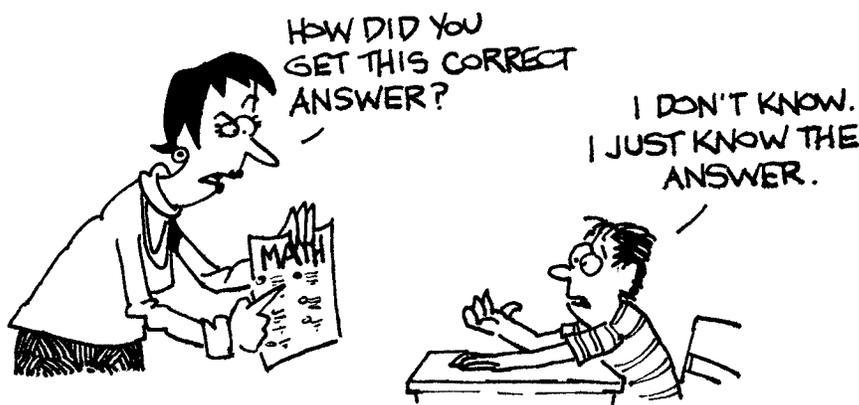


## Showing Your Work When There's Nothing to Show

Alexandra Shires Golon

Does your visual-spatial child answer math problems accurately, but never show the steps taken? Can your child solve complex long division or algebraic equations, but is not able to tell you how the answer was obtained? For visual-spatial learners, those who think and learn in pictures, rather than in words, there are few requests more frustrating than, “Show your work..” Because this type of learner intuitively grasps the “big picture” rather than taking what would be a painfully slow series of steps to reach a conclusion, the demand to “show your work,” is nearly an impossible task. Visual-spatial learners (VSLs) very often just see the correct answer—and *they're right*. They cannot tell you how they know, they just know. They cannot tell you how they got their answer, they just get it.



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In no subject is this a greater problem than in math. Because most teachers are sequential thinkers, they teach in a step-by-step manner and expect their students to solve math problems in a step-by-step fashion. They also tend to anticipate that their students will be able to demonstrate their work by detailing the steps they took to arrive at their answers. The same is true for textbook developers and those who construct state achievement tests. But, for someone who thinks in pictures and sees the correct solution without ever taking a step, this could result in a devastating outcome. Every day, students are admonished, even accused of cheating, because they are intuitively able to reach accurate solutions to complex math problems but absolutely unable to explain how they got there. Most of the time, they lose partial or full credit for their answer because they did not show their work. At a time when “thinking outside the box” is a revered ability in the business world, when to be able to find solutions to complex problems is highly regarded (*and don't we need answers to today's complex problems?*), it's time we stop penalizing these students for their innate gifts and begin honoring what comes naturally to them.

*Until that day, however...*

It is quite likely that visual-spatial students sitting in math classes at all different levels, are being docked credit for answers they cannot support with detailed steps. Nearly every standardized achievement test in the United States deducts credit when the steps are not shown to solve a particular problem. So, I propose it's time we teach visual-spatial learners to fight back! "Show your work," doesn't have to mean "complete the problem exactly as I, a left-hemispheric, auditory-sequential thinker would." It means, teach me, the left-hemispheric, auditory-sequential thinker, how you did this so I can do it myself. Show me, in the way I learn best (step-by-step) how to do this. When students know the material well enough to teach it, they really know it. If we help our visual-spatial students learn how to explain their answer to someone who does not think in images, then we've succeeded in teaching them to show their work, how to offer the smaller details, and, hopefully, to cease the unfair practices of losing credit on their tests and assignments.

While I was homeschooling my children, I found that one of the best tests of whether or not they had learned the material we had covered was whether they were able to teach it to someone else. This was true for math, history, geography and a wide range of subjects. Often, my sons were asked to teach their dad whatever new history material had been covered that day; or they taught their math-phobic grandmother a new concept in that subject.

Until we've created an understanding of different learning styles, we'll have to help our visual-spatial students cope in their predominantly left-hemispheric classrooms by being able to communicate to those who do not think like they do, who do not immediately see the picture (or answer). Teaching them to work backwards will hopefully accomplish this.

First, allow visual-spatial students to perfect whatever strategy works for them in solving their math problems. Then, have them test their methods with a calculator to be certain their answers are correct. Once the students have polished their own unique systems, gradually increase the difficulty of the problems to continue to test their methods. Once they have consistently answered the problems correctly, using their own strategies, show them how to work in reverse. In other words, they can continue to use their methods (so long as they produce accurate results) to arrive at an answer and then they work backwards through the problem to show the details to someone who needs to be shown the steps, or "work."

For example, in the long division problem below, let's suppose that the student, using whatever mental or written method this student has created, arrives at a solution and has proven it is correct by double-checking the answer with a calculator.

$$\begin{array}{r} \underline{\quad 26} \\ 15 \ ) \ 390 \end{array}$$

Now that the answer is known, the student simply works through the solution to show the steps. So the first "work" to show is  $15 \times 2$ . This answer is then written directly under the 39:

$$\begin{array}{r} \underline{\quad 26} \\ 15 \ ) \ 390 \\ \underline{\quad 30} \end{array}$$

Next, show the student that auditory-sequential learners can't just hold numbers (or other images, for that matter) in their head as easily as visual-spatial do, so the next "work" to show is to subtract the 30 from 39 and bring down the next digit:

$$\begin{array}{r} \underline{26} \\ 15 \ ) \ 390 \\ \underline{30} \\ 90 \end{array}$$

The student doesn't need to figure out how many times 15 goes into 90, because he or she already knew (saw) that! It must be 6. But the auditory-sequential thinker will need to be shown, so just write out the last bit of work:

$$\begin{array}{r} \underline{26} \\ 15 \ ) \ 390 \\ \underline{30} \\ 90 \\ \underline{90} \\ 0 \end{array}$$

While it may seem obvious to the student, the last number showing in any problem such as this must be 0 or the work has not been shown in a manner in which the teacher, or another auditory-sequential learner, can follow.

By working backwards through problems, in math and other areas, too (creating an outline of a report after the report is written qualifies as working backwards!), visual-spatial learners can demonstrate the steps of their work so that the auditory-sequential learners they must communicate with (primarily teachers) can understand exactly how they arrived at their answers. By opening the doors of communication and demonstrating their work in a manner that can be interpreted by sequential thinkers, they can receive grades commensurate with their abilities.

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