SINGAPORE MATH

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WHAT IS SINGAPORE MATH?

Originally developed in the 1980s by Singapore's Ministry of Education, Singapore Math (SM) was designed to sharpen students' technical skills to boost the national labour force.[1] The SM teaching approach follows a framework centred on problem solving, with mathematically rich textbooks, challenging assessments, and qualified teachers focused on teaching to mastery.[2] In 1998, the SM approach and accompanying Primary Mathematics textbooks were distributed and popularized in the U.S.[1]

EFFECTIVENESS

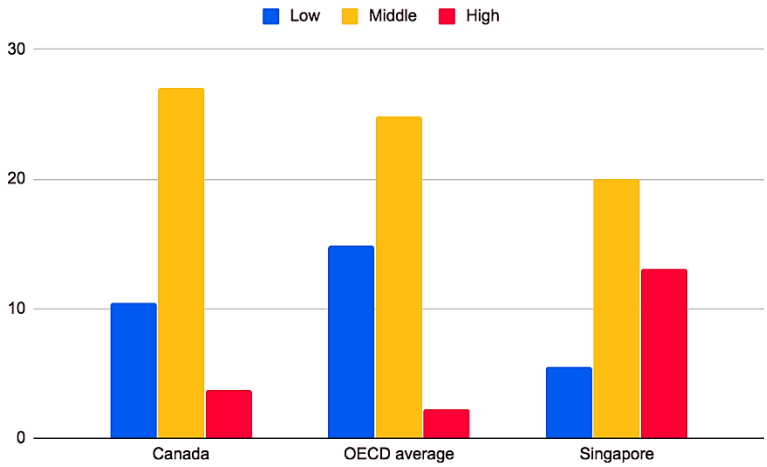
In one recent study, the effectiveness of an American program called Math in Focus (MIF) was examined.[3] Like SM, MIF features concrete visual representation, a planned instructional pathway and giving students time to struggle with concepts. The study found MIF to have a modest positive impact on math achievement. For the program to be effective, it must be fully integrated into the math curriculum and implemented with students over several years.[3]

Official Website:
https://www.singaporemath.com/
Singapore Curriculum Documents:
https://www.moe.gov.sg/education/syllabuses/scienceshttps://
Forsten, C. (2010). Step by step model drawing: Solving word problems the Singapore way.
Walker, L. (2010). Model drawing for challenging word problems: Finding solutions the Singapore way.

COMPARING CURRICULA

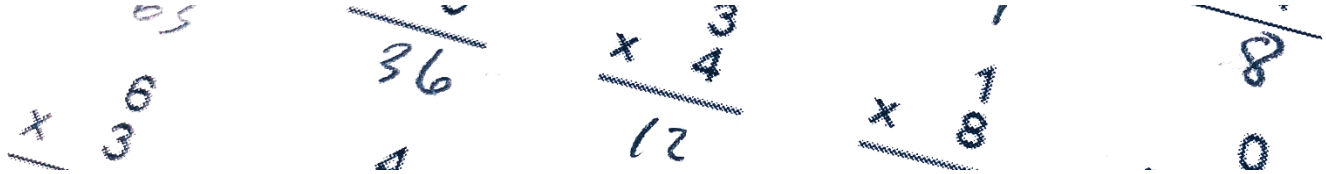
While the Ontario Curriculum stresses 5 strands of Mathematics, the Singapore Curriculum has 3 content strands: Number and Algebra, Measurement and Geometry, and Statistics. Both curricula provide a problem-solving framework, but the Singapore Curriculum has an official model used in all Primary Math textbooks.[4] Singapore textbooks use a logical sequence and narrow scope, employing a mastery approach where the class must reach a certain level of content understanding in order to move on to the next topic.[1] Students are asked to show their thinking, not explain them.[1]

PISA 2015 Math Scores: Canada & Singapore



The PISA (Program for International Student Assessment) compares math performance between countries. The highest level of achievement is marked by scoring at least 669 out of 1000 points. Singapore has over twice the number of students at the highest level of PISA scores than Canada and the average of all 36 countries in the OECD (Organization for Economic Cooperation & Development).[5]

([1]Garelick, 2006; [2] American Institutes for Research, 2005; [3] Jaciw et al., 2016; [4] Ng & Lee, 2009; [5] OECD, n.d.)

