The Newark Hill Academy Approach to Maths

Aims of Teaching Maths

In line with the National Curriculum (2014), the teaching of maths within the school should aim for children to:

- Become fluent in the fundamentals of mathematics, including practice at increasingly complex problems, so that children can use and apply their knowledge practically
- Solve problems by applying their mathematics to a variety of routine and non routine problems with increasing sophistication, including breaking down problems into smaller steps and persevering.
- Reason mathematically by following a line of enquiry, establishing relationships and generalisations, and developing an argument, justification or proof using mathematical language.

The National Curriculum programmes of study for mathematics also states:

The expectation is that the majority of pupils will move through the programmes of study at broadly the same pace. However, decisions about when to progress should always be based on the security of pupils' understanding and their readiness to progress to the next stage. Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.

Our Mathematical Approach

At Newark Hill Academy, we strongly believe in developing Mastery through **whole class teaching** so that it is:

- achievable for all.
- accessible to all.
- sustainable, where children have the ability to build on something that has already been sufficiently mastered. By providing longer time on key topics, it ensures learning is deep and embedded.
- develops both factual/procedural and conceptual fluency, with an ability to reason about a concept and make connections.

Lessons are planned using the '**Differentiation by Depth**' strategy. In every lesson, all the children are given the opportunity to build on their knowledge, skills and understanding as they engage with problems at different depths.

Teachers plan for ***Intelligent Practice-*** this type of practice supports children to build conceptual understanding, at the same time as developing procedural fluency. We believe this is the type of practice all pupils need to develop sustained mathematical learning.

Carefully structured ***questioning*****,** combined with ***exercises that employ variation***, provide children with the opportunity to practice calculation whilst, at the same time, encouraging the children to think about the relationships within the maths, thus deepening conceptual knowledge and helping them build mathematical connections. These questions probe the depth of pupils' understanding, enabling all pupils to be challenged within the context of whole class teaching because we believe they can be answered at different levels of sophistication. All pupils benefit from such questions because they encourage pupils to engage with and understand concepts more deeply.

We believe we can meet the needs of most pupils without differentiation of lesson content.

This can be achieved by:

i. Ensuring that in **every lesson**, most children are able to access deeper learning opportunities within their Fluency practice, Problem Solving and Reasoning questions, in order to Master the specific area of Maths that is taught.

ii. Incorporating **skilful questioning** within whole class teaching.

Deeper understanding can be achieved for all pupils by questioning that asks them to articulate **HOW** and **WHY** different mathematical techniques work, and to make deep mathematical connections. As pupils' mathematical education continues, they experience deep, sustainable learning of increasingly sophisticated mathematical ideas.

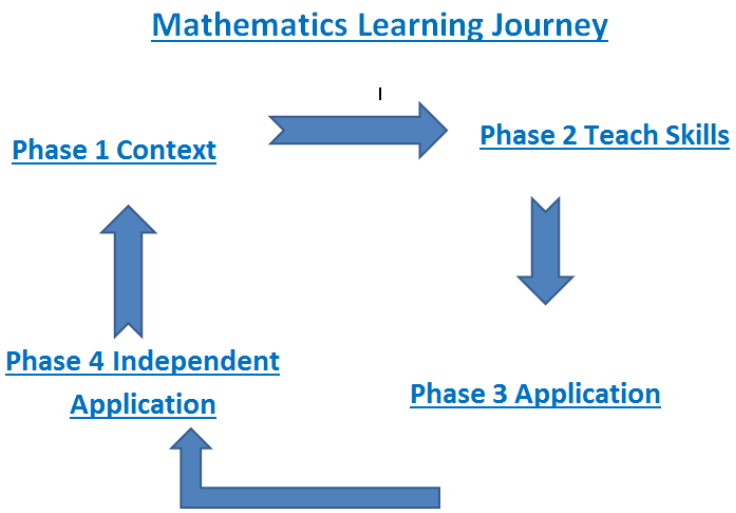
iii. Ensuring that any **pupils having more difficulty** in grasping any particular aspect of curriculum content are **identified very rapidly** and provided with **extra support** to help them master that content before moving on to new material.

Same day intervention can provide the necessary support to secure learning before the next lesson. This requires rapid formative assessment and mechanisms for enabling pupils to access support as soon as the need has been identified.

Planning and Teaching of Mathematics: The Learning Journey Approach.

At Newark Hill Academy, we believe that Problem Solving is at the heart of every Maths unit.

The Phases in our Learning Journey ensures that we plan in a **logical skill based order** to ensure that children develop deep understanding of the mathematical concepts that are taught and are able to make clear connections.



The phases of the Learning Journey include:

1: **Context**- a Whole Class Problem (with elements of Mastery) is shared with the children; this is cross curricular and based around the theme of the topic that the children are learning that half term e.g. The Great Fire of London. Children attempt to solve this problem on their own as a pre- assessment. Through key questioning/careful scaffolding by the teacher, the children discuss which skills they need to solve the problem. Using the skills sheet as a self-assessment tool, they reflect on where they are at the start of the Learning Journey.

2: **Teach the skills**- the skills (needed to solve the Whole Class Problem) are taught in a logical order- this can take place from 2- 6 maths sessions. This allows flexibility on a particular topic, allowing longer time if necessary in order to understand concepts more deeply and embed learning. In every lesson, children are given the opportunity to practise fluency, problem solving and reasoning skills.

3. **Application-** Once the skills have been mastered, the children refer back to the whole class problem and reflect on the skills they have been taught. As a class, the problem is solved, with the teacher modelling key skills/strategies.

4. **Independent application-** the children get an opportunity to solve an independent problem which allows them to show mastery of the skills they have been taught.

Throughout the learning journey, the children reflect on their learning at three crucial stages- start of the problem, after each skill is taught and at the end of the problem. The skills sheet is displayed on the Working Wall and in books.

