Why Do Singapore Students Surpass the Rest of the World in Math and Science?

The latest results from the Trends in International Mathematics and Science Study (TIMSS)--an international assessment of 60 participating countries--have been released to prove that once again Singapore's students dominate both math and science in every tested grade level.

This raises a familiar question: ***What makes Singapore students so STEM-savvy and what can U.S. students learn from them to improve?***

While U.S. students have shown long-term improvement since TIMSS was first administered in 1995, the results are lackluster for a country that has been tirelessly focused on improving its students' skills in math and science fields.

Here are four things Singapore does different from the U.S. when it comes to math, and possibly four things the U.S. can keep in mind to help to raise student achievement:

Foundational Learning/Deep Mastery

Experts agree that part of the reason why Singapore students are so successful in math is because their curriculum teaches them a deep mastery of the subject through carefully calculated foundational learning; each grade level is a building block.

"While American math instruction often relies on drilling and memorization of many skills each year, Singapore math focuses on children not just learning but also truly mastering a limited number of concepts each school year. The goal is for children to perform well because they understand the material on a deeper level; they are not just learning it for the test," says PBS.org.

This approach helps students surpass memorization to truly understand the material, also making them less likely to forget important concepts in-between grade level learning.

A Culture of Growth Mindset

Singapore's Ministry of Education heavily believes in "research-proven pedagogical approaches that lead to lasting learning beyond the test," says KQED News.

One of these pedagogical approaches is helping students obtain a growth mindset to ultimately help them persevere, especially when they are confronted with the difficult material associated with advanced math.

A growth mindset, as defined and popularized by Carol Dweck, is the idea that intelligence is not a set of fixed traits but rather is something that can be developed and improved through hard work and education.

Experts say students are more likely to succeed particularly in difficult subjects like math when they ditch the feeling that they're simply *just not good at it* and replace it with the feeling that they can ultimately succeed if they keep trying.

The support of this mindset is speculated to be one reason why Singapore students are continually able to succeed.

Emphasis on Visual Learning

"Singapore Math does something dramatically different when it comes to word problems," says an administrator for Martin Elementary School in a letter to parents explaining why the school has chosen to teach Singapore math.

"It relies on model drawing, which uses units to visually represent a word problem. Students learn to visualize what a word problem is saying so they can understand the meaning and thus how to solve the problem."

Word problems are often where students struggle the most when being tested on difficult math concepts, but Singapore students routinely tackle them with ease.

This is because instead of focusing on the concrete meaning of the words within the problems, Singapore students turn the words into pictorial models that "transforms words into recognizable pictures for young minds."

" ...Singaporean students are exposed to higher-level, multi-step word problems than are U.S. students, and proficiency in solving these complex problems is a key factor in why they have fared so well on international mathematics assessments," said Bill Jackson, a math teacher in Scarsdale Public Schools in an article for The Daily Riff.

"Singapore's model drawing approach helps children to get past the words by visualizing and illustrating word problems with simple diagrams. And as children become better and more confident problem solvers, they become more interested in mathematics," he said.

Mental Math as a Core Principle

Singapore students are encouraged to become successful at doing math in their heads.

"Mental math is one of the cornerstones of Singapore Math as its emphasis is on helping students to calculate mathematically in their heads, thus developing number sense and place value," says the administration of Martin Elementary School.

This helps Singapore students not only get math questions right, but get them right quickly without the interference of outside tools.

Related Readings:

- What Can Be Learned from Singapore's Math Curriculum
- Singapore, Malaysian Teachers Update Innovative Math Game for New School Year

Nicole Gorman, Senior Education World Contributor

11/30/2016