Bill Quay Primary School

Policy for Mathematics

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Rationale

At Bill Quay Primary School, we believe that all pupils are capable of succeeding in mathematics and teach a well-structured and coherent curriculum that develops pupils' deep structural knowledge and the ability to make connections.

Our approach:

- makes use of mathematical representations that expose the underlying structure of the mathematics;

- helps children to make sense of concepts and achieve fluency through carefully structured questions, exercises and problems that use conceptual and procedural variation to provide 'intelligent practice;

- blends whole class discussion and precise questioning with intelligent practice and, where necessary, individual support;

- ensures there are many opportunities throughout the year for revisiting and reinforcing key objectives.

Intent

Our intent is to provide pupils with a mathematics curriculum that will allow them to become confident individuals through developing their mathematical skills to their full potential. We also aim to present maths as a challenging, exciting, creative and relevant subject in order to promote a positive and confident attitude.

Our aims in teaching mathematics are to:

- enable pupils to be proficient, competent and confident mathematicians and have the ability to solve mathematical problems;

- promote positive attitudes towards mathematics, and thus develop pupils' confidence;

- promote enjoyment and curiosity in mathematics, and the understanding of mathematics in our world;

- use mathematical equipment and vocabulary to develop both mental and written strategies;

- develop the ability to communicate mathematics with confidence through the teaching of key mathematical language;

- develop an understanding of mathematics through a process of enquiry, experiment, reason and investigation;

- consolidate learning and concepts through repetition and intervention to acquire solid foundations for fluency of mathematics.

Implementation

At Bill Quay Primary, we use the National Curriculum for Mathematics (2014) as the basis for teaching maths, referring also to the DfE 'ready-to-progress criteria to support planning. These criteria have been identified as being essential objectives that pupils need to master before progressing from one year group to another.

Our curriculum is one in which:

- both procedural fluency and conceptual understanding is recognised as being equally important;

- there is sufficient time for each concept or skill to be understood in depth;

- the content builds in small steps. Once a concept or skill has been learnt, it is built upon and applied in the learning that follows;

- pupils in the same year group, wherever possible, study the same concepts and skills;

- exposes pupils to multiple methods for solving a mathematical problem so that they can decide on the most efficient method.

- incorporates the principles of a Mastery Curriculum.

Underpinning the teaching of mastery in maths are the NCTEM's five 'big ideas'.
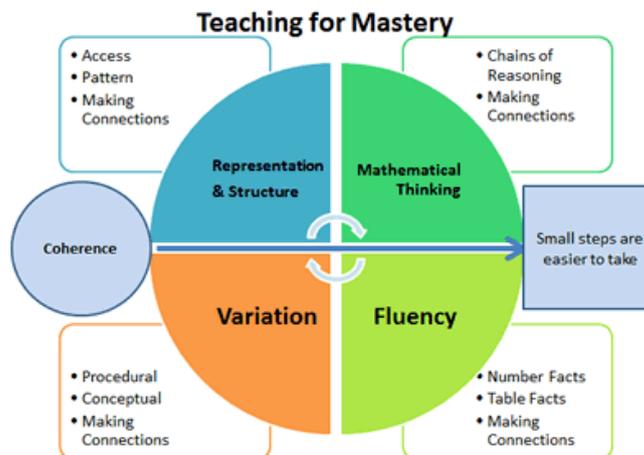
Opportunities for mathematical thinking allow children to make chains of reasoning connected with the other areas of their mathematics. A focus on representation and structure ensures concepts are explored using concrete, pictorial and abstract representations with pupils actively looking for patterns as well as generalising 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 focus on number bonds and times table facts.

Our maths planning is largely based on the Schemes of Learning from White Rose Maths and enhanced by a wide range of resources. This ensures a progressive and thorough curriculum in every year group. Teachers know which objectives must be taught and assessed in each year group and can follow progressive small steps to ensure pupils have a comprehensive understanding of maths. The White Rose progression document (Appendix 1) links to the National Curriculum objectives as well as outlining how objectives progress through the topics.

Features of Lesson Design:

- Maths lessons last between 45-60 minutes; teacher input usually lasts around 30 minutes giving ample time for independent practice whilst the teacher delivers rapid intervention should somebody require it. Independent practice includes reasoning, problem solving and higher-order thinking activities.
- Lessons are sharply focused with one new objective introduced at a time.
- 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.
- Precise mathematical language is used by teachers so that learning is conveyed with clarity and precision.
- Teacher-led discussion is interspersed with mini tasks involving pupil to pupil discussion and completion of short activities.

Key Skills

In order to develop pupils' procedural fluency in maths (rapid and accurate recall), we also use the Big Maths 'CLIC' scheme. This is a sequential programme of daily basic skills and focuses on developing pupils' core numeracy.

