ANALYSIS OF SCHOOL MATHEMATICS CURRICULUM IN TWO COUNTRIES

Leong Kwan Eu
University of Malaya

This article compares the school mathematics curriculum in the United States and Malaysia. The analysis is done in terms of rigor, curriculum focus and coherence. Both curricula have similar focuses but the approach is done in a slightly distinct way. For some content areas, the introduction of the materials differs from one to two grade levels. The school mathematics curriculum in the United States standards include algebraic thinking from the beginning of the elementary grades that intends to build a strong foundation for high school algebra. In addition, the geometry component has been arranged in a systematic way to focus on the essential geometrical concepts. The high school standards cover all the content areas and prepares students for college education. Meanwhile the Malaysian school mathematics curriculum focuses on ensuring a strong foundation of the numbers concept and the four basic operations in the elementary level. Conceptual understanding and procedural skills are also stressed for all content areas but are lacking in geometry content at the primary level. At the secondary level, the mathematics content is rigorous even though there is less focus on many topics with the critical thinking component.

The various types of curriculum usually include the intended curriculum, the written (textbook) curriculum and the implemented curriculum. The intended mathematics curriculum also known as “curriculum standards” generally provides learning objectives that guide what should be taught and the important mathematical content and processes that are expected from a student. The first Common Core State Standards which is a state initiative to produce a clear guide to students learning goal is the first time the United States devised a national standard. It will be interesting to look at how these Standards are similar or different from those of other countries. The inspection of curriculum documents in Malaysia and the United States reveal
Issues in Education, 38, (3), 2014

The National Council of Teachers of Mathematics (NCTM) recommended a Curriculum for Students in Grades K-12 that emphasizes the development of mathematical proficiency.

For purposes of comprehension, the authors use the term K-12 (Grades 6-12) for the range of mathematics courses offered in the United States. The Advanced Placement (AP) mathematics courses offered in the United States are designed to challenge and engage talented students, and they are often considered as prerequisites for college success. The AP courses cover a broad range of topics, including algebra, geometry, trigonometry, and calculus, and they are typically offered by schools with Advanced Placement programs.

In the Common Core State Standards (CCSS), the K-5 standards are divided into five categories: Counting and Cardinality, Operations and Algebraic Thinking, Number and Operations in Base Ten, Measurement and Data, and Geometry. These categories are designed to help students develop a strong foundation in mathematics, which is essential for success in higher education and careers.

The CCSSM (Common Core State Standards in Mathematics) are designed to ensure that students are prepared for college and career success. The CCSSM are a set of standards that outline what students should know and be able to do in mathematics at each grade level. The CCSSM are intended to improve the quality of mathematics education in the United States by providing a clear framework for what students should learn and by setting high standards for student achievement.

Common Core State Standards in Mathematics (CCSSM)

The CCSSM are designed to ensure that students are prepared for college and career success. The CCSSM are a set of standards that outline what students should know and be able to do in mathematics at each grade level. The CCSSM are intended to improve the quality of mathematics education in the United States by providing a clear framework for what students should learn and by setting high standards for student achievement.

Reflecting on the CCSSM and their impact on mathematics education, it is clear that the standards are designed to help students develop a strong foundation in mathematics, which is essential for success in higher education and careers. The CCSSM are a valuable tool for educators and policymakers who are committed to improving the quality of mathematics education in the United States.
School Mathematics Curriculum Comparison

In this paper, the analysis was done on the CCSSM and the year 2003 version of the Malaysian ICM for the primary and secondary levels in terms of rigor, coherence and focus. Rigor refers to “the degree that set of standards address key content that prepares students for success beyond high school” (NGA 2010, p. 2). Coherence is defined as “whether the standards reflect a meaningful structure, revealing significant relationship among topics and suggest a logical progression of content and skills over the year” (NGA 2010, p. 2). Focus regards “whether the standards suggest an appropriate balance in conceptual understanding, procedural skill and problem solving with an emphasis on application and modeling; the standards should be teachable within a school year and key ideas in a given grade or topic area should be clear” (Achieve, 2010, p. 2). Analyzing curriculum with rigor, coherence and focus provides educators and parents with a more detailed and fair comparison of the standards. It also provides sufficient guidance for the stakeholders.

I have looked at the content of each grade level thoroughly of the CCSSM and the Malaysian ICM. In particular, the inclusion and treatment of every topic at all grade level were compared for both the curricula.

In the ICM document, the mathematics curriculum defines the pertinent elements in each content area. In addition, the list of topics falling under the scope of each area is given. This is similar to the ‘standards’ in CCSSM. In the more detailed curriculum specifications it is presented in five columns namely the “learning objectives”, “suggested teaching and learning activities”, “learning outcomes”, “points to note” and “vocabulary”. CCSSM only presents the grade level standards in three rows namely the “standards”, “clusters” and “domains”.

