



Mathematics Policy

2021-2022

Northbourne CE Primary School
Cockcroft Road,
Didcot
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'The only way to learn mathematics is to do mathematics': Paul Halmos

'There is a difference between not knowing and not knowing yet': Sheila Tobias

'Learning mathematics is about looking at what you thought you understood and seeing that there's deeper mystery there than you realised': Dan Finkel

The National Curriculum states that “mathematics is a creative and highly inter-connected discipline. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject”.

At Northbourne, we agree that maths is a creative discipline that can stimulate moments of pleasure and wonder when a pupil solves a problem for the first time, discovers a more sophisticated solution to a problem or suddenly sees hidden connections. Our aim is for all children to enjoy mathematics and have a secure and deep understanding of fundamental mathematical concepts and procedures when they leave us to go to secondary school. We want children to see the mathematics that surrounds them every day and enjoy developing vital life skills in this subject.

We use the Programmes of Study from the National Curriculum to ensure pupils develop:

- Competence and confidence in mathematical knowledge, understanding and skills
- A positive attitude towards maths
- An ability to solve problems, reason, think logically, and work systematically and accurately
- Initiative, independence and perseverance when faced with mathematical problems and challenges
- An ability to use and apply mathematical understanding and skills to problems across the curriculum and in real-life contexts
- An ability to communicate mathematical understanding

Through careful planning, we ensure that pupils are given motivating, interesting and well-differentiated opportunities to learn through and from:

- Practical activities and maths games
- Problem solving, including problems using real-life and everyday contexts
- Individual, group and whole-class discussions and activities
- Open-ended, 'low threshold, high ceiling' investigative activities
- A range of methods of calculating, including mental, pencil-and-paper and using a calculator

We know that effective teachers cultivate an ethos where pupils can make mistakes and errors as part of learning and are prepared to take risks. We strive to create teaching and learning environments where pupils feel comfortable asking for help with their maths, and where mistakes and misunderstandings are shared openly.

1. Our Mastery approach to Maths

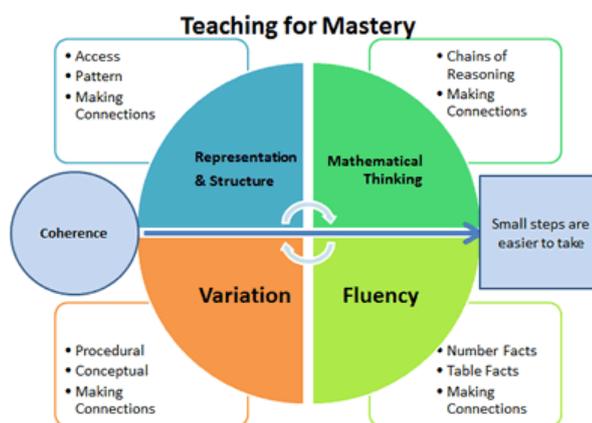
At Northbourne, we have adopted a mastery approach in the learning and teaching of mathematics, which is being embedded across the school. The main aim of such an approach, and development of a curriculum model that values 'going deeper', is to ensure that our children develop a secure knowledge of mathematical concepts, so that those pupils beginning their education at school are able to access age-appropriate ideas and do not see gaps open in their learning over time. Integral to this is the school's vision for mathematics which, '...rejects the idea that a large proportion of people 'just can't do maths,' [and aligns with the] 'belief that by working hard at maths they can succeed' (NCETM – 'The Essence of Maths Teaching for Mastery', 2016).

The rationale behind using this approach to teaching mathematics lies within the 2014 National Curriculum, which states:

- The expectation is that most pupils will move through the programmes of study at broadly the same pace;
- 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 teaching for mastery is underpinned by the NCETM's 5 Big Ideas:

- Opportunities for **Mathematical Thinking** allow children to make chains of reasoning connected with the other areas of their mathematics;
- A focus on **Representation and Structure** ensures concepts are explored using concrete, pictorial and abstract representations, the children actively look for patterns and generalise whilst problem solving;
- **Coherence** is achieved through the planning of small, connected steps to link every question and lesson within a topic;
- Teachers use both procedural and conceptual **Variation** within their lessons and there remains an emphasis on **Fluency** with a relentless focus on number and times table facts.



