2014 National Mathematics Strategy

Creating A Community of Problem Solvers

Bermuda Public Schools

Putting Children First

NATIONAL MATHEMATICS STRATEGY

In order to deliver a first class education in mathematics for Bermuda's public school students, there is an urgent need to improve the quality of teaching and learning of mathematics in every classroom.

> The vision of the mathematics classroom must become one where students are confidently engaged in doing mathematics, problem solving, reasoning, critical thinking, collaboration and inquiry. This classroom will feature teachers who intentionally facilitate a community of students with rigorous and relevant tasks, building on student understanding and strategies to develop procedural and conceptual knowledge. - National Mathematics Strategy

The National Mathematics Strategy has been designed to provide a strategic, 3-year plan that will improve the mathematics outcomes of Bermuda's students by 2017 through the transformation of learning and teaching in our schools. The following strategies are critical to the realization of this vision:

A DECADE OF MIXED OUTCOMES

Over the last decade, the mathematics outcomes and experiences of Bermudian students have remained static, shown only inconsistent improvement, or declined. Consistently data from this period has depicted Bermuda's public schools as generally underachieving when compared to their international counterparts (see 2007 Bermuda Education Review; 2010 Mathematics Task Force: An Interim Report). The data has painted a picture of achievement gaps beginning in the primary level, on

through to senior school. A recent report on performance in the Cambridge curriculum implemented in 2010, underscored that the "most significant challenge for improvement lies in mathematics" where "mean scores are the lowest of all three [CIE] subjects at both levels" and represent the "largest difference" in comparison with international mean scores. Yet, several primary schools continue to perform above the international average and recently improvement at the middle level was the largest gain seen in recent years. Moreover, despite relative low numbers, the number of senior school students receiving C or above in IGCSE examinations tripled in 2013, jumping from 25 to 75 students.

FOCUS ON TEACHING

Surveys of mathematics classroom teaching indicate scant change in the quality of teaching over the last four years. In 2010 Mathematics Taskforce Interim Report, a snapshot found 30% of classroom teaching at the primary and middle level was found to be reflective of standards-based teaching ideals. Additionally, a recent 2013-14 audit of all 5 middle schools found only 32% of 25 mathematics lesson episodes represented proficient teaching based on a standard evaluation rubric. Despite this, the data also reveal that there is a great potential and "will" for growth, with large clusters of teaching remaining *just* below proficiency in the Novice range.