'CLIC' ensures frequent practice, so that pupils are able to recall and apply their knowledge rapidly and accurately to problems. CLIC maths is taught for 15-20 minutes a day, as part of the 'Key Skills' maths lesson and is structured as follows:

C –counting
L- learn its (for example, number facts, multiplication tables)
I- it's nothing new (for example, place value, sequences and doubling/halving)
C- calculation (4 operations)

In addition to the teaching of these core numeracy skills, teachers may choose to use the basic skills lesson to:

- re-visit and consolidate objectives taught previously in maths lessons;
- use interleaved practice to test pupils' ability to choose an efficient strategy when solving a problem;
- pre-teach a small step to a target group of pupils, in advance of a maths lesson, so that they can 'keep up'.

Teaching and Learning

EYFS

Mathematics within the EYFS is developed through purposeful, play based experiences and will be represented throughout the indoor and outdoor provision. Learning is based on pupil's interests and current themes, and will focus on the expectations from the Early Years Outcomes.
Teachers will use the White Rose Scheme of Learning in their planning (Appendix 2). This underpins the Ready-to-Progress Criteria and supports a curriculum that embeds mathematical thinking and talk. Pupils will be taught a daily 15 minute maths lesson as a whole class and complete 2 or 3 activities throughout the week.

This scheme is based on the five principles of counting:
1. The one-to-one principle.
2. The stable-order principle
3. The cardinal principle
4. The abstraction principle
5. The order-relevance principle

By the end of Reception class, pupils will be able to:
- count reliably with numbers from 1 to 20.
- place them in order.
- say which number is one more or one less than a given number.
- use quantities and objects, add and subtract two single-digit numbers and count on or back to find the answer.
- solve problems, including doubling, halving and sharing.
- recognise, create and describe patterns.
- use mathematical language to explore the properties of everyday objects and shapes.

Key Stage 1

The principal focus of mathematics teaching in key stage 1 is to ensure that pupils develop confidence and mental fluency with whole numbers, counting and place value.

The DfE Ready-to-Progress criteria outline the key concepts that pupils need to achieve by the end of their year group.

By the end of Year 1, pupils will be able to:
- Count within 100, forwards and backwards, starting with any number.
- Reason about the location of numbers to 20 within the linear number system
- Be fluent in addition and subtraction facts within 10.
- Count in multiples of 2, 5 and 10.
- Partition numbers to 10 into two parts.
- Read, write and compose number sentences containing +, - and =
- Recognise common 2D and 3D shapes.
- Compose 2D and 3D shapes from smaller shapes to match an example.

By the end of Year 2, pupils will be able to:

- Recognise the place value of each digit in 2-digit numbers.
- Reason about the location of any 2-dgit number in the linear number system.
- Be secure in addition and subtraction facts within 10.
- Add and subtract across 10.
- Recognise the subtraction structure of difference and how many more.
- Add and subtract within 100.
- Understand multiplication as repeated addition and know the 2, 5 and 10 times tables.
- Solve grouping problems involving missing factors and division.
- Describe and compare 2D and 3D shapes.

Lower Key Stage 2

The principal focus of mathematics teaching in lower key stage 2 is to ensure that pupils become increasingly fluent with whole numbers and the four operations. This includes number facts and the concept of place value, to develop efficient written and mental methods and perform calculations accurately with increasingly large whole numbers. By the end of Year 4, all pupils will know their multiplication facts up to 12 x 12.

By the end of Year 3, pupils will be able to:

- Recognise the equivalence between 10 hundreds and one thousand.
- Recognise the place value of each digit in three-digit numbers.
- Reason about the location of any three-digit number in the linear number system.
- Read scales with 2,4, 5 or 10 intervals.
- Fluently add and subtract within and across 10.
- Recall multiplication facts, and corresponding division facts, in the 10, 5, 2, 4 and 8 multiplication tables.
- Scale number facts by 10.
- Calculate compliments to 100.
- Add and subtract up to 3-digit numbers using the column method.
- Understand the inverse relationship between addition and subtraction.
- Apply known multiplication and division facts to solve contextual problems.
- Use and understand fraction notation.

- Find unit fractions of quantities.
- Reason about the location of any fraction within 1.
- Add and subtract fractions with the same denominator, within 1.
- Recognise right angles.
- Draw polygons and recognise parallel and perpendicular lines.

