

Learning math literacy and using direct and indirect proofs — in English? Sounds peculiar but maybe this is really what can happen with the new focus on skills that cross disciplines. Perhaps these two content areas are more similar than we might imagine. After all, as the Common Core State Standards have helped us realize: We teach students and content, and we both are asking students to use their brains in similar ways. K