FLUENCY – REASONING – PROBLEM SOLVING

These three key aims of the National Curriculum are addressed in each sequence of learning.

Through our lessons, teachers aim to promote connections within and across National Curriculum domains, so that children are taken deeper with their learning over time and recognise the interconnectedness of concepts. It is also intended that pupils revisit concepts, for example, multiplication within area when presented as an array model, which means that pupils absorb learning within their long-term memory. This revisiting should occur both within maths as well as across subjects, such as in Science, PE and Music.

Varied use of practical resources, structures and representations, plus questioning that requires deeper reasoning, is used to ensure all children are supported/challenged appropriately. A progression in key representations and structures, leading to understanding of sometimes complex and abstract concepts, has been defined and is exemplified in our Calculation Policy. This in turn supports the delivery of consistent approaches and equity of access for learners.

Teaching for Mastery Principles

- **It is achievable for all** – we have high expectations and encourage a positive ‘can do’ mindset towards mathematics in all pupils, creating learning experiences which develop children’s resilience in the face of a challenge and carefully scaffolding learning so everyone can make progress.
- **Deep and sustainable learning** – lessons are designed with careful small steps, questions and tasks in place to ensure the learning is not superficial.
- **The ability to build on something that has already been sufficiently mastered** – pupils’ learning of concepts is seen as a continuum across the school.
- **The ability to reason about a concept and make connections** – pupils are encouraged to make connections and spot patterns between different concepts (E.g. the link between ratio, division and fractions) and use precise mathematical language, which frees up working memory and deepens conceptual understanding.
- **Conceptual and procedural fluency** – teachers move mathematics from one context to another (using objects, pictorial representations, equations and word problems). There are high expectations for pupils to learn times tables, key number facts (so they are automatic) and have a true sense of number. Pupils are also encouraged to think whether their method for tackling a given calculation or problem is Appropriate, Reliable and Efficient (A.R.E).
- **Problem solving is central** – this develops pupils’ understanding of why something works so that they truly have an appreciation of what they are doing rather than just learning to repeat routines without grasping what is happening.
- **Challenge through greater depth** - rather than accelerated content (moving onto next year’s concepts), teachers set tasks to deepen knowledge and improve reasoning skills within the objectives of their year group.

2. Curriculum design and planning

Three layers of planning are used to guide teaching and learning in maths:

- **Long-term planning**
Teachers follow White Rose Primary Schemes of Learning, which outlines when each block is taught, to ensure consistency and full coverage of the maths curriculum across the whole school.
- **Medium-term planning**
At the start of each unit of work, teachers use previous assessments and records of attainment to determine the ‘flow’ of teaching within the block. This will typically include notes on how many days will be spent on each key objective, where teaching will be ‘back-tracked’ to fill in any gaps in knowledge, and the mental strategies that will be taught. Teachers use their own formats for this level of planning, typically informal notes and jottings, as these encourage teachers to adapt teaching where necessary throughout the unit.
- **Short-term (weekly) planning**
Prior to the start of each week, or small step within a block, teachers plan each day of teaching in more detail. Teachers are encouraged to use a format which they find most helpful; however, the objective being addressed each day (tightly linked to the current National Curriculum) must be shown as a minimum. This planning is uploaded onto the teacher’s shared drive to allow it to be shared with colleagues and supply staff and monitored by the maths subject leader and the Senior Leadership Team (SLT).

Staff use White Rose Maths Schemes of Learning as a starting point in order to develop a coherent and comprehensive conceptual pathway through the mathematics. The focus is on the whole class progressing together. Collaborative planning with year group colleagues is encouraged to ensure consistency. Learning is broken down into small, connected steps, building from what pupils already know. Difficult points and potential misconceptions are identified in advance and strategies to address them planned. Key questions are planned, to challenge thinking and develop learning for all pupils. Contexts and representations are carefully chosen to develop reasoning skills and to help pupils link concrete ideas to abstract mathematical concepts.

The use of high-quality materials and tasks to support learning is integrated into lessons.