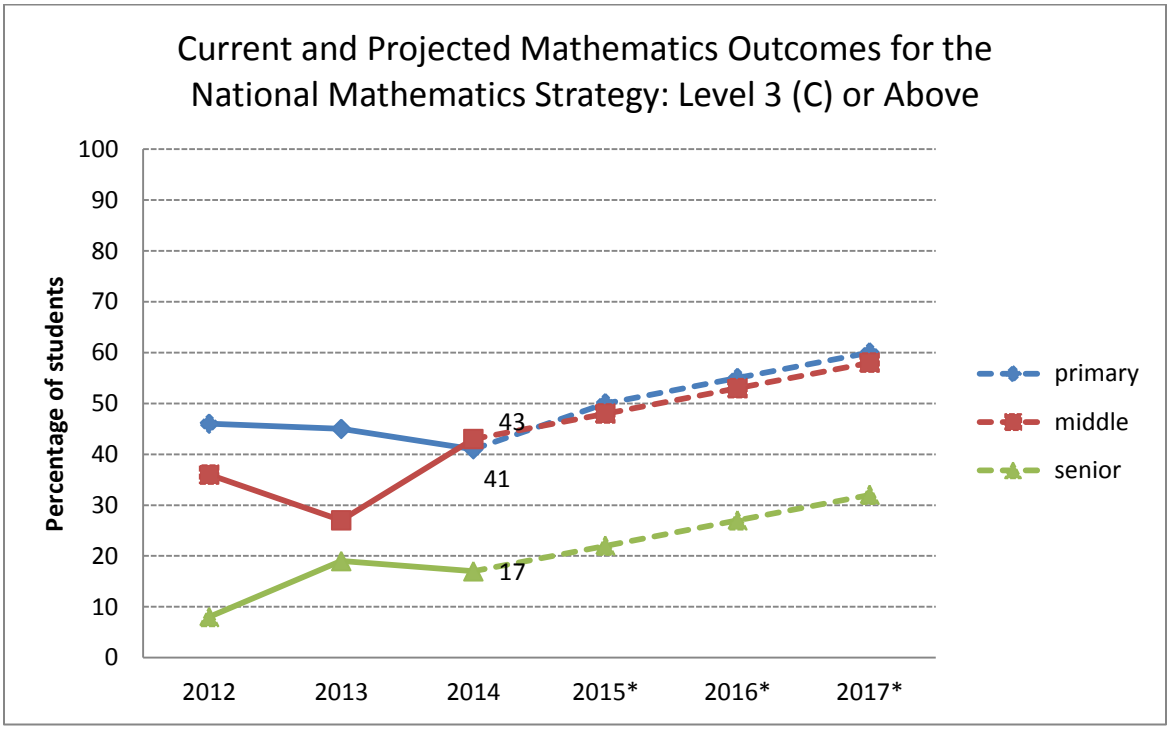
Past work of the 2010 Mathematics Task Force identified key gaps and areas of support for the improvement mathematics teaching and learning. One recommendation implemented was the hiring of 'math specialists' in 2012 to be deployed into each zone to work directly with principals, coordinators and teachers. Eventually, only one Mathematics Content Specialist Teacher was hired. Since that time approximately 112 teachers have participated in over 125 hours of professional development focused on mathematics content and pedagogy.

EMPHASIS ON EQUITY AND STEM

IN THE 21ST CENTURY, ALL STUDENTS WILL NEED TO BE PREPARED FOR A WORLD HEAVILY RELIANT ON SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS.

Over a three-year period special attention will be placed on ensuring that all students, regardless of gender or special needs, have equal access and opportunity to do well in mathematics. In order to accomplish this, there must be increased attention and focus on teachers' capacity to provide culturally relevant and responsive experiences. Culturally relevant teaching is responsive to the needs of all children because it promotes academic excellence in a manner that attends to students' identities and empowers them as critically conscious citizens. Identifying and providing more

opportunities for students to pursue interests in science and science related fields will be critical during the span of the Strategy.

