



Emmaville Primary School Maths Policy February 2023

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The Importance of Mathematics

At Emmaville we believe that mathematics is essential to everyday life, critical to science, technology and engineering, and necessary in most forms of employment. A high-quality mathematics education, therefore, provides a foundation for understanding the world, the ability to reason mathematically and a sense of enjoyment and curiosity about the subject. We believe that mathematics should help our children to develop an appreciation of, and enjoyment in, the subject itself as well as a realisation of its role in other curriculum areas.

Our school's policy for Mathematics is based on the National Curriculum for Mathematics and the Mathematics sections of the Statutory Framework for the Early Years Foundation Stage.

The National Curriculum for mathematics aims to ensure that all pupils

- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils have conceptual understanding and are able to recall and apply their knowledge rapidly and accurately to problems.
- **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language.
- can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Aims of our Mathematics Policy - Intent

The purpose of this policy is to describe our practice in mathematics and the principles upon which this is based in relation to meeting the needs of all mathematical learners at Emmaville Primary School. It outlines the framework within which all staff work and gives guidance on planning, teaching and assessment. It is designed to describe how the school intends to meet the needs of mathematics' learners of all ages.

In the first instance this will be through the Statutory Framework for the Early Years and Foundation Stage. From Year 1 to Year 6, statutory requirements of the National Curriculum in Mathematics will be met by fully implementing the New National Curriculum objectives through the use of the National Centre for Excellence in the Teaching of Mathematics (NCETM) Curriculum Prioritisation Documents.

This policy is intended to be read in conjunction with our calculation policy (Appendix 1) which illustrates strategies and methods outlined in the national curriculum and that are taught from Reception to Year 6. In addition to this, the Early Years and Foundation Curriculum Framework (Appendix 2) highlights the Early Learning Goals and the guide for progression in the Reception year. Alongside this, the National Centre for the Excellence in the Teaching of Mathematics (NCETM) progression maps (Appendix 3) show the whole programmes of study under the topic headings as they appear in the National Curriculum.

At Emmaville Primary school, we recognise that a whole-school, systematic approach to delivering quality maths is vital to our success. We use a 'Mastery Programme' in which all pupils are encouraged by the belief that by working hard at maths they can succeed.

Through fully adopting the mastery approach, alongside meeting the three main aims of the new national curriculum for mathematics, we want all children at Emmaville to develop into confident and competent mathematical thinkers, who are able to use maths in real life situations.

Approaches to Learning – Implementation

The national curriculum states, 'Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas.' Therefore, it is organised into distinct domains. However, pupils should make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. The distinct domains highlight the important areas of mathematics children need to learn to make effective progress.

Progression maps for each of these domains can be found in Appendix 3

Planning

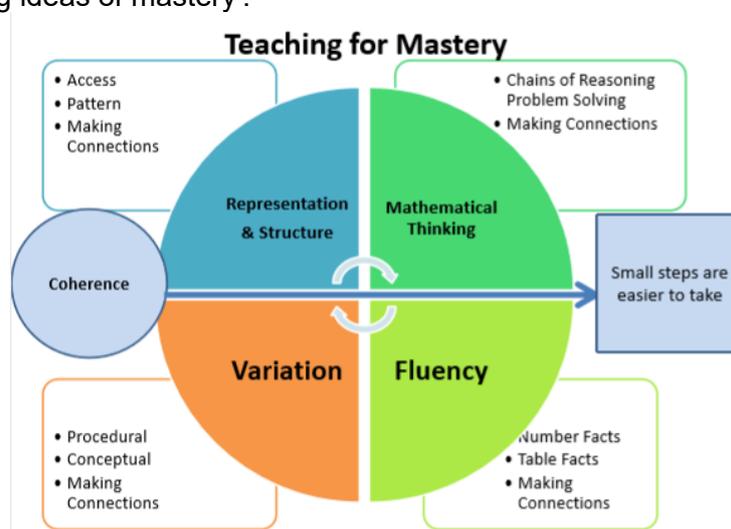
Teachers plan maths lessons together by mapping key mathematical concepts in a topic considering the key concepts that children will need to be secure in to access the new mathematics that is to be taught. Teachers map out the key points, the difficult points and then break them down into small steps, ensuring that lessons follow a coherent learning journey of carefully planned steps.