Teaching resources which are typically used within a week are:

- White Rose Maths Schemes of Learning and Assessment Materials
- Classroom Secrets
- I See Reasoning
- Maths of the Day
- Maths – No Problem!
- NCETM Mastery materials
- NRICH
- Number Blocks

Opportunities for extra fluency practice (instant recall of key facts, such as number bonds, times tables, division facts, addition and subtraction facts) should be provided outside mathematics lessons (morning starters or post-lunch).

All the above decisions taken, in terms of curriculum design and learning/teaching, are inextricably linked to necessary Continuing Professional Development (CPD) for teaching staff. School leaders ensure a range of CPD is made available for staff, which means that increasing consistency is gained across all year groups. Taking into account ACME’s ‘[Professional learning for all teachers of mathematics](#)’ (2016) report, whereby it is stated, ‘highly-effective teachers of mathematics have a positive disposition towards the subject and are comfortable in exploring mathematical ideas with their learners,’ the most effective CPD experiences result in this being a key impact on our teaching staff.

3. Class organisation and lesson structure

From Reception to Year 6, classes are organised with a focus on both year groups and ability groups linked to levels of attainment:

Puffins, Miss Sophie Tierney: Reception	Swans, Mrs Sharon Stanley: Reception	
Nightingales, Mrs Jenny Alleway: Year 1/2	Robins, Miss Zoe Murray: Year 2	Wrens, Mrs Rebecca Parsons: Year 1/2
Owls, Miss Jessie Kellock: Year 3/4	Hawks, Mr David Macfarlane: Year 3/4	Falcons, Mrs Anna Conway: Year 4
Kites, Miss Charlotte Rawcliffe: Year 5/6	Kestrels, Mr Dan Guy: Year 5/6	Eagles, Miss Lyn Hill/Mr Rob Woods: Year 6

Each pupil has a daily maths lesson. In Foundation Stage and Reception, this lasts for around 30 minutes; in KS1 and throughout Key Stage Two, the daily maths lesson lasts for one hour.

From Foundation Stage to Year 6, teachers lead the main taught input of the lesson, although this may be followed up by guided group work led by either a teacher or a teaching assistant. In Foundation Stage, learning is followed up in continuous provision, and in Key Stage One maths activities are available for the children to access independently during exploring time.

The structure of a daily maths lesson is flexible, with the starting position of a lesson adapted according to the context. A lesson will typically include a mental maths element and recap of previous learning, with explicit connections being made to that lesson's objective ("Yesterday, we learnt A so that today we can learn B"). The bulk of the lesson input will be a 'ping pong' format of 'I do, We do, You do', with the lesson alternating between guided and independent practice, during which time the teacher circulates to further support or challenge pupils. The lesson will finish with independent practice, followed by a plenary, during which learning may be recapped, children may share their learning or questions may be asked of the children to enable them to evaluate their success during the lesson.

Key aims of teaching:

- Lessons are sharply focused; digression is generally avoided.
- Key new learning points are identified explicitly.
- There is regular interchange between concrete/contextual ideas, pictorial representations and their abstract/symbolic representation.
- Mathematical generalisations are emphasised as they emerge from underlying mathematics, which is thoroughly explored within contexts that make sense to pupils.
- Making comparisons is an important feature of developing deep knowledge. The questions "What's the same, what's different?" are often used to draw attention to essential features of concepts.
- Repetition of key ideas (for example, in the form of whole class recitation, repeating to talk partners etc) is used frequently. This helps to verbalise and embed mathematical ideas and provides pupils with a shared language to think about and communicate mathematics.
- Teacher-led discussion is interspersed with short tasks involving pupil to pupil discussion and completion of short activities.
- Formative assessment is carried out throughout the lesson; the teacher regularly checks pupils' knowledge and understanding and adjusts the lesson accordingly.
- Gaps in pupils' knowledge and understanding are identified early by in-class questioning. They are addressed rapidly through individual or small group intervention, either with class teacher, teaching assistant or specialist maths TA, either on the same day or the next day, which may be separate from the main mathematics lesson, to ensure all pupils are ready for the next lesson.
- Teachers discuss their mathematics teaching regularly with colleagues, sharing teaching ideas and classroom experiences in detail and working together to improve their practice.

