Mathematics Policy

New City Primary School

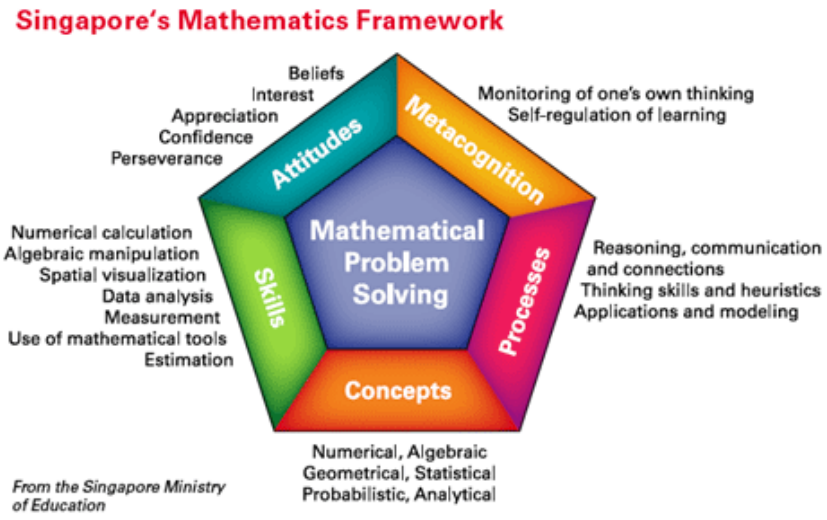
Good teaching in mathematics provides children with a balance between repetition and practice, new learning and the application of ongoing learning with appropriate challenge and high expectation. The New Mastery Curriculum encompasses the need to embed key skills as well as promote and develop greater depth of learning.

The mathematics curriculum content should be organised in ways that emphasise the connection between mathematical ideas. It should enable children to recognise how their learning fits together within the four operations, rather than appearing fragmented. The challenge for teachers in planning and learning for children is to provide the interlinked 'bigger picture' and connections which is then broken down into manageable chunks for all learners to access.

At New City, we have adopted elements of the Singapore methods of teaching in order to embed the fundamental mathematical skills we want our Learners to achieve. The Concrete-Pictorial-Abstract (CPA) approach supports such learning, alongside embedding key skills required to achieve a mathematics mastery curriculum.

Teaching and Learning in Mathematics - **The Singapore Approach:**

New City have adopted the five key principles of The Singapore Mathematics Framework (Metacognition; Processes; Concepts; Skills; Attitudes) to underpin and promote core values that are believed to encourage, enable and enhance student learning whilst ultimately developing mathematical problem solving for everyday real life contexts.



Thinking skills:

Thinking skills and heuristics are essential for mathematical problem solving. Thinking skills are skills that can be used in a thinking process such as classifying, comparing, analysing parts and whole identifying patterns and relationships induction, deduction generalising and spatial visualisation.

Heuristics are general rules of thumb of what students can do to tackle a problem when the solution to the problem is not obvious. These include using a representation (e.g. drawing a diagram, tabulating) making a guess (e.g. trial and improvement/guess and check making a supposition), walking through the process (e.g. acting it out, working backwards) and changing the problem (e.g. simplifying the problem, considering special cases)

Key approaches to learning:

Learning is about making connections:

- The spiral curriculum (curriculum approach) – connecting to extend existing knowledge and skills
- The **Concrete-Pictorial-Abstract** (C-P-A) development of concepts (pedagogical approach) that connect to make sense of learning
- **Learning experiences** (Learning approach) – connections to realise the curriculum

'The Big 5' – Ban Har:

'Ideas do not get crystallised unless they get a chance to be articulated.'

Dr Yeap Ban Har echoes the above theorists and educators by supporting their values and endorsing the following principles as key fundamentals that should be included in every Maths lesson:

- Exploration (making connections)
- Structure (to be taken place after exploration has taken place)
- Journal (*'Ideas do not get crystallised unless they get a chance to be articulated'*)
- Reflection (Element of evaluation and judgement of what they(the student/s) have said)
- Practice (Not to be confused with 'drills' or learning by rote repetition).

In order for students to make those all-important connections that are pivotal to learning, Ban Har further reinforces and links these to the following, highlighting the dual function and purpose of these examples taking place in the classroom:

- Real – world model
- Visual model
- Oral explanation
- Written explanation
- Challenge (enrichment activity)

The Teaching and Learning of Mathematics at New City should be reflective of these key principles and provide daily opportunities for these connections and skills to be taught.