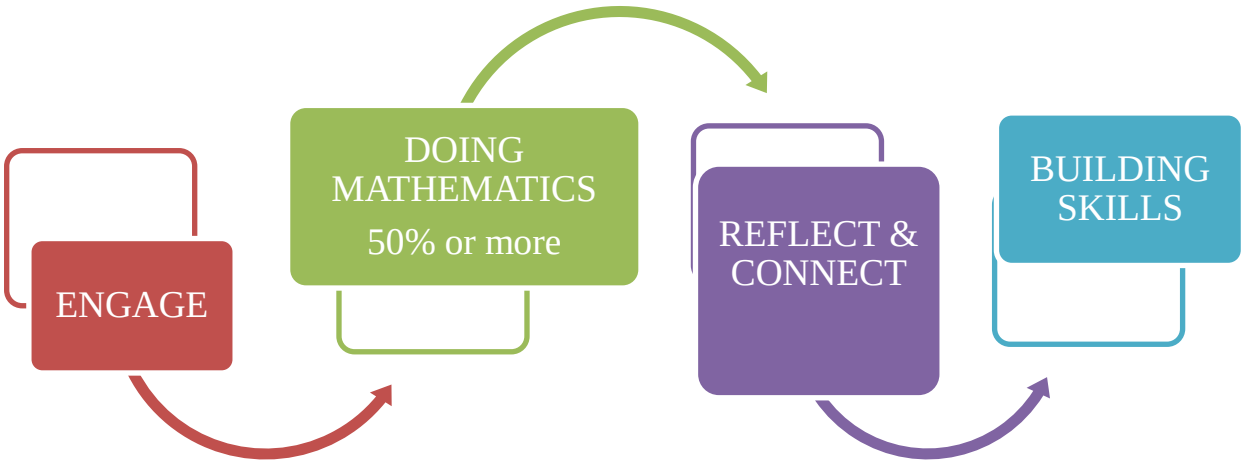


NOTE: 2015, 2016, 2017 ARE EXPECTED INCREASES BASED ON PAST TRENDS AND EXPECTED SHIFTS IN MATHEMATICS TEACHING

STRATEGY I: TEACHING THROUGH PROBLEM SOLVING

> *Utilize a common framework to shift teaching of mathematics towards emphasizing problem solving, inquiry, critical thinking, collaboration, and communication in every classroom.*

Bermudian classrooms will utilize an instructional framework which places emphasis on problem solving and student centered instruction. The framework is made up four phases: (1) Engage (2) Doing Mathematics (3) Reflect & Connect, and (4) Building Skills.



In the *Engage* phase teachers activate student thinking by engaging students in problem-solving situation by posing a thought-provoking problem designed to prepare them for learning important concepts. The *Doing Mathematics* phase finds students actively engaged in cognitively demanding and relevant tasks in 50% or more of the class lesson. Teachers probe students and work to clarify mathematical misconceptions, as needed, by redirecting students through questioning. In the *Reflect and Connect* phase, students share their findings, using a variety of concrete, pictorial, and numerical representations. Students justify and explain their thinking while reflecting on their learning. Teachers help students to defend their ideas and relate their strategies and solutions to similar types of problems in order to help students generalize concepts. Additionally, teachers address student misconceptions and use this time for opportunities for learning. In the *Building Skills* phase teachers focus on providing opportunities for mental mathematics, review and building prerequisite skills, computational skills and procedural fluency.

STRATEGY I: TEACHING THROUGH PROBLEM SOLVING

SUCCESS TARGET

A common framework to emphasizing problem solving, inquiry, critical thinking, collaboration, and communication utilized in every classroom.

YEAR ONE KEY ACTIONS

- In October 2014, all primary school teachers, teacher leaders, principals and support personnel will participate in an orientation to the National Mathematics Strategy.
- Beginning January 2015 all Mathematics Teacher Leaders will receive ongoing training and onsite coaching for all math teacher leaders around the Framework emphasizing modeling problem solving and critical thinking.
- In February 2015 Primary principals will participate in a 10 hour training module focused on leading mathematics instruction aligned with the mathematics framework.
- In February 2015 the DOE will define and communicate and support an inquiry model for preschool leaders and teachers

YEAR TWO KEY ACTIONS

- ✓ Adopt a STEM-teaching endorsement certification for primary and middle teachers beginning March 2016.
- ✓ Beginning September 2015 Principals and support personnel will use a common rubric to ensure that the Framework is the standard of practice for all mathematics lessons.
- ✓ In September 2015, all primary teachers will receive focused professional development on utilizing the mathematics framework focused on teaching through problem solving.
- ✓ In October 2015 Principals, school and department support personnel will conduct instructional to observe and monitor progress on the implementation of the framework in classrooms.
- ✓ In July 2015, middle school students will participate in a Summer STEM (Science, Technology, Engineering and Mathematics) programme to foster interest in STEM careers and pathways.
- ✓ In July 2015, primary and middle school teachers
- ✓ Establish a cadre of 3-5 highly qualified coaches who can model exemplary instruction and support zones and schools in improving mathematics teaching by June 2015

STRATEGY II: PROVEN, RESEARCH-BASED INTERVENTIONS

> *Ensure every student has immediate, consistent access to effective, researched-based, interventions which close achievement gaps in mathematics.*

Ensuring that kids who have difficulties have access to a range of proven, researched based interventions that work to close gaps in students' mathematics knowledge is critical to improving student outcomes. Students must have access to online mathematics intervention programmes that enhance understanding and provide enrichment opportunities for students that struggle. Such programmes allow parents and educators to assess gaps, provide supplemental instruction, and track progress. To accomplish this, expectations for classroom practice as well as opportunities for intensive intervention in mathematics will be established and teachers will receive training around effective intervention strategies, and programs. Teacher Leaders and Principal will oversee the implementation and monitoring of intervention strategies.

