Mastery Teaching in Mathematics at Heathbrook Primary School

We believe that the vast majority of children can succeed in learning mathematics in line with national expectations at the end of each key stage. We aim to equip all pupils with the skills and confidence to solve a range of problems through fluency with numbers and mathematical reasoning.

Mathematics Planning

Whole class teaching

- Teachers plan for whole class teaching with no acceleration onto new content.
- Teachers plan to support and challenge the learning needs of all pupils through careful scaffolding, skilful questioning and carefully designed enriching exercises. Support for pupils is further provided for in mixed ability pairings.

Coherence

- The mathematics learning journey is coherently sequenced into a series of connected small steps, taken from the White Rose Schemes of Learning, which enables cumulatively sufficient knowledge to be acquired.
- Each small step builds upon children’s prior learning. Lessons focus on one small step or a series of small steps.

Lesson Structure

A. Prior learning revisited – The previous small step or steps are briefly revisited in order to prepare pupils for learning the new small step.

B. Concept introduction - The concept of the small step is introduced by showing examples of it in the world. For example, this could be achieved through objects, images and concept cartoons.

C. Vocabulary – Precise mathematical vocabulary for the small step is shared, clarified and recited by pupils.

D. Representations - Teachers carefully select concrete, pictorial and abstract representations to expose the lesson’s concept in a variety of ways. The non-concept and near-concept are also shared to support understanding further.

E. Ping-Pong - Pupils explore the concept through a variety of activities and questions which regularly move between teacher and children and back again. Mathematical Thinking strategies are used. Misconceptions are accurately identified and clear, direct feedback is provided. Pupils recite full sentences that often express key conceptual ideas or generalities. Fluency is developed through memorisation of mathematical facts.

F. Intelligent Practise - Pupils work independently or collaboratively on activities and questions that employ procedural variation (intelligent practise). The three aims of the National Curriculum should be addressed: Fluency, Reasoning and Problem Solving. Differentiation is used to support and challenge pupils.

G. Plenary – Pupils reflect on the lesson’s learning. Teachers identify pupils who struggled with the concept and need rapid intervention before the next Mathematics lesson.

Mastery Teaching Strategies
1. **Representation** – Mathematical concepts are exposed by employing concrete, pictorial and abstract representations. Concrete objects and pictorial representations are used to support learning in every year group such as bar models, part-whole models, number-lines, numicon, cubes, counters and dienes.

2. **Conceptual Variation** – A variety of relevant representations are utilised to expose a concept (concrete, pictorial and abstract). Children are exposed to the concept, non-concept and near-concept.

3. **Procedural Variation (Intelligent Practise)** – Questions/activities are carefully varied to avoid tasks becoming merely a mechanical exercise where no understanding is required.

4. **Mathematical Thinking** – Teachers and children explore a concept through a variety of question types such as the following: 'True or False?', 'What's the same and what's different?', 'Odd one out', 'Do you agree or disagree?', 'Explain your reasoning', 'How do you know?', 'Can you prove it?', 'What does your partner think?'

5. **Mathematical Language** – Teachers and children use precise mathematical vocabulary, embedded in full sentences. New vocabulary is introduced to and recited by children. Teachers use the non-statutory guidance within the National Curriculum to extend children’s language.

6. **Coherence** – Learning is organised into Blocks and broken down into a series of connected Small Steps with each building on the children’s prior learning. Each lesson focuses on one or a series of small steps.

7. **Fluency** – After exposure to a concept, pupils memorise mathematical facts, such as times tables and number bonds. This prevents cognitive-overload when pupils undertake problem-solving and reasoning activities. Frequent opportunities for additional practise should take place outside of the lesson in order to develop fluency.

8. **Differentiation** – Teachers plan for whole-class teaching with no acceleration onto new content (unless a child has a significant learning difficulty and is also significantly well below age-related expectations). Children learn in carefully planned mixed-ability pairs and mixed-ability tables. Struggling learners are supported by the use of additional concrete objects and pictorial representations (e.g. cubes, numicon, times table squares, number lines and place value grids). Adults can provide additional support to learners during the lesson. Pupils are challenged through skilful questioning from an adult. Teachers prepare ‘Diving Deeper’ activities to provide further challenge and stretch the learning of rapid graspers. These are particularly challenging and enriching activities.

9. **Recitation** – Teachers use repetition of planned sentences that express key conceptual ideas or generalities. Teachers may utilise an ‘I say it; you say it’ approach to express ideas.

10. **Potential Misconceptions** – Teachers plan for and address areas of the lesson concept that children may find challenging. Teachers expose/work through misconceptions during modelling.

11. **Ping-Pong** – During the lesson input and as the lesson’s concept is explored, ideas and activities regularly move from teacher to children and back again. Working this way maintains children’s engagement and allows them to explore a concept thoroughly. The Ping-Pong approach emotionally enables pupils to succeed in the lesson as it allows teachers to address misconceptions and support struggling learners rapidly.

**Resources**

Teachers plan and deliver lessons using the support from a range of high-quality resources, including:

- Department for Education approved textbooks – ‘Power Maths’ and ‘Maths No Problem’.
- White Rose Schemes of Learning, assessments and lesson materials.
- ‘Classroom Secrets’ materials.
- ‘Master the Curriculum’ materials.
- Pearson’s ‘Pinpoint Maths – problem solving and reasoning challenge cards’.
Representations

Bar models

Bar models are used in many topics to help solve problems.

<table>
<thead>
<tr>
<th>Addition</th>
<th>Subtraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 + 30 = ?</td>
<td></td>
</tr>
<tr>
<td><img src="image1" alt="Addition Diagram" /></td>
<td><img src="image2" alt="Subtraction Diagram" /></td>
</tr>
<tr>
<td>60 + 30 = 90</td>
<td></td>
</tr>
<tr>
<td>90 − 30 = ?</td>
<td></td>
</tr>
<tr>
<td><img src="image3" alt="Subtraction Diagram" /></td>
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</tr>
<tr>
<td>90 − 30 = 60</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Multiplication</th>
<th>Division</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 × 5 = ?</td>
<td></td>
</tr>
<tr>
<td><img src="image4" alt="Multiplication Diagram" /></td>
<td><img src="image5" alt="Division Diagram" /></td>
</tr>
<tr>
<td>4 × 5 = 20</td>
<td></td>
</tr>
<tr>
<td>25 ÷ 5 = ?</td>
<td></td>
</tr>
<tr>
<td><img src="image6" alt="Division Diagram" /></td>
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</tr>
<tr>
<td>25 ÷ 5 = 5</td>
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</tbody>
</table>

Part Whole Models

Part Whole models can also be used to represent different calculations and problems.

![Part Whole Models Diagram](image7)

Number Lines

Number lines can be used for counting forwards and backwards and are useful for all four operations.

![Number Line](image8)