Long Term Planning

The Long Term Plan (LTP) is taken from the NCETMs Curriculum Prioritisation documents and their lesson overviews are used to inform our Medium-Term Plan (MTP). The LTP is used as a guidance tool in order to pace out coverage of the curriculum throughout the year. Teachers are encouraged to use professional discretion when deciding on how long is needed to cover a particular curriculum area whilst ensuring all objectives are covered by the end of the academic year.

Medium Term Planning

When teachers are planning a unit of work, they consider a set of criteria (see below) which relate to the '5 Big ideas of mastery'.



Short term Planning

Teachers are not expected to provide short-term plans - the slides are the plan. Teachers are encouraged to think carefully about each representation, question, challenge question etc. using the medium-term plans to support them.

Teachers consider the following areas when planning....

Key Objectives

The National Curriculum is referred to and objectives are broken down into smaller steps.

Fluency

Fluency facts are regularly taught e.g. times tables, number bonds and measure facts.

In short term planning teachers...

- Develop the fluency in mental methods, encouraging pupils to **calculate rather than count** e.g. using known facts to solve unknown facts. Example- when adding $8+6$ pupils are encouraged to add $8+2+4$. This can apply to larger numbers such as $68+6$, $708+6$ etc.
- Develop fluency in written formal methods. Informal methods are used for a short period of time and are used as a stepping stone for formal written methods.
- Provide opportunities for **intelligent practice**. 'In designing exercises, the teacher avoids mechanical repetition and creates opportunities for an appropriate path for practicing the thinking process with increasing creativity.'
- Encourage children to look for connections.

Reasoning

Teachers promote Reasoning skills by asking questions such as '*What's the same and what's different?*' *Which is the odd one out?*; *True or false?*; *Convince me*; *Always Sometimes or Never?* The NCETM progression document supports teachers with this. Teachers also use reasoning prompts for written explanations e.g. *I noticed... I agree because...*

Problem solving

Within a mastery lesson, teachers include problem solving questions (which incorporate reasoning and fluency skills). This involves routine and non-routine problems. All pupils have opportunities to tackle them – they are not just located at the end of an exercise or set as extension tasks so that only the 'rapid graspers' work on these. Teachers use '*nrich*' or other low threshold/high ceiling activities which all children have access to. During the lesson, teachers will assess who needs support and who needs further challenge. These questions and scaffolding are planned prior to the lesson.

Problem solving is not just word problems and pupils have opportunity to develop their skills in the following;

Working systematically

Conjecturing
Trial and Improvement
Logical Reasoning
Spotting patterns
Visualising
Working Backwards

Comparison

Teachers reinforce equivalence and greater than and less than with all concepts, including measures ($=$, $<$ and $>$). This includes varying the position of the $=$ symbol and empty box problems.

Stem sentences/ Precise vocabulary

Stem sentences help children to communicate their ideas with mathematical precision and clarity. These sentence structures often express key conceptual ideas or generalities and provide a framework to embed conceptual knowledge and build understanding. Teachers plan for these during a unit of work. For example: ***If the whole is divided into three equal parts, one part is one third of the whole.*** Having modelled the sentence, the teacher asks individual pupils to repeat this, before asking the whole class to chorus chant the sentence. This provides children with a valuable sentence for talking about fractions, for example. Repeated use helps to embed key conceptual knowledge.

In every lesson, children are expected to use precise mathematical vocabulary. Sometimes, pupils will record the sentences in their books. Working walls support this too.

Measures and Geometry

When appropriate, Measures and Geometry are taught alongside key skills such as addition and subtraction rather than as a discrete unit e.g. perimeter of regular shapes is taught alongside multiplication, mm is taught alongside fractions (tenths).

Misconceptions

There will be opportunities to address misconceptions as they arise, but teachers also pre-plan examples which the children will find tricky. Reasoning questions are used to address misconceptions too e.g. Always, Sometimes, Never? / True or false? / Odd one out e.g. *Sam says that if you add 2 tens to 43 then the answer is 45. Do you agree? Prove it.*

Bob says to record three hundred and four, you write 3004. Is he correct?

