

## Glenn's Mona Lisa Metaphor

Science and math education theorists often use what I call the Brick Wall Metaphor when describing how students learn science and mathematics. The explanation often goes something like this:

Learning math and science is like building a brick wall—(okay, it's a simile, not a metaphor)—the bottom row—the basics—has to be perfect. All other bricks—knowledge—is built upon the bottom row. You can't start building the second or subsequent layers until the first layer is completed. Furthermore, any mistakes or imperfections in the lower layers will be passed on and amplified in the overlying layers. By the time you get to the top of the wall the flaws will be so great that the wall will just tumble over. Before you begin building layer 2, you have to make sure that layer 1 is complete and flawless, and before you can begin layer 3, you have to make sure layer 2 is correct, and so on. And so it is with math and science education—each basic concept has to be mastered before more advanced concepts can be learned.

The problem is that, while this does make for a nice, simple model in the abstract, in a real classroom this kind of learning never occurs. Students are absent and miss lessons, students have bad days, classrooms exhibit such a broad range of abilities that not every student achieves competency at the same time. In typical classrooms, students are often required to learn more advanced concepts when they still have areas of uncertainty about the more basic ones. If the brick wall metaphor were indeed the way that math and science were learned, the by the time everyone graduated from high school their walls would be wobbly and crumbling. There would be no scientists or mathematicians. Even though much of the educational materials, texts, standards and standardized tests used in most public school classrooms are based on a tacit acceptance of the brick wall metaphor, in reality brick wall learning never occur.

So instead, I'd like to propose a new metaphor for how students learn math and science, and while we're on the subject, social studies and language and any other topic you can think of. I call this metaphor Glenn's Mona Lisa Metaphor, and it goes like this:

Picture the Mona Lisa. Now picture it lying down on the ground but with one end propped up slightly—perhaps with a couple of the bricks left over from the Brick Wall Metaphor stuck under one end—so that it is at a slight angle. Assume that the painting is covered with sand; the entire image is hidden, and all you can see is sand. Now imagine it is outside in the rain. Each time a raindrop strikes it, another tiny portion of the picture is uncovered. No one rain drop would uncover enough area to show anything recognizable, but eventually enough rain falls and moves enough of the sand out of the way that at some point enough of the picture is uncovered that you finally recognize it as the Mona Lisa.

That is how we learn. Each new discovery, experience, bit of information is like a raindrop uncovering another small piece of the mystery. It is not important that everyone's Mona Lisa have the left eye uncovered before the chin is uncovered, nor even that same areas of every painting are uncovered. What is important is that everyone has enough of their painting uncovered that they can recognize it for what it is and thus have the opportunity to appreciate its beauty. That is learning.