By the end of Year 4, pupils will be able to:

- Know that 10 hundreds are equivalent to 1 thousand, and that 1,000 is 10 times the size of 100;
- Recognise the place value of each digit in four-digit numbers.
- Reason about the location of any four-digit number in the linear number system.
- Read scales with 2, 4, 5 or 10 intervals.
- Recall multiplication and division facts up to 12 x 12.
- Solve division problems, with two-digit dividends and one-digit divisors, that involve remainders.
- Scale number facts by 100.
- Multiply and divide by 10 and 100.
- Understand and apply the commutative property of multiplication.
- Reason about the location of mixed numbers in the linear number system.
- Convert mixed numbers to improper fractions and vice versa.
- Add and subtract improper and mixed fractions with the same denominator.
- Draw polygons, specified by coordinates in the first quadrant, and translate within the first quadrant.
- Find the perimeter of regular and irregular polygons.
- Identify line symmetry in 2D shapes.

Upper Key Stage 2

The principal focus of mathematics teaching in upper key stage 2 is to ensure that pupils extend their understanding of the number system and place value to include larger integers. This develops the connections that pupils make between multiplication and division with fractions, decimals, percentages and ratio. At this stage, pupils develop their ability to solve a wider range of problems, including increasingly complex properties of numbers and arithmetic, and problems demanding efficient written and mental methods of calculation. With this foundation in arithmetic, pupils are introduced to the language of algebra as a means for solving a variety of problems. Teaching in geometry and measures consolidates and extends knowledge developed in number. Teaching ensures that pupils classify shapes with increasingly complex geometric properties and that they learn the vocabulary they need to describe them. Pupils should read, spell and pronounce mathematical vocabulary correctly.

By the end of Year 5, pupils will be able to:

- Know that 10 tenths are equivalent to 1 one, and that 1 is 10 times the size of 0.1. Know that 100 hundredths are equivalent to 1 one, and that 1 is 100 times

the size of 0.01. Know that 10 hundredths are equivalent to 1 tenth, and that 0.1 is 10 times the size of 0.01.

- Recognise the place value of each digit in numbers with up to 2 decimal places.
- Reason about the location of any number with up to 2 decimals places in the linear number system.
- Divide 1 into 2, 4, 5 and 10 equal parts, and read scales/number lines marked in units of 1 with 2, 4, 5 and 10 equal parts.
- Convert between units of measure, including using common decimals and fractions.
- Secure fluency in multiplication table facts, and corresponding division facts.
- Scale number facts by 0.1 or 0.01.
- Multiply and divide numbers by 10 and 100.
- Find factors and multiples of positive whole numbers.
- Multiply any whole number with up to 4 digits by any one-digit number using a formal written method.
- Divide a number with up to 4 digits by a one-digit number using a formal written method.
- Find non-unit fractions of quantities.
- Find equivalent fractions..
- Recall decimal fraction equivalents for ½. ¼, 1/5 and 1/10 and for multiples of these proper fractions.
- Compare angles, estimate and measure angles in degrees (°) and draw angles of a given size.
- Compare areas and calculate the area of rectangles.

By the end of Year 6, pupils will be able to:

- Understand the relationship between powers of 10 from 1 hundredth to 10 million.
- Recognise the place value of each digit in numbers up to 10 million, including decimal fractions.
- Reason about the location of any number up to 10 million, including decimal fractions, in the linear number system, and round numbers.
- Divide powers of 10, from 1 hundredth to 10 million, into 2, 4, 5 and 10 equal parts, and read scales/number lines with labelled intervals divided into 2, 4, 5 and 10 equal parts.
- Understand that 2 numbers can be related additively or multiplicatively, and quantify additive and multiplicative relationships.
- Derive related calculations.
- Solve problems involving ratio relationships.
- Solve problems with 2 unknowns.
- Recognise when fractions can be simplified, and use common factors to simplify fractions.
- Express fractions in a common denomination and use this to compare fractions that are similar in value.
- Compare fractions with different denominators, including fractions greater than 1.

- Draw, compose, and decompose shapes according to given properties, including dimensions, angles and area, and solve related problems.

Inclusion

'Different learners have different needs, but they do not need different content. Every child is entitled to a deep understanding of the whole curriculum.' (Dury, H. 2015).

A mastery curriculum enables all pupils to access maths. This inclusive approach, and its emphasis on promoting multiple methods of solving a problem, builds self-confidence and resilience in our pupils. There is no differentiation in content taught, but the questioning and scaffolding individual pupils receive in class as they work through problems will differ, with higher attaining children, or those pupils who grasp concepts quickly, challenged through more demanding problems which deepen their knowledge of the same content. Those children who are not sufficiently fluent are provided additional support to consolidate their understanding before moving on.

The schemes of learning include many examples of where pupils could go wrong, challenging the pupils to spot, explain and rectify errors. Pupils' responses to these prompts helps teachers to identify and tackle misunderstandings early on rather than let these incorrect ideas become established in pupils' minds.