Cross- Curricular links

Statistics is included in every science topic and, where appropriate, in other subjects e.g. reading tables in a geography lesson or making a tally chart in a history lesson. Other maths objectives can be covered in other subjects too but must match the year group expectation e.g. find the difference between given populations, (Year 5) calculate the perimeter of the pyramid (Year 3)

Representation and Structure

Teachers choose models and manipulatives that expose the structure of the maths and they make connections between them e.g. money/place value; Tens frames/ Part -Part whole/ bar model.

When using the bar model, teachers reinforce that this representation is a model not a method in that it helps children to understand relationships between numbers and to strengthen students' understanding of procedures. It is used alongside calculation strategies.

Other areas that teachers consider in their short-term plans

- The Maths is contextualised to help them understand the concepts.
- The objectives are broken down into smaller steps.
- Teachers reinforce what the number represents in an equation e.g. $10-4=6$, $4\times 5=20$, $50\div 10=5$? *Which number is the whole, part, size of group, number of groups, factor, product, dividend, divisor, quotient etc.?*
- Regular assessments or quizzes are planned to check understanding and aid working memory.
- Questions to support and challenge understanding are planned for prior to the lesson.
- The use of manipulatives to promote understanding and to challenge rapid graspers

Our Classrooms

Our classrooms aim to provide a rich learning environment to support children's learning of mathematics. Each classroom has a maths learning wall, which includes the learning journey of the domain of maths that is currently being studied and concrete, pictorial and abstract examples of mathematics currently being taught.

The learning wall also includes stem sentences which can act as an enabling prompt when children are explaining their thinking and ensures that children use accurate mathematical vocabulary during lessons.

All of our classrooms contain manipulatives for children to use to help them to understand and reproduce a variety of concrete representations of the mathematics that they are studying.

Our classrooms also provide opportunities for a continuous curriculum in terms of charts, tables, four clocks (digital, analogue, 12-hour, 24-hour), and embedded classroom habits to help children to understand that maths is all around them.

Maths extensions and maths games are also provided to ensure that there is easy access to additional challenge.

Our Maths Lessons

A dedicated daily mathematics lesson is planned in each class, which lasts for an hour in KS1 and KS2. In Reception there are 4 daily lessons, which last for at least 40 minutes,

alongside opportunities for mathematical activities daily through continuous provision. In Nursery there is a 5-minute lesson, twice daily plus one 15-minute weekly session.

Pupils are taught through whole-class interactive teaching, where the focus is on all pupils working together on the same lesson content at the same time. Lower attaining children do not experience a narrower range of mathematics.

- Lessons are well structured, lively and delivered at a good pace.
- Children will actively take part and are enthusiastic during their maths lessons, and will develop an appropriate mathematical vocabulary, as modelled by the teachers, using guidance from the vocabulary specified in the national curriculum.
- Lessons are structured to embed mathematical understanding through concrete, pictorial and abstract representation. Physical representations of mathematics are modelled by teachers and children, alongside abstract and written ones, not just in specific years or key stages; however, teachers recognise when to withdraw them to ensure children become confident about working in the abstract.
- Variation is used to broaden the children's exposure to the learning objectives in a wide range of contexts to ensure deeper understanding of concepts.
- The foundations of mental calculation and recall of number facts are established thoroughly through daily starters which consolidate mental recall and informal/written calculations. Daily starters are often in the form of a 'Flashback' to ensure that essential skills are regularly revisited and retrieved to strengthen retention.
- Teaching, questioning and level of support is differentiated by children so that the children are all working towards the same learning objective appropriate to their age group. A high proportion of lesson time is devoted to direct teaching of methods and vocabulary through modelled examples to ensure that the children are fully confident to tackle independent tasks.
- All children will be exposed to challenge through tasks and questioning including further mastery standard problem-solving activities for high-attaining pupils and rapid graspers. Opportunities are designed into the curriculum to include chances to look at topics again in new contexts.
- Time is given in other subjects for pupils to develop and apply their mathematical skills.

Teaching and Learning Strategies

- The children are taught in discreet year groups.
- Children sit in mixed attainment pairs or groups within mixed attainment classes. All children are expected to achieve key learning points, working through the same

sequence of work. Work is carried out using a balance of individual, paired and group work.