Maths Mastery Teaching Timeline and Approach:

Our Maths lessons adopt a **four part structure** of:

- Anchor (Hook – opportunity for exploration)
- Guidance (Main teaching where teacher models examples)
- Independent (Students have the opportunity to practice examples themselves independently)
- Reflection (opportunity to review learning and misconceptions – plenaries, mini-plenaries)

A heavy emphasis is placed on the C-P-A approach. Research in Learning from key theorists* in education is heavily referred to in promoting students positive attributes to learning. The following are fundamental in ensuring that such key aspects are being delivered daily in the classroom:

- Opportunities for students to interact with their peers (Vygotsky)
- Concrete activities
- Exploration (Piaget)
- Safety of learning environment (Promoting 'productive failure' – learning form mistakes)

*(*Dienes, Bruner, Vygotsky, Skemp, Piaget)*

We want pupils at New City to become independent mathematical learners who are encouraged to reason and explain their learning. Such skills can be

reinforced, embedded and developed further in order to be used and applied in different contexts.

New City Maths Teaching Timeline:
The duration of a Mathematics lesson at New City is approximately 1 hour. They follow a generic format

Planning:

The curriculum overview is organised within the four operations of number (Numerical reasoning; Additive reasoning; Multiplicative reasoning and Geometric reasoning). These skills are to be taught over a 3 to 4 week block with frequent opportunities to use and apply within varying contexts such as measure and statistics.

Long term and Medium term planning in Mathematics: is based on the New City Whole School overview in Mathematics. The concepts to be taught and covered are listed accordingly. Teachers, need to ensure these are broken down into child friendly objectives that are seen to be progressive in its learning journey over the week.

Short term planning: is carried out on a weekly basis. All planning includes a skill based learning objective with succinct success criteria, **an anchor task**, a progressive teaching sequence, Key AFL strategies, key questioning, relevant vocabulary and resources.

Short term planning is collected and monitored by the maths co-ordinator and SLT.

Weekly Teaching Cycle:

Monday	Tuesday	Wednesday	Thursday	Friday
Anchor task **Exploration** **Setting the bigger picture** **C-P-A** Teaching of skills e.g. Number sense; Teaching of mental and written methods Using and applying within a given context e.g. Measure; statistics Using the bar method – problem solving Securing facts. Setting out calculations	**Anchor task** Teaching of skills e.g. Number sense; Teaching of mental and written methods Using and applying within a given context e.g. Measure; statistics Securing facts. **C-P-A** Using the bar method – problem solving Refining calculations	**Anchor task** Teaching of skills e.g. Number sense; Teaching of mental and written methods Using and applying within a given context e.g. Measure; statistics Securing facts. **C-P-A** Using the bar method – problem solving Refining calculations	**Anchor task** Teaching of skills e.g. Number sense; Teaching of mental and written methods Using and applying within a given context e.g. Measure; statistics Securing facts. **C-P-A** Using the bar method – problem solving Refining calculations	**Anchor task** Teaching of skills e.g. Number sense; Teaching of mental and written methods Teaching of skills e.g. Number sense; Teaching of mental and written methods Investigations. **C-P-A** Using the bar method – problem solving Real-life contexts.

Key Learning Documentation in Mathematics

From September 2016, these are the key documents that we will be using when planning mathematics:

- New Maths Curriculum
- Maths Overviews
- Maths No Problem
- Maths on target.
- New City Primary calculation policy
- Test Base

Mental Maths

Why mental mathematics and visualisation?

Mental mathematics is part of any mathematical activity and is the quickest way to raise standards in school. As children become more confident at seeing mathematics and working things out in their heads they become better at problem solving and reasoning as well as calculating or working with shape and measure.
Mental activity needs teaching and practice to develop efficient and effective ways of thinking and organising thoughts and ideas. We need to help children to:

- Carry and manipulate information in their heads.
- Visualise images and to interpret and analyse what they see.
- Select and organise information in a systematic and logical way identifying patterns and applying logical reasoning.

Visualisation

To use visualisation successfully, children need practical experience, along with opportunities to talk about the equipment they are using and the images they are forming in their head. They also need to learn and use the related mathematical language. Visualisation could also involve the children making some notes or jottings to help them. These should not replace the visualisation but provide support when children can no longer hold everything in their minds. Being able to listen to description, interpret the context or task and manipulate the image can be challenging for some children, so making jottings of this kind might be an important step in the development of their visualisation.

Teaching mental maths at New City

The teaching of mental maths at New City should consist of objectives taken from the key learning document and visualisation activities. Mental maths is taught everyday and activities should focus predominately on number.

Planning is undertaken at three levels:

Long term planning is based on the new New City topic overview in Mathematics.

Medium term planning are the objectives and concepts that are set out in the 'Securing Progression in Mathematics'. Teachers select the objectives and concepts that fit with the topic that is outlined in the New City overview.

Short term planning is carried out on a weekly basis. All panning includes a skill based learning objective with succinct success criteria, a mental starter, a progressive teaching sequence, key AFL strategies, key questioning, relevant vocabulary and resources.

The medium and short term planning is collected and monitored by the maths co-ordinator and SLT.

Practical Learning in mathematics

Practical learning in mathematics is essential because it helps bring together both abstract and practical everyday learning to mathematical concepts. Practical maths puts learning into a real-life context and makes it relevant. A child's learning and development in mathematics will be deeper and they will become more competent mathematicians.