YEAR ONE KEY ACTIONS

- ✓ Beginning December 2014, Senior School Leaders and Department will build and share a plan to improve the mathematics outcomes of students at the senior level addressing curriculum, intervention and practice.
- ✓ Beginning February 2015, School Leaders and Department support persons will conduct instructional rounds in senior schools aimed and improving instruction and the use of intervention strategies in classrooms.
- ✓ By March 2015, the Department will identify and purchase critical intervention programs for middle and senior school students in mathematics that will be used to close academic gaps and support instruction.
- ✓ Establish a directory of required intervention programs and practices for each level by May 2015.

YEAR TWO KEY ACTIONS

- ✓ Beginning September 2015, the Department will provide professional development training focused on intervention strategies for teachers, math teacher leaders and principals.
- ✓ In November 2015, middle and senior school principals will ensure that all students with academic gaps in mathematics have access to an approved intervention program.
- ✓ By March 2016, the Department will identify and purchase critical intervention programs for middle and senior school students in mathematics that will be used to close academic gaps and support instruction.

STRATEGY III: RIGOROUS, RELEVANT AND ENGAGING MATHEMATICS TASKS

Provide students access to critical thinking and problem solving tasks on a daily basis by utilizing common tasks throughout each term.

Tasks require students to go beyond just identifying correct answers. Rather, good tasks allow students to critically think and to demonstrate various processes of doing mathematics such as: communicating their thinking and understanding, justifying their reasoning, problem solving, and using multiple representations of their thinking. They also require that teachers improve their approach to include more questioning, rigour and active learning (Chamberlin, 2006). It is imperative that teachers plan mathematics lessons that provide opportunities for students to engage in problems that require a productive struggle (Van de Walle J. e., 2014). As they do this, teachers also choose problems that give access to various levels of opportunities for student learning (Stein, 2000). Another feature of good classroom tasks is that they are relevant to students' backgrounds and lives as student use mathematics to empower their own lives and communities (Matthews, 2003).

SUCCESS TARGET

Provide students access to critical thinking and problem solving tasks on a daily basis by utilizing common tasks throughout each term.

YEAR ONE KEY ACTIONS

- ✓ Beginning January 2015 all Mathematics Teacher Leaders will commence ongoing training and onsite coaching for all mathematics teacher leaders around creating, modeling and utilizing rigorous and relevant problem solving tasks.
- ✓ Beginning February 2015 Primary principals will participate in a 10 hour training module focused on leading mathematics instruction aligned with rigorous mathematics tasks.
- ✓ By March 2015, the Department will communicate criteria and resources that will assist teachers in identifying engaging mathematics tasks
- ✓ Beginning May 2015, establish an online library of teacher-generated tasks for teachers to access for each year level.

YEAR TWO KEY ACTIONS

- ✓ Beginning September 2015, mathematics teacher leaders and principals ensure that all classrooms are utilizing rigorous and engaging tasks and that critical thinking and problem solving are occurring daily.

STRATEGY IV: HIGH QUALITY TEXTS AND RESOURCES

Establish a standard for high quality texts and resources to be utilized by students and teachers

Ensuring that all children and teachers have access to high quality resources that encourage problem solving and critical thinking is important to improving mathematics outcomes. Such materials will have an appropriate balance of skill development, knowledge of important concepts and understanding of processes. High quality texts and resources provide opportunities for students to discuss important ideas, strategies and concepts. This is different from those that only focus on rote procedures and drill. Effective math textbooks address the misconceptions that students bring to math classes. They encourage students to not only utilize math concepts, but to understand why certain math rules exist. High quality text and resources for mathematics will also include useful diagrams, charts, data and models. These texts and resources possess individual and group components to encourage students to share their thinking with each other and as a whole. The Department will work to ensure that all teachers and leaders utilize high quality texts and resources and know how to use them to get the best from students as they progress through the Cambridge curriculum.