Every classroom provides a rich maths environment. This typically consists of displays of key vocabulary and mathematical images, pictures and models. All classes also have a maths working wall or working space to act as a record of what is currently being learned in maths; for example, the calculation methods currently being learned. Key maths resources, such as calculators, and counting equipment, such as multilink cubes or number lines, are either on display in the classroom or easily accessible to pupils, who are encouraged to access these resources themselves when they are needed. Foundation Stage and Key Stage One free-flow activities always include maths games, puzzles or other activities to ensure pupils are encouraged to apply their mathematical skills outside of the daily lesson. Similarly, teachers across the whole of the school ensure they exploit all opportunities across the curriculum to ensure mathematical skills and understanding are used and applied as widely as possible.

4. Teaching

To ensure maths teaching is motivating and interesting, a range of approaches are used. However, as far as possible, activities set in maths are open-ended and have a problem-solving context. This may be as simple as introducing a new calculation method in the context of an everyday problem in which the calculation may be used. This approach helps pupils make connections between different aspects of maths, ensures the use and application of maths methods remains at the centre of teaching within the subject, and contributes to the development of a classroom ethos where children feel confident to take risks and learn from their own mistakes.

Open-ended, extended investigative work is also used widely, often through paired or group work where pupils are encouraged to discuss and explain their thinking, reasoning and methods. Right from the start of school, pupils are encouraged to develop their mathematical vocabulary through discussion with peers and are encouraged to verbalise their mathematical thinking and strategies to enable misconceptions to be uncovered and addressed.

Throughout all these approaches, a range of practical resources are used to aid pupils' understanding; this is the case throughout all year groups. Visual models are also used widely in maths to reinforce pupils' understanding.

We acknowledge that, sometimes, drill-and-practise exercises may be needed for pupils to consolidate their understanding of a calculation method. However, repetitive worksheets and textbooks are used sparingly in maths teaching, with rich tasks being the preferred activities to use when teaching. It is also possible to make drill-and-practice activities more open-ended and challenging through, for example, the use of dice and number cards for pupils to generate their own calculations and problems.

5. Inclusion and Special Educational Needs

Northbourne aims to meet the needs of all, considering gender, ethnicity, culture, religion, language, disability, age and social circumstances. The provision for children with special needs is detailed in the SEND Policy and information report. SEN pupils may be supported by additional adults, different resources or differentiated activities. They may also complete additional activities outside of the maths lesson or be taught in a smaller group size. Intervention support, outside of the daily maths lesson, is provided by class teachers, class TAs and our specialist Maths TA. We have high expectations of all children and strongly believe that all children are able to achieve in mathematics. Some may take longer to grasp concepts and may need careful scaffolding or extra time/support.

6. Differentiation

Despite having developed a mastery approach in the learning and teaching of mathematics, we are aware that some children will have gaps in their pre-requisite knowledge. Consequently, our medium-term planning has been designed to consider cases where 'catch-up' is still required.

Pupils progress through curriculum content at broadly the same rate, although support/intervention and broader opportunities are provided to move groups of children on so that they are able to:

- Grasp concepts and methods, e.g. through more varied use of practical equipment – in the case of lower attainers.
- Be challenged through exposure to greater depth in their learning, e.g. through tackling more complex problems in different contexts - in the case of higher attainers/rapid graspers.

As a result, differentiation is sometimes likely to appear to be more subtle than before. Practise and consolidation play a central role in pupils' learning experiences. Although the 'pace' in lessons may appear to be slow, this could

mask development of deep understanding of mathematical concepts through use of small steps. Further challenge is provided to all children through use of problem solving, which may or may not be linked with a real-life context.

In cases where children's learning is most effectively being deepened, the following descriptors can be seen in their learning:

Depth:

- describe it in his or her own words;
- represent it in a variety of ways (e.g. using concrete materials, pictures and symbols – the CPA approach)⁸
- explain it to someone else;
- make up his or her own examples (and non-examples) of it;
- see connections between it and other facts or ideas;
- recognise it in new situations and contexts;
- make use of it in various ways, including in new situations.⁹

Greater depth:

- solve problems of greater complexity (i.e. where the approach is not immediately obvious), demonstrating creativity and imagination;
- independently explore and investigate mathematical contexts and structures, communicate results clearly and systematically explain and generalise the mathematics.