Daily Lesson Structure:

To ensure that we have a consistent approach across school, below are the following elements that are included in a typical 'skills' based lesson. **Most of the children are taught and given the same content**, although some children will progress through this at a different pace within the lesson. Children are further supported through practical resources, appropriate questioning by the teacher and guided groups supported by an adult.

Arithmetic: (2 - 4 questions) This time is designated for children to focus on calculation strategies, both mental and written forms, and should be used as an opportunity for them to continually work on and refine these skills. The development of skills which should be covered in these sessions is clearly outlined in the calculation policy.

Fluency: (6- 8 questions) This part of the lesson enables the children to become fluent in the fundamentals of mathematics through Intelligent Practice. They can develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately. The teacher should use this time for the teaching and modelling of the new skills and objectives in line with the National Curriculum. Formal written methods can be practised in this section of the lesson by carefully following the clear progression of skills outlined in our calculation policy. This is also time for the children to access concrete, pictorial and abstract representations to support them in achieving their objective. Guided group work is imperative at this point of the lesson in order to give children instant verbal feedback, live mark, model how to solve using written methods and pose questions to the children to push their learning on. As soon as a child has shown secure knowledge of the fluency element of the lesson, they should swiftly be moved on to the Problem Solving task.

Problem Solving: (3 – 5 questions) Problem solving is interpreted as working through a series of related and predictable questions in order to acquire a particular skill. It is about engaging with real problems; guessing, discovering, and making sense of mathematics. Problem solving skills include: • Working systematically • Trial and improvement • Logical reasoning Spotting patterns • Visualising • Working backwards • Conjecturing

Reasoning: (2- 4 questions) This part of the lesson is fundamental to knowing and doing mathematics. It enables children to make use of all their other mathematical skills and so reasoning could be thought of as the 'glue' which helps mathematics makes sense. In this part of the lesson children might: • Evaluate situations • Select problem-solving strategies • Draw logical conclusions • Develop solutions • Describe solutions • Reflect on solutions.

Talk Partner Task: This element of the lesson can be introduced at the start (linked to the Whole Class Problem) or end of a lesson (as a Plenary). This enables the children to access high level skills of comparing, explaining and justifying. A statement is posed related to their topic that is being taught and the children have the opportunity to share not only how they come to an answer but also describe how and why it worked, and how their method is the same or different to those of others through discussion with a partner. At this point of the lesson, there is great scope to introduce and/or revise mathematical vocabulary with the children. A list of year group appropriate vocabulary can be found in our Mathematical Vocabulary document

Self-assessment bar: The self-assessment bar is placed next to the day's learning objective. Children self-assess by colouring each element using red, amber or green to show how they have fared after completing each section.

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Continuous Provision

At Newark Hill Academy, we believe that there are many opportunities throughout the day to reinforce/teach basic key concepts in Maths such as: times tables, telling the time, fractions, decimals and percentages, money, shapes, numbers, temperature etc. These purposeful conversations with children are carefully planned into the timetable and become embedded as part of the daily routine. Practical resources to support the teaching of these concepts are clearly displayed in class for the children/teacher to refer to.

Learning Walls

Each class has a Maths Learning Wall, which displays the whole class problem, skills sheet, key vocabulary and model and images used to the support the teaching of the key skills. As well as this, there are opportunities for children's work to be displayed which shows good examples of key skills taught. Ownership of the working wall encourages the children to use the wall more as a resource to help with their learning. The working wall is updated for each new problem/unit.

Arithmetic

As well as daily Arithmetic practice, every fortnight, the children complete an Arithmetic test which focuses on key skills based on the four calculations. This time is designed for the children to practise the calculation strategies, both mental and written forms, as well as receive detailed feedback which gives them an opportunity to continually work on and refine these skills. The development of skills which should be covered in these sessions is clearly outlined in the calculation policy.

Times tables:

We strongly believe that knowledge of the times tables is crucial to developing the fluency needed to succeed in Mathematics. From year 2 onwards, children are tested on their times tables weekly to ensure that they meet end of year expectations; this data is monitored by the Maths/Times Table Leader and built on year on year. By Year 4, the expectation is that children should know all the times tables up to the 12x table.

There are three levels of testing for each times table: Bronze (testing times table in order) Silver (testing times table out of order) and Gold (testing division facts related to the times table). Mastering a times table is celebrated at Newark Hill, with children receiving rewards at each stage. When the children have mastered all the times tables, they are called a 'Times Table Champion'- this allows them to move on to the next stage of testing- where they use and apply their times table knowledge in other contexts. Additional resources such as Times Table Rock Stars, PIXL Times Table App, Online games/songs are used as part of the daily routines to develop fluency.

Calculation Policy

The Calculation Policy has been adapted to meet the demands of the new curriculum. It clearly shows the progression of skills for each strand, across the year groups, and can be found on the server or in hard copy. Professional judgement should be used to ensure that children are working on and using appropriate methods for their attainment levels. **For consistency ONLY the methods set out in the Calculation Policy should be taught.** Any questions regarding the teaching of the methods within the Calculation policy need to be addressed to the SLT.

Resources

Within the new Calculation Policy there is a particular focus on ensuring that lessons are kept as practical as possible, specifically focusing on the use of place value counters, dienes

and Numicon. Each year group has access to a set of resources and are readily available for use.

Maths boxes are available for children to use within lessons and these are kept stocked up with resources that children may need to access on a regular basis. In line with the National Curriculum, other resources should also be available within the classroom and children should know where they can go to in order to find these, and are aware that this is the first step in helping themselves if they become stuck or are unsure on a question.

*children with severe SEN needs do not fall into this criteria and will be planned for separately according to their specific needs.