Teachers will also bear in mind the aims of the lesson. If the focus of a lesson is to understand that the area of a rectangle is found by multiplying the length by the width, then providing pupils with times-tables grids will help them to focus on this, rather than struggling with the mechanics of the calculations, if these are an obstacle.

Assessment of Maths

At Bill Quay Primary School, we recognise that the best forms of ongoing, formative assessment arise from well-structured classroom activities involving interaction and dialogue (between teacher and pupils, and between pupils themselves). This formative assessment allows teachers to identify misconceptions as and when they arise, enabling the teacher to design his/her lesson around pupils' needs and plan for follow-up intervention.

Integral to mastery of the curriculum is the development of deep rather than superficial conceptual understanding. Progress in mathematics learning each year will be assessed according to the extent to which pupils are gaining a deep understanding of the content taught for that year, resulting in sustainable knowledge and skills. Key measures of this are the abilities to reason mathematically and to solve increasingly complex problems.
Mastery of the curriculum therefore, requires that all pupils:

- use mathematical concepts, facts and procedures appropriately, flexibly and fluently. Recall key number facts with speed and accuracy and use them to calculate and work out unknown facts;

- have sufficient depth of knowledge and understanding to reason and explain mathematical concepts and procedures and use them to solve a variety of problems.

A pupil really understands a mathematical concept, idea or technique if he or she can:

- describe it in his/her own words;
- represent it in a variety of ways (e.g. using concrete materials, pictures and symbols);
- 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.

An overview sheet listing the small steps in learning will be placed at the front of each unit of work in each child's jotter. This will act as an assessment tool for the teacher at the end of the unit, with a simple tick indicating that the child has demonstrated a good understanding of the small step taught.

At the end of each unit of learning, pupils will be assessed using a White Rose end of unit assessment sheet. Teachers will use the assessment information from these tests to feed into their planning, reinforcing key concepts in basic skills lessons and targeting misconceptions through intervention.

At the end of each term, pupils will be assessed against the curriculum that they have been taught so far. Summative tests, together with formative records, will inform the teacher of next steps for each pupil.

Pupils will be assessed in mathematics at the end of the year using the Gateshead Assessment Profile (G.A.P Appendix 3). They will be judged as to whether they:

- have mastered the content and have met age related expectations (G.A.P. 5)

- have mastered it in greater depth and are working beyond age related expectations (G.A.P 6);

- have mastered most of the content but have some gaps in learning (G.A.P 4)

- have not yet mastered the content and are working towards mastery (G.A.P 3)

- are working below the content taught for their year group (G.A.P 2)

Targeted Intervention

The White Rose Scheme of Learning is designed to support the development of reasoning and problem solving alongside fluency to ensure challenge and ambition for all pupils. The small steps structure, the progression documents and the assessments

that underpin the White Rose Maths curriculum will help teachers to identify gaps and ensure targeted support is given.

We have found that intervention is most effective when it is carried out on the same day, ideally within the maths lesson or following it. This 'keep up' ensures that any pupils, who have not grasped what was taught in the main lesson during the morning, are supported in 'keeping up' with the rest of the class in preparation for the next lesson. Teachers may also choose to pre-teach targeted pupils following a pre-assessment that has identified gaps in learning.

Specific interventions that may be delivered to pupils include Numbers Count and Third Space Learning.

Equal Opportunities

All children have equal access to the curriculum regardless of race, social circumstance or gender. This is monitored by analysing pupil performance throughout the school to ensure that there is no disparity between groups

We incorporate mathematics into a wide range of cross curricular subjects and seek to take advantage of multicultural aspects of mathematics e.g. graphs in science.

We are committed to giving all our children every opportunity to achieve the highest of standards. We do this by taking account of pupils' varied life experiences and needs. We offer a broad and balanced curriculum and have high expectations for all children. The Inclusion policy helps to ensure that this school promotes the individuality of all of our children, irrespective of ethnicity, attainment, age, disability, gender or background.

Role of the Maths Subject Lead

The maths lead:
- 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 and learning
- Leads the whole-school monitoring and evaluation of teaching and learning in mathematics by: observing teaching and learning in maths regularly; analyzing assessment data in order to plan whole school improvement in mathematics; conducting work scrutiny to inform evaluation of progress; conducting pupil interviews and reports to the Head Teacher.
- Takes responsibility for managing own professional development by participating in external training, independent private study, engagement in educational research and scholarly reading.
- 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 SENDCo to ensure the learning needs of all pupils in mathematics are met effectively.

This policy also links to the following school policies:
- Assessment
- Marking
- Inclusion
- Calculation Policy: Addition and Subtraction (Appendix 4)
- Calculation Policy: Multiplication and Division (Appendix 5)

This policy will be reviewed regularly.