Practical learning at New City

The teaching of numeracy at New City should give opportunities for children to develop their mathematics skills through practical activities. Due to the time constraints of the 45 minutes lesson teachers need to ensure that practical lessons are well planned, well resourced and simple. Children must have the opportunity to complete a short practical task followed by time for them to record their findings.

Areas of the mathematics curriculum where practical learning is necessary are weight, length, capacity, money and sometimes fractions. In KS1 practical learning is also needed when the children are beginning to understand multiplication and division. All children at New City should experience some practical learning each term. Practical learning could form the basis of the AT1 lesson on a Friday. The practical task could be used a means of solving the problem followed by the children recording what they have found out. This should only be the case when the whole school topic being covered is measure.

Teaching and Learning methods and approaches

The duration of a mathematics lesson at New City is 1 hour. They follow a generic format with teacher input and modelling (20 minutes), children's independent learning time with mini-plenaries (30 -35 minutes) and full Plenary (5 minutes).

Teaching and learning times in mathematics may vary depending on the nature of the maths beings taught or competency of the children. For example if the children are confident with the skill or concept that is being taught the teacher should give more time over for independent learning. If the children are struggling with the objective then more time should be given over for teacher modelling and explanation. However all lessons should give children time to work independently.

The teaching of mathematics at New City provides opportunities for:

- Group work
- Paired work
- Whole class teaching
- Individual work.

Pupils engage in:

- The development of mental strategies.
- Written methods
- Practical work
- Investigational work
- Problem-solving
- Mathematical discussion
- Consolidation of learning

At New City School we recognise the importance of establishing a secure foundation in mental calculation and recall of number facts before standard

written methods are introduced. We aim to set work that is challenging, motivating and encourages the pupils to talk about what they have been doing.

Display

We recognise the important role display has in the teaching and learning of mathematics by having maths work displayed in the school. Every class has a mathematics board, where possible in the main teaching area, which has number lines (relevant to the work the children are doing), number grids, vocabulary and other display materials that provide a visual support for the children's mental processes.

Assessment and Record Keeping

At New City we are continually assessing our pupils and recording their progress. We see assessment as an integral part of the teaching process and aim to make our assessment purposeful, allowing us to match the correct level of work to the needs of the pupils, thus benefiting the pupils and ensuring progress. Assessment is carried out on three levels.

Short-term assessments are an informal part of every lesson and are closely matched to the teaching objectives. These tend not to be recorded because they are for the teacher's immediate attention and action; however, pertinent comments are occasionally recorded on the reverse of the short-term planning sheets.

Medium term and long term assessments are carried out termly. The purpose of these assessments is to review and record the progress the pupils have made, measured against school and national targets. This is done by drawing on class records of Key Objectives and any supplementary notes that have been made and where applicable QCA tests.

All data is analysed by senior management, the numeracy coordinator and the Inclusion team.

All parents receive an annual written report on which there is a summary of their child's effort and progress in mathematics over the year. In addition to this, parents will also receive a half termly report card which provides information on the child's current level, the progress grade and the effort grade.

At the end of Key Stage 1 and Key Stage 2 each pupil's level of achievement against national standards is included as part of their annual written report.

Resources

Resources for the delivery of the maths curriculum are stored both centrally and in classrooms. Everyday basic equipment is kept in classrooms. Additional equipment and topic-specific items are stored centrally.

New City School uses a variety of published materials to facilitate the teaching of mathematics but recognises the need for the teaching of maths to be 'scheme assisted not scheme driven.'

Materials are constantly updated, as new and relevant items become available. The maths post holder orders new resources after consultation with the staff.

All KS1 and KS2 classrooms should keep a ready supply of support materials for the children to use in each lesson. Number lines and Number squares, where necessary should be displayed in each classroom.

Equal opportunities

As a staff we endeavour to maintain an awareness of, and to provide for equal opportunities for all our pupils in mathematics. We aim to take into account cultural background, gender and Special Needs, both in our teaching attitudes and in the published materials we use with our pupils.

Children with special educational needs

Wherever possible we aim to fully include SEN pupils in the daily mathematics lesson so that they benefit from the emphasis on oral and mental work and by listening and participating with other children in demonstrating and explaining their methods.

Where necessary teachers will, in consultation with the Inclusion Manager, set manageable mathematical termly targets . If a child's needs are particularly severe they will work on an individualised programme written in consultation with the appropriate staff.

When planning teachers will try to address the child's needs through simplified or modified tasks or the use of support staff.

Homework

Children are given mathematics homework twice a week. The first being a set times tables to learn and prepare for a weekly test, the second homework is given to further the child's learning in the current unit they are working on. The amount of homework set is about 20 minutes in both keg stages. All homework is written work, which needs marking and we encourage teachers to set work, which makes use of the home context.

September 2016

Next review September 2017