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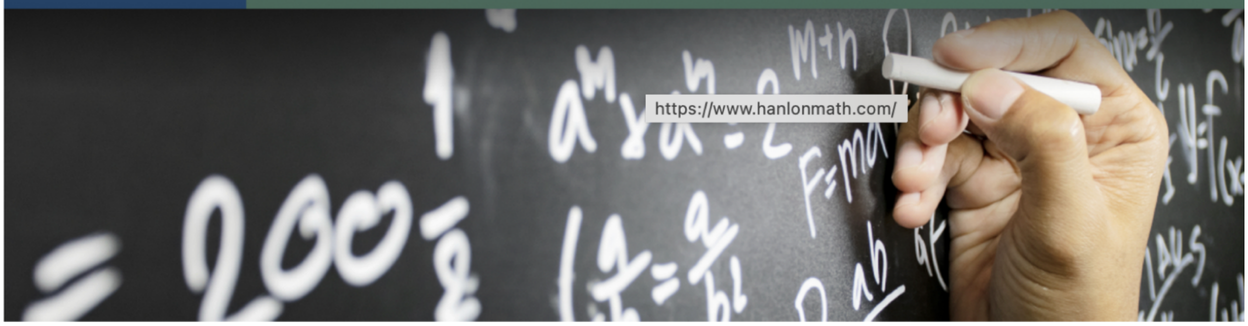
Math Content Based Professional Development



Teaching Algebra vs. Geometry
Different Emphases

Why do some students do well in algebra but not in geometry? Often times it gets down to two strategies; the ***Get Rid of It*** and the ***Where is it*** strategies.

Comparing those two strategies illustrates how the emphasis on strategies will result in students having to think differently. As an example, the ***Get Rid of It*** strategy used in algebra can be viewed as something like this. You walk in a room and see something that doesn't belong, out of place, and you move it, get rid of it. It's almost obvious. In algebra, students get rid of fractional equations, parentheses, absolute values, radicals, etc. to make problems look more familiar when solving equations.

With geometry, using the ***Where is It*** strategy, you walk in a room, and you sense something is missing. What's missing doesn't jump out at you. You have to think about (visualize) the room and finally realize what needs to be added to the room. That's different than how you think in algebra. In geometry, students dependence on prior learning is so very important because they have to visualize what they know and add something to a problem (using constructions) to make it look familiar. That's clearly a different way of thinking than is typically used in algebra.

Math content strategies include; *go back to the definition, link to previous learning, use of examples to be used with initial instruction and scaffolding examples to reach grade level expectations, look for a pattern, make a table or list, draw a picture, guess and check, examine a simpler case, examine a related problem, identify a sub goal, write an equation, and work backward.*

The math content strategies emphasized in algebra are different from those emphasized in geometry. In a nutshell, since students are usually unaware of those differences, they think one of those courses is more difficult than the other to learn.

For example, algebra teachers tend to use *look for a pattern, make a table, examine a simpler case, and write an equation* as general strategies that form the basis for most of their instruction. Along with those, I normally recommend the: ***Get Rid of It"*** strategy. That is, take an equation you don't recognize and transform it into an equation you do recognize by getting rid of what is distracting to you. As examples, dealing with fractional equations, we get rid of the fractions. Solving equations containing absolute value or radicals, we get rid of them. Solving two equations (systems), we get rid of one of the equations. As a result, students grow comfortable learning math with those strategies.

Unfortunately, too many students learn algebra by rote memorization without understanding. That results in any variation of a problem causing great difficulty and frustration for students. For example, most students can the mean (average)of aa group of numbers. But, with a slight variation and little understanding, there's an issue. For instance, if 30 students in Class A had an average of 80 and 20 students in Class B had an average of 90, what is the average of the two classes combined? That can be clearly seen on the results of high stakes tests in mathematics – especially when there are distractors. BTW, the answer is 84.

Successful teachers of geometry tend to use: *go back to the definition, draw a picture, examine a related problem, identify a sub goal, and work backward* as their primary strategies. Students who learned algebra by memorizing often run into difficulty in geometry. Teachers who use those same strategies to teach geometry that were successfully used in algebra often run into difficulty too – resulting in higher fail rates. While I use the ***"Get Rid of It"*** strategy in algebra, in geometry. I tend to use the "***Where is it"*** strategy. That is, adding something to the problem to make it look more familiar. Those somethings, auxiliary lines, are angle bisectors, perpendicular bisectors, auxiliary lines to form triangles, etc.

In geometry, students are required to use higher order thinking skills that are not being used in a typical algebra class. In essence, geometry is students first class in logic. In my experience observing instruction, too many geometry students do not have a good visualization of the definitions, postulates, and theorems that are being introduced because of the strategies used to present the topics. If we expect students to do well in geometry, they should be able to not only verbalize that knowledge but also to visualize it, draw a picture that reflects the information being presented. That way they can add to problems to make them look familiar.

Geometry is also filled with a lot of new terminology and notation, teachers need to be very mindful that student success in math is dependent upon them learning the language. All too often in math, the difficulties experienced by students has more to do with a lack of understanding of vocabulary and notation than the math concept being taught. Classroom teachers should take the time to ensure students are learning and using that vocabulary and notation, those should be in their notes, on their homework and on quizzes and tests.

Students should be required to write their definitions, postulates and theorems on their homework, quizzes or tests, they should also be required to draw a corresponding diagrams. They should be asked to explain a concept, connect it previous learning, and write about what they understand or what may be causing them difficulty. If they can do that, they will be more successful learning geometry.

And while some math content strategies are used more routinely in one subject area vs. another, the fact is all math content strategies should be used at appropriate times in all of mathematics.

In math and algebra, we typically make problems look alike by using the "**Get Rid of It**" strategy. In geometry, students have to very familiar with their definitions, postulates and theorems and be able to visualize them so they can "add" information to a problem using the "**Where is It**?" that makes the problem more familiar.

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