

# The Spiral vs Mastery Debate: A Discussion of High School (Homeschool) Mathematics

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As I sat down to write this short, simple, little article on Spiral vs Mastery learning, I realized that the Spiral vs Mastery debate is the stuff of doctoral theses-not two page articles. We will get to the terms "Spiral" and "Mastery" in a moment, but first let me define that tiny little section of the debate that I'll be tackling today:

- ✂ Mathematics (not history or language arts or music...)
- ✂ Homeschool (not public schools or group instruction...)
- ✂ High School (pre-algebra and up...)

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## What is Spiral Learning?

Spiral learning in its purist form touches on a topic briefly and then moves on. The assumption is made that if a fact or skill is not learned "this time around" a student will get it on the next pass. Each pass asks the student to learn more about a particular area of study, expand on a skill, or build new knowledge. The theory here is that once a student has seen a topic they are more prepared to construct their own knowledge upon that framework.

## What Does Spiral Learning Look Like?

A spiral homeschool, high school mathematics curriculum looks like... Saxon. When I compared the general topics covered in Algebra ½, Algebra 1, and Algebra 2, I found almost 2/3 of topics are repeated again in a future book. More specifically, students in Algebra 1, explicitly learn about exponents in lessons 19, 21, 29, 36, 40, 53, 74, 80, and 114. Lessons are fast moving, one per day, and each day includes a majority of cumulative review. It is assumed that a student who doesn't quite "get it" during the lesson will eventually learn each skill through continual review.

## What is Mastery Learning?

Mastery learning is the idea that learning is sequential, and that each area of knowledge or skill must be mastered before a student moves on. Fewer topics are covered, and much more time is given to instruction and practice on each topic. Students are asked to master a certain objective before moving on, because that objective will not be taught again. Singapore, an island country off of the Malay Peninsula, topped the TIMSS charts in each of the last three testing cycles with their mastery learning curriculum.

## What does Mastery Learning Look Like?

When you check out the scope and sequence chart for Singapore's high school level mathematics curriculum, you find very little repetition between books. Many subjects, such as unit conversion or quadratic equations, are covered in only one of the four book sequence-books contain review material, but mastery is clearly assumed the *first* time around.

Similarly, Math-U-See aims for "long term memory and short term understanding." They include opportunities for review, but concepts are not left to be mastered in some vague, distant future. Lessons are expected to take several days, and students are taught to understand a concept even as they memorize facts and algorithms. Both skill mastery and understanding are expected before a student moves on.

## Spiral vs Mastery Learning

In terms of the long-term application of high school mathematics in the “real world” of life, college, and career, I believe mastery learning to be far superior to spiral. Students who have mastered material score higher on standardized testing and are more prepared to apply mathematics to real-life situations than students who have simply progressed through a spiral curriculum. In addition, Saxon, arguably the most popular “spiral” choice among homeschoolers today, does not claim to function effectively in the manner that modern homeschoolers are applying their materials.

As mentioned earlier, Singapore, a country with a population about half that of New York City, has been topping the international math tests for years. In 2003, American eighth graders scored 15<sup>th</sup> out of 45 countries, with a score of 504; The United States scored 201 points below that of frontrunner Singapore—a country that uses a uniform, mastery curriculum nationally. Those numbers should strongly encourage us to consider a mastery program as we hit the pre-algebra years.

When was the last time you cracked open an Algebra text and factored a polynomial “just for fun”? According to Steve Demme, creator of Math-U-See, “the reason that you learn math is to do word problems.” Thomas E. Clark, author of VideoText Algebra, defines the goal of arithmetic as finding an answer, but the goal of mathematics as solving a problem. Whether you are an engineer, a nurse, a contractor, or a quilter, successfully applying mathematics to everyday life takes a level of understanding beyond the ability to plug numbers into an equation. When I taught (in a classroom) with Saxon, students would often complain that they didn't know “what kind of problem” was on their homework. Some remembered the formulas for computing simple interest but few could correctly identify a simple interest word problem out of the “pack”. Newer Saxon textbooks have been modified to include lesson numbers next to each individual problem—eliminating any need for that recognition.

Looking up Saxon Mathematics in a curriculum catalog, you might find such descriptors as: “It is relatively easy to teach and, from fourth grade up, requires little parental involvement.” It's easy to be tempted by that carrot—it *is* easy to hand a textbook to a child and ask them to complete Lesson 73. It's significantly harder for *them* to learn advanced concepts that way. They might have been able to “fake it” through the computations of arithmetic, but algebra requires legitimate understanding. Saxon itself replies: “Buying only the workbooks would be tantamount to buying only one-third of the program.” In the early years, Saxon lays out detailed lesson plans in a Teacher's Manual. In the high school years, the Saxon assumes that a mathematics teacher, someone *with a mathematics degree*, is presenting a lesson to the student before he or she approaches the textbook materials. If only we had a spare math teacher lying around the house!

Reviewing means, literally, “to reexamine judicially”. It means the looking back over learned material and confirming those skills and lessons in your own mind. I would encourage you to teach your students to review, and study, independently. As you make your homeschool choices for the years to come I would strongly encourage you to consider a mathematics curriculum that emphasizes mastery. Consider a high school curriculum (such as Math-U-See, Teaching Textbooks, or VideoText Algebra) that is written with the homeschooler in mind—directly to the student. Because we all want our children, whatever their life goals, to master the foundations of mathematics.