Findings

The CCSSM and Malaysian ICM describe similar levels of rigor for the number and operations in base ten. However, the CCSSM has a higher level of rigor for the geometry section for the elementary and middle school levels. The grade placement discrepancies occur between the two documents is usually within one year of one another particularly in the geometry content.

The CCSSM and Malaysian ICM are comparable in their coherence and focus. Nevertheless, there are key differences where CCSSM specifically addresses algebraic thinking in the elementary and middle school level compared to the Malaysian ICM. The latter has a stronger focus on numbers and the four basic operations involving various representations such as length, time, money, mass and volume in the elementary level. At the secondary level, the rigor for algebra, statistics and probability is also is higher in ICM than CCSSM.

Rigor

Both the CCSSM and Malaysia’s ICM have rigorous learning objectives for students. There are differences in stages at which certain standards are given priority. Students are expected to know certain skills and concepts at a particular grade but in most cases the differences is just one grade level. However, the differences do not make each set of standard more rigorous than another. One exception would be the geometry standard in CCSSM which seems to be more rigorous than the ICM in the elementary and middle grades.

Elementary Grades (Standard 1 to 5)

The ICM focuses on the arithmetic computations of numbers and measurement to build a solid foundation while the CCSSM concentrates on the meaning and understanding of the arithmetic concepts. In the early primary years, both the documents have similar levels of rigor for the arithmetic computations. In Standard 3, the Malaysian expectation is higher in fractions till middle school. In addition the relationship between fractions, decimals and percentages is addressed in Standard 5 of ICM. However the geometry rigor in CCSSM is one year ahead of ICM beginning in Standard 2 and this continues till middle school. Furthermore, the CCSSM includes identifying geometric properties such as lines, rays, angles and also graphing points on the coordinate plane while the CCSSM only concentrates on the properties of the basic two dimensional and three dimensional shapes. One more area the CCSSM is ahead is in the algebraic thinking domain which begins in Standard 1. The ICM does not specifically address the algebraic thinking domain till middle school grades. In general, the ICM is a spiral curriculum that repeats the arithmetic computations involving the four basic operations at different grade levels and each time at a higher level of difficulty and in greater depth to build a strong foundation of numbers with operations with procedural skills emphasized while the CCSSM invests in rigor of meaning and conceptual understanding of arithmetic and algebraic concepts.
Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

<table>
<thead>
<tr>
<th>Quadratics</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equation of motion</td>
<td>Problems of force and motion</td>
</tr>
<tr>
<td>Optimization</td>
<td>Maximum and minimum</td>
</tr>
<tr>
<td>Probability</td>
<td>Calculus</td>
</tr>
<tr>
<td>Geometry</td>
<td>Trigonometry</td>
</tr>
<tr>
<td>Number and Quantity</td>
<td>Addendum mathematics</td>
</tr>
<tr>
<td>Addendum mathematics</td>
<td>Functions</td>
</tr>
</tbody>
</table>

**Table 2**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 3**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

**Table 1**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

The Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 2**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 3**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

The Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 1**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 2**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 3**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 1**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 2**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 3**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 1**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 2**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 3**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 1**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 2**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 3**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 1**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 2**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 3**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 1**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 2**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 3**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 1**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 2**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 3**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 1**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 2**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 3**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 1**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 2**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 3**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 1**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 2**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 3**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 1**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 2**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 3**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 1**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 2**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 3**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 1**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 2**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 3**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 1**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 2**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 3**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 1**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 2**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 3**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 1**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 2**

**CCSSM of the CCSSM and ICM Domain of Secondary Level**

Below is the Grade 12 pre-calculus level. The new framework in the High School stands out:

**Table 3**
Coherence and Focus

The author's analysis suggest that CCSSM displays a coherent structure by beginning standards such as algebraic thinking that prepares students for algebraic equations in middle and high schools, numbers to base 10 and operations which lead to the number system in the next levels and also from the measurement and data standard in the elementary that leads to a smooth transition to the statistics and probability standards in middle and high schools. The geometry standards are devised such that students get a strong conceptual foundation of the properties of shapes and figures at the elementary level before a logical progression to more sophisticated ideas in high school.

For the ICM, the coherent structure is based on the four fundamental areas which are numbers, shape and space, data and measurement and relationship from the elementary till high school. The logical progression using the same domain areas helps with student learning. Both the CCSSM and Malaysian ICM indicate some meaningful traits of coherence and focus. CCSSM presents a more detailed expectation of the concepts and meaning. It also includes specific grade-level objectives of skills and knowledge. However, the Malaysian ICM strength lies in providing assistance to teachers with the suggested teaching and learning activities for each learning objective; such detailed suggested activities are not found in the CCSSM. As a result, teachers who use the ICM will be able to understand how the topics progress from each grade level.