SUCCESS TARGET

High quality texts and resources are utilized in all classrooms by students and teachers

YEAR ONE KEY ACTIONS

- ✓ The National Mathematics Strategy Team will initiate an assessment of current school mathematics textbooks and resources by March 2015.
- ✓ By May 2015, the National Mathematics Strategy Team will establish a list of approved mathematics texts and resources for use at every school level.

- ✓ In May 2015, Primary mathematics teachers will receive professional training focused on using one of several endorsed mathematics texts.

YEAR TWO KEY ACTIONS

- ✓ Create a textbook adoption program for all levels to support the purchase of quality text books by December 2015.
- Ensure all schools can purchase high quality mathematics textbooks for the 2016/2017 school year by June 2016.

STRATEGY V: PROFESSIONAL DEVELOPMENT FOR COACHING, CONTENT AND INSTRUCTION

Provide systemic, robust professional coaching and development in mathematics content and instructional strategies for all teachers, teacher leaders, principals and DOE instructional support personnel

In order to advance the proficiency of students in the Bermuda Public School System in mathematics, all teachers need to have a high level of knowledge and proficiency in the delivery of mathematical content and effective instructional strategies. In order to support this goal the Department of Education will concentrate on building capacity for all teachers, teacher leaders, principals, administrators, and Department officers. Professional development will come in many forms, ranging from professional learning communities to one-on-one coaching to ongoing training modules. All of these experiences will be geared toward building deep understanding of both content and strategies in order to transform teaching and learning in each classroom.

SUCCESS TARGET

Systemic, robust professional coaching and development in mathematics content and instructional strategies for all teachers, teacher leaders, principals and DOE instructional support personnel

YEAR ONE KEY ACTIONS

- ✓ In October 2014, all primary school teachers, teacher leaders, principals and support personnel will participate in an orientation to the National Mathematics Strategy.

- ✓ Utilize a Support Team Model to provide targeted whole-school professional development and coaching support over 6-9 week periods to selected schools based on need beginning November 2014.
- ✓ In January 2015, Create and establish an 80-hour certification program for all current and prospective mathematics teacher leaders. The program will consist of five modules focused on modeling exemplary instruction, building professional capacity, leading instruction, building interventions, and coaching.
- ✓ Beginning February 2015, conduct instructional rounds with principals to examine and improve the daily mathematics experience, emphasizing inquiry, problem solving, and interventions at all levels.
- ✓ Beginning February 2015, Establish a professional learner communities led by senior school mathematics teachers which meet monthly to improve mathematics practices and implement the senior school mathematics improvement plan.
- ✓ Ensure mathematics teacher leaders provide monthly professional development in each primary school on best instructional strategies beginning May 2015

YEAR TWO KEY ACTIONS

- ✓ Beginning September 2015, implement a program of systemic professional development focused on instruction and interventions for all teachers, and coaching and leadership for principals, school leaders and Department support persons.

NATIONAL MATHEMATICS STRATEGY TEAM

Team Member	Job Title
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Joann Dill	Principal Heron Bay Primary School
Holly Richardson	Principal Port Royal Primary School
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Laveta Ebbin	P6 Teacher & Teacher Leader Port Royal Primary School
Micquita Minors	P5 Teacher & Teacher Leader East End Primary School
Lisa Marshall	Former Principal Dellwood Middle School
Angelique Burgess	Middle School Math Teacher & Teacher Leader Sandys Secondary Middle School
Keisha Douglas	Deputy Principal The Berkeley Institute
Damyon Ray	Senior School Math Teacher CedarBridge Academy
Gina Monroe	Learning Support Teacher Elliot Primary School

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