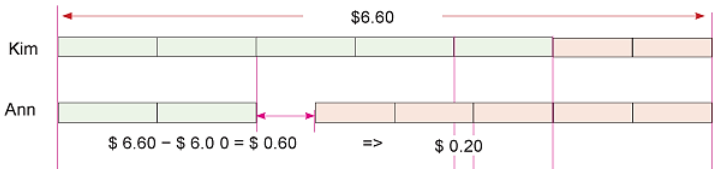


THE CPA APPROACH

Math textbooks in Singapore use a concrete-pictorial-abstract (CPA) approach for solving multi-step word problems.[1] The CPA process moves from the use of manipulatives for concrete representation, to illustrations for pictorial representation, to the abstract numerical representation, embodying the concreteness fading technique.

THE BAR MODEL

Singapore Math has become known for bar modelling, a method that extends the CPA approach by helping learners to visualize the problem, organize key information, and find solutions. The bar model can be used with whole number, fraction, ratio and percentage word problems.[2] Ng & Lee (2009) propose that the use of the model requires moving through 3 phases.



REFERENCES:

American Institutes for Research (2005). What the United States Can Learn from Singapore's World-Class Mathematics System (and what Singapore can learn from the United States): An Exploratory Study. Retrieved from https://www.air.org/sites/default/files/downloads/report/Singapore_Report_Bookmark_Version1_0.pdf

Garelick, B. (2006). Miracle math. *Education Next, 6*(4), 38-45. Retrieved from http://search.ebscohost.com.myaccess.library.utoronto.ca/login.aspx?direct=true&db=eue&AN=507924812&site=ehost-live

Jaciw, A. P., Hegseth, W. M., Lin, L., Toby, M., Newman, D., Ma, B., & Zacamy, J. (2016). Assessing Impacts of Math in Focus, a "Singapore Math" Program. *Journal of Research on Educational Effectiveness, 9*(4), 473–502. https://doi.org/10.1080/19345747.2016.1164777

Ng, S., & Lee, K. (2009). The Model Method: Singapore Children's Tool for Representing and Solving Algebraic Word Problems. *Journal for Research in Mathematics Education, 40*(3), 282-313.

OECD: Education GPS. (n.d.). PISA 2015: Full selection of indicators. Available from http://gpseducation.oecd.org.

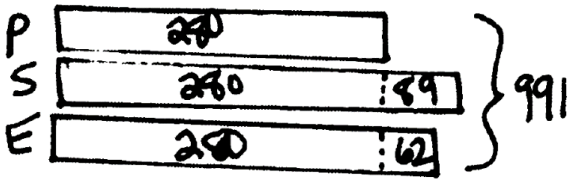
Phase 1: Text Phase

Read word problem.

"Dunearn Primary School has 280 pupils. Sunshine Primary School has 89 more pupils than Dunearn Primary. Excellent Primary has 62 more pupils than Dunearn Primary. How many pupils are there altogether?"

Phase 2: Structural Phase

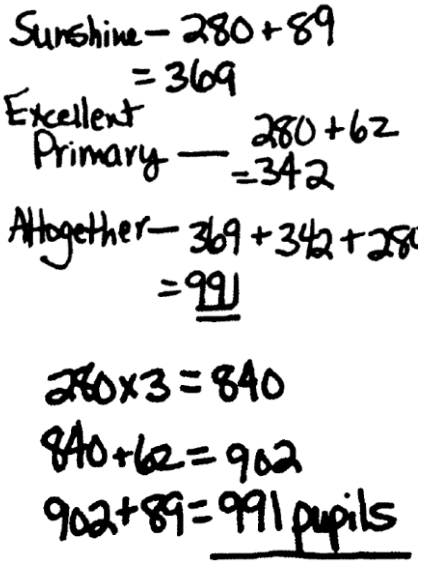
Sketch bars to represent key information from the word problem.



Phase 3: Procedural-symbolic Phase

The student uses the model to plan and solve the problem.[3]

*May include using arithmetic equations
*Students may do this section differently



([1]American Institutes for Research, 2005; [2]Ng & Lee, 2009; ; [3]Ibid, p. 300)