# Math in Focus™: Theory and Practice

Volume 5

As you reflect on your work with *Math in Focus* this school year and prepare for the next, we encourage you to focus on student and teacher growth. Adopting a new pedagogy and implementing new standards can be a challenge, but the rewards are great. Each year brings new learning and progress, and ultimately the creation of successful mathematicians. As students have developed new understandings at a deeper cognitive level, questions about mastery begin to emerge. A previous newsletter asked you to focus on what students know instead of what they don't know. Let's move one step further and look at the level at which the students know.

## Mastery Within the *Math in Focus* Curriculum: In Theory

When Singapore's Ministry of Education created a national mathematics curriculum that was both focused and coherent, spent more time on fewer math topics, and expected mastery of a concept before moving on to new learning, their students made considerable gains on international assessments and have remained as top scorers for most of twenty years.

Mastery learning asks students to move away from a "mile wide…inch deep" approach to mathematics. More time is given to instruction and practice on each topic so that students will have a chance to understand the mathematics before moving forward. The expectation is that students have a deep conceptual understanding of the topic because it will not be taught at its inception again. Topics will be revisited and applied, but at a higher level--a spiral of increasing radius.

## Mastery Within the *Math in Focus* Curriculum: In Practice

In order for students to master the curriculum and know it well enough to build upon, instruction and practice must include some essential features. As teachers become more ingrained in the Singaporean pedagogy and have more involvement with students and the mathematics, they will be able to add onto this list.

Anchor Tasks:

The **Learn** portion of the lesson in *Math in Focus* offers mathematical content that is to be explored. Often it is just one problem or scenario that is introduced. That is purposeful. Student engagement with a focused task (or small group of related tasks) for a longer amount of time allows the struggling students some time to build understanding through discussion and manipulation of concrete materials or pictorial representations. This same time allows more advanced students, or ones with more experience with the topic, to go deeper with their understanding. Many times these students want to move quickly through the topic, but the goal is to advance the thinking without necessarily advancing the mathematics. Working through multiple strategies helps students become more flexible in their thinking and opportunities given by the teacher allow students to apply and connect these strategies to previous and future learning. Because so much time is spent with the task(s), important mathematical questions can be revisited multiple times to ensure students are thinking deeply about the content.

Guided Practice:

With the gradual release lesson structure, the Guided Practice opportunities cannot be emphasized enough. These practice problems, Games, Hands On, Let's Explore, and Math Journal tasks give students time to share ideas, interpret content and flesh out discrepancies in understanding. Listen to his/her students' discussions, ask questions that help clarify or deepen student comprehension, and allow students to create arguments to defend their mathematical view. This is why there are multiple days and activities to use and discuss concrete, pictorial and abstract representations—students need time to make sense of something they did not previously know.

Levels of Mastery:

The two instructional features described above, along with carefully crafted questions, will assist teachers in gaging the level of mastery each student has. When given a problem or scenario to complete, does the student have the ability to:

- successfully complete with the support of concrete materials?
- successfully complete with the support of a visual or pictorial representation?
- successfully apply concepts in a problem-solving situation?
- successfully apply concepts to novel, or new, situations?

This pathway of student performance will help teachers decide whether to move on with the content and at what depth. One can only build on what a students knows, not what he/she does not know, so the multi-day lessons, good questioning, and concrete to pictorial to abstract pedagogy is essential when teaching to mastery.

Grading:
We are often asked, “What is considered mastery? What number grade should be assigned?”
We often reply with a question, “How did you assign a grade before implementing the Common Core Standards and *Math in Focus*?”
Grades should be based against the standard required at that grade level. If the standard requires students to solve and understand problems by using concrete materials and pictorial representations, then a student who is successful at that level should be assigned a grade to reflect that ability. If the grade level expectation is fluency, with understanding, and representation in the abstract form, then a student’s grade should reflect whether or not the student is successful with that task.
While making the transition to the higher standard and the rigor that it entails, adjustments in grading can be made by offering less weight to extremely difficult problems and/or assigning difficult problems as bonus questions that all students must attempt. However, continue to assign these more rigorous problems to allow students to adjust to the new expectation.

Celebrate your accomplishments this year and enjoy your summer.
We look forward to the work we will do through *Math in Focus* next year.

Take Care,
The *Math in Focus* Specialist Team