In terms of focus, the CCSSM and Malaysia ICM take a similar approach. CCSSM applies the standards for mathematical practice that "describes the varieties of expertise that mathematics educators at all levels should seek to develop in their students" (CCSSM, 2010, p. 7). These processes refer to the National Council of Teachers of Mathematics standards for problem solving, reasoning and proof, communication, representations and connections and the National Research Council strands of mathematical proficiency. The standards for mathematical practice go deeper into the processes and proficiencies and emphasize modeling with mathematics, reasoning and sense making and the usage of appropriate tools. The ICM emphasizes on the teaching and learning of mathematics is similar to NCTM’s standards mentioned above. What is different is the ICM has a section that refers to suitable approaches in teaching and learning that include cooperative learning, contextual learning, mastery learning, investigation, inquiry and exploratory learning (CDC, 2007). Furthermore, the ICM proposes the usage of abacus for mental calculation and understanding computation from Standard 1 to 3 beginning in 2004 (CDC, 2010). The intention was for students to master the addition and subtraction operations by modeling the calculations and as a visualization tool.

While both the standards are very similar in focus, there are slight differences. CCSSM gives priority to the connection between conceptual knowledge and necessary skills. The Malaysian ICM does not relate the conceptual knowledge learned in the elementary with the middle grades. For example in the Grade 3 operations standard, CCSSM expects students to "apply the properties of operation to multiply and divide" (CCSSM 2010, p. 23). On this topic, the Malaysian ICM applies a slightly different conceptual approach to multiplication by "model concept of multiplication by repeated addition using concrete and manipulative materials" (CDC, 2005, p. 12).

Another example is in the Grade 7 standard, where the CCSSM still applies the properties of operation to add, subtract, multiply and divide algebraic expressions. The Malaysian ICM is less specific and detailed on this topic in the Grade 7 Standards as students will be able to “(a) perform addition and subtraction involving two algebraic expressions and (b) multiply and divide algebraic operations by numbers” (CDC, 2005, p. 25). However in terms of technology usage, the ICM proposes the usage of the dynamic software Geometer’s Sketchpad and the graphing calculators especially in the Grade 7 standard and beyond. This, according to the ICM, helps student understanding by enabling visualization and exploration of difficult concepts.

The accessibility of the Sketchpad software has been further enhanced with the subscription to the license of this software by the Ministry of Education in 2004 (Teoh, 2005). Not only do the students and teachers from the public school system have the opportunity to utilize this software but lecturers from the public universities can do so as well (Ministry of Education Malaysia, 2001).

The CCSSM prepares students for the development of algebraic reasoning in a more consistent way since the primary level. It emphasizes the role of properties of numbers as a basis for understanding the more abstract algebraic rules for expression and equations in the middle grades. With the focus of the CCSSM in preparing students for algebraic thinking, the emphasis on constructing number sentences with unknown values is done from Grade 1. In comparison, the Malaysian ICM applies the spiral curriculum method of mastering the four basic operations in the elementary grades. The algebraic thinking and number operations are not mentioned explicitly in the standards but examples of finding unknown numbers in number sentences for either addition, subtraction, multiplication or division is suggested as a learning activity. To solve a problem pupils are expected to use simulation or modeling as a tool in obtaining a solution in CCSSM. Strong emphasis on concrete examples in the elementary level is one way the ICM prepares students to master the arithmetic skills.
null
PROFESSIONAL ISSUES IN PRODUCING MULTICULTURALLY COMPETENT COUNSELLORS IN MALAYSIA

Rafidah Aga Mohd Jaladin
University of Malaya

Noh Amit
Universiti Kebangsaan Malaysia

Lau Poh Li
University of Malaya

Counsellors with multicultural counselling competencies are needed in the helping professions in most multicultural countries such as America, Australia, Britain, and Malaysia. However, efforts towards producing multiculturally competent counsellors are not easy if there are still some professional issues in the counselling profession that are not wisely dealt with. Therefore, this article identifies and discusses some issues which may become the limitations and barriers to practicing counsellors' efforts towards becoming multiculturally competent professionals in Malaysia. Professional issues pertaining to theory, practice, training, and research are critically analyzed. The central focus of the discussion is on the education and training of Malaysian counsellors. Some suggestions for future research in counselling are also included.

The population of Malaysia is culturally diverse, yet the vast majority of counsellors are males, Malays by ethnicity, Muslim religion (Lembaga Kaucsor Malaysia, 2014), and the vast majority of the major theoretical approaches to counselling are basically having a strong influence of the Euro-American culture (Pope et al., 2002; Scorzelli, 1987). This phenomenon gives rise to a pressing need to enhance the availability, accessibility, and quality of counselling services, especially when dealing with multicultural societies.

Previous research findings and literature on culture and multicultural counselling in the Western settings such as in the USA, Britain, New Zealand and Australia have identified the need for multicultural counselling