NCETM – [‘Teaching for Mastery: Questions, tasks and activities to support assessment’ \(2015\)](#)

7. Assessing

We understand the need for children to achieve key objectives for their current stage of learning. Such assessment links with day-to-day Assessment for Learning, which informs teachers about the elements of learning pupils need to develop further. In lessons, teachers use precise questioning to check conceptual and procedural knowledge. They formatively assess how misconceptions can be used as growth points in learning, whilst also diagnosing who requires intervention, meaning that all children are expected to ‘keep up’ rather than ‘catch-up.’ Work in books and informal observations made by teachers and teaching assistants throughout all parts of the maths lesson, including any guided group sessions, are used to develop a picture of each pupils’ abilities across all the strands in the maths curriculum. Summative assessment gathering is kept meaningful and is viewed as a diagnostic tool whereby collated information is used purposefully when planning pupils’ next steps.

At the end of each unit or objective, Target Tracker is used to assess a child’s achievement of related objectives. This information is used by class teachers the following academic year to identify gaps in children’s learning.

8. Marking

Marking of mathematics books is completed in line with the Northbourne marking policy.

Work in maths can generate a great deal of marking. To help address this, as well as to promote independence, pupils in Key Stage 2 are encouraged to mark work themselves using a calculator, where appropriate, or detailed marking may be rotated between groups throughout the week. The quality of marking is crucial; a mark to indicate an incorrect answer is of little help to a child unless accompanied by an explanation of the problem, and the explanation of the problem is useless unless it is read, understood and used by the child. ‘Helicoptering’ marking is encouraged of all staff, providing children with instant feedback. This does not withdraw from their independence

but is rather used to identify children who may be struggling and provide support. Children are expected to fix their mistakes immediately in the lesson, or during the following lessons, using purple pen. Next steps are not necessary as the next lesson is normally the next step in learning. However, it is essential that all marking picks up and addresses any misconceptions/mistakes and thorough questioning ensures children have clarified their thinking clearly.

9. Early Years Foundation Stage (EYFS)

Children in EYFS explore mathematical concepts through active exploration and their everyday play-based learning. Children are taught key concepts and develop number sense using a hands-on practical approach. EYFS practitioners provide opportunities for children to manipulate a variety of objects which supports their understanding of quantity and number. Pupils explore the 'story' of numbers to twenty and the development of models and images for numbers as a solid foundation for further progress. The CPA approach is used when teaching children key mathematical skills. Practitioners allow children time for exploration and the use of concrete objects helps to support children's mathematical understanding. Mathematics in the early years provides children with a solid foundation that will enable them to develop skills as they progress through their schooling and ensures children are ready for the National Curriculum.

10. Subject leader

The maths subject leader for 2021-22 is Miss Charlotte Rawcliffe, supported by the team leaders of different age phases in the school.

Role of the Subject Leader

- Ensures teachers understand the requirements of the National Curriculum and supports them to plan lessons. Leads by example by setting high standards in their own teaching.
- Leads continuing professional development; facilitates joint professional development – especially Lesson Study; provides coaching and feedback for teachers to improve pupil learning.
- Leads the whole-school monitoring and evaluation of teaching and learning in mathematics by observing teaching and learning in mathematics regularly; analysing assessment data in order to plan whole school improvement in mathematics; conducting work scrutiny to inform evaluation of progress; conducting pupil interviews.
- Takes responsibility for managing own professional development by participating in external training, independent private study, engaging in educational research and scholarly reading and keeping up to date with Teaching for Mastery developments.
- Keeps parents informed about mathematics issues.
- Ensures that the school's senior leaders and governors are kept informed about the quality of teaching and learning in mathematics.
- Works in close partnership with the school's senior leaders to ensure the learning needs of all pupils in mathematics are met effectively.
- Keeps the school's policy for mathematics under regular review and ensures this is implemented consistently.