This paper examines the curriculum used by Riverside Secondary School, Singapore for the Secondary Two* Mathematics. The curriculum is based on Book Two of the New Syllabus Mathematics series (5th edition). In addition, the school also uses a “Scheme of Work” to specify the timeframe for covering the content within the academic year. The curriculum examined is taken to be the Scheme of Work and the textbook on which it is based.

**Summary of Curriculum**

The New Syllabus Mathematics follows the Mathematics Syllabus for Secondary Schools in Singapore, implemented from 2001 by the Ministry of Education, Singapore. The key learning goal is the acquisition of the necessary mathematical knowledge and skills, appropriate at the learners’ current grade level, to develop thinking processes and apply them in situations they will meet in life.

**The Rationale**

Although it was not stated explicitly, we can deduce that the curriculum’s rationale is influenced by several ideologies and theorists.

Firstly, it is clear that the emphasis and primary aim of the curriculum is to help learners acquire problem-solving capability. This is manifested evidently from two elements: the prevalence of word problems – used as examples and assessments, situated in appropriate, likely real-world context - in the textbook, and the explicit teaching of problem-solving heuristics. Some problems are extremely challenging, and require deep conceptual understanding (learners can’t get away with just memorizing algorithms). The emphasis on problem-solving and thinking skills resonates with Dewey’s philosophy that greater emphasis should be placed on problem-solving and critical thinking skills, rather than simply on the memorization of lessons (Dewey, 38). The emphasis on problem-solving reflects a pragmatic, highly functional view of education behind the curriculum.

Secondly, the curriculum is heavily influenced by Bruner’s ideas on curriculum and teaching. Each topic is divided into segments, sequenced in a logical order. Successful completion of one segment
helps to relate to, build and extend the initial structure of the topic into a more sophisticated one by assimilation and accommodation. Connections between topics are common. For example, under the topic “Linear Graph”, learners first understand rectangular coordinates in two dimensions and its use for locating discrete points before learning how it can be used in graphs of linear equations. Similarly, after understanding the basic linear equation, they extend their mental structures by learning about special cases (e.g. parallel, perpendicular to axes), different forms, and forms connections with the earlier concepts on simultaneous equations. The emphasis is not just on topical understanding, but relational understanding. This resonates well with Bruner’s stress on building the fundamental structure of a discipline (Bruner, 60), to help learners connect, organize and assimilate new knowledge.

In addition, the curriculum also utilizes Bruner’s ideas of knowledge in the three cognitive modes: Enactive (action), Ikonic (imagery) and Symbolic (language) (Bruner, 66). In contrast with many other Math textbooks which use mainly symbolic mode, the curriculum makes a substantial effort to promote imagery by frequently using good diagrams, graphs and models.

Thirdly, in analyzing the depth and breadth of the curriculum, I feel Gardner would probably find it a tad too broad (Gardner, 99) as it covers a total of 15 chapters. However, rather than describing it as one that emphases breadth over depth, it is more apt to refer to it as a “T-Shaped” curriculum: exposing learners to a reasonably wide spectrum of topics but focusing sufficiently in-depth on a few ones (two topics in our case - Algebra and Graphs, occupying about 40% of total pages).

**Intended Goals and Learning Activities**

In general, the learning activities are well structured, clearly defined and provide excellent support to achieve the intended goals. At the start of each topic, specific learning objectives are stated and at its end, summaries are provided to reinforce key ideas. As mentioned earlier, each topic is divided into well-sequenced segments. Each segment ends with exercises to reinforce the concepts taught. These
exercises are designed to tie in closely with the specific learning objectives stated at the beginning. Sometimes, class activities are suggested as well. Regardless of exercises or class activities, the focus and intended outcome are the same: to assess the extent of learners’ understanding based on the stated objectives. For example, the segment on Rotational Symmetry has regular exercises - questions based on different geometrical shapes and figures - as well as an in-class activity involving paper cutting to make a fan. The exercises and activity, though existing in different forms, sought to produce the same thing: learner’s demonstration of key concepts of rotational symmetry (order and center of rotation) as stated explicitly at the beginning of the chapter. This method of structuring learning activities and assessments to elicit evidences (of learning) based on pre-determined desired objectives, echoes the backward design process described by Wiggins and McTighe (Wiggins & McTighe, 98).

**Strengths & Weaknesses**

The greatest strength of the curriculum is its extremely clear presentation of concepts, achieved through a tight integration of sub-units arranged in a logical, sequential order delivered with concrete, multi-modal representations, focused assessments, and importantly, the emphasis on problem-solving.

In terms of shortcomings, one thing lacking is the use of multifarious introductions. The current curriculum introduces each topic with a list of specific learning objectives, followed by some information or questions accompanied with a photograph. The information is often dull, unfamiliar to students and does not relate well to the topic at hand. It is not hard to see that this attempt to provide “interesting” introductions is perfunctory and superficial. Although a large extent of math is algorithmic, the planners can certainly make a more concerted effort, utilizing Gardner’s multiple intelligences, for example - to come up with diverse and imaginative ways to introduce the topics. Although not all approaches will work for all students, the more ways we teach (or introduce a topic in our case), the more learners we’ll reach.
Another shortcoming I see is the relatively de-emphasis of the exploratory and investigative nature of the subject and the over-emphasis - intentional or otherwise - on outcome. Although there are exploration activities for many topics, they are all located at the end of the chapter, when the topic has been taught and students see no incentives to explore further. As each chapter is so efficiently sequenced, sharply focused and matter-of-factly explained, combined with the over-arcing emphasis on problem-solving, the danger is that students may subconsciously begin each topic with an “auto-problem-solving” mode that is overly task and performance oriented. In other words, the open-endedness, uncertainty and discovery nature of knowledge may no longer be associated with the subject.

In summary, this is a curriculum that will accomplish its intended goal – the acquisition of knowledge and skills to solve problems - through its well-planned and designed instruction, assessment and overall organization. In the larger context and purpose of education – such as lifelong learning and creation of new knowledge - however, it might be appropriate for the curriculum planners to reexamine their philosophy and expectation, and the changing circumstances and demands of society, so as to redefine their goals, if necessary, of an education program that will help mould and develop our next generation of learners.

**References**