- Lessons usually begin with a warm-up which includes a revisit of previous concepts taught, using spaced retrieval, to help children to embed their learning into their long-term memory.
- In a typical lesson, the teacher leads back and forth interaction, including questioning, short tasks, explanation, demonstration, and discussion. Mathematical errors and misconceptions are dealt with as they are identified in a positive and supportive way, teaching what is right and what is not right.
- Teachers adopt strategies to ensure all children access the whole curriculum. Lower attaining children do not experience a narrower range of mathematics. Teachers demonstrate, explain and illustrate mathematical ideas to fully involve pupils and maintain their interest through appropriately demanding work.
- The emphasis on pupil's learning begins with practical examples; manipulatives help to develop strategies to deepen and embed understanding. For many pupils, the Concrete Pictorial Abstract (CPA) approach is a 'way in' to a topic whilst also it can be challenge for pupils to find an alternative representation to the ones they already have. The learning then leads onto informal jottings and mental strategies, and finally to formal representations as laid out for year groups in our calculation policy. (appendix 1). The children are expected to gain a wide range of experiences with a variety of materials including IT.
- Children are given a variety of mathematical approaches to solving problems. They are encouraged to develop their own mathematical strategies as well as learning standard methods. A high priority is placed on children reasoning and explaining their strategies.
- Teachers use and expect children to use precise mathematical notation and vocabulary and full sentences. Pupils are expected to present work carefully. Work in maths books is headed with the date, followed by the learning objective, which is highlighted when achieved.
- Speedy recall of number facts is highly valued and fluency and reasoning are developed in tandem. Intra-school competitions are regularly hosted on learning platforms such as Doodle Tables to encourage children to increase their fluency when recalling multiplication and related division facts.
- The use of calculators is introduced near the end of key stage 2 to support pupils' conceptual understanding and exploration of more complex number problems, once written and mental arithmetic are secure. Calculators are used in lower years as well as KS2 as a way to self-check answers.

Parental Engagement

At Emmaville we feel that it is vital that parents play an active role in their child's mathematical education. We recognise that some parents may be unsure about how best to support their child's learning around mathematics. During the Autumn term 'Meet the Teacher' meeting, parents are given information about the years programme of study in mathematics, which includes information about physical (concrete) and abstract representations of the mathematics that will be taught throughout the year. At these meetings, we also communicate to parents the importance of being positive about mathematics. Parents fully understand and the benefits and key concepts taught within our Mastering Number lessons at school

Emmaville is also part of the 'Mastering Number @home' programme (Great North Maths Hub) whereby we host a series of parent workshops with each of our YR, Y1 and Y2 classes to ensure that parents fully understand the benefits and key concepts taught within Mastering Number. Parents are given resources in the form of carefully crafted games and activities recognising that when parents are engaged in their children's learning, outcomes for children can improve.

Homework for all pupils is set in accordance with our homework policy.

Differentiation

Differentiation is provided with targeted, positive support to help those who have difficulties with mathematics, as well as those who are rapid graspers. In line with the aims of the National Curriculum 2014, differentiation has now moved to focus on all children achieving the same learning outcome with the differentiation being the way in which different groups of children are supported to achieve this.

Special Educational Needs and Disabilities (SEND)

Daily maths lessons are inclusive to pupils with SEND. Where required, children's individual support plans incorporate suitable objectives from the National Curriculum for Mathematics or Development Matters, and teachers refer to these when planning. These targets may be worked upon within the lesson as well as a 1:1 basis, or within a small group, outside the maths lessons. Maths focussed intervention in school helps pupils with gaps in their learning and mathematical understanding. These are delivered by teachers and support staff and overseen by the SENDCo and the class teacher. Within the daily maths lesson, teachers have responsibility to not only provide differentiated activities and resources to support children with SEND, but also activities that provide sufficient challenge for children who are high achievers. It is the teacher's responsibility to ensure that all children are challenged at a level appropriate to their ability.

Interventions

If a pupil fails to grasp a concept or procedure, this is identified quickly and early intervention (usually on the same day) ensures the pupil is ready to move forward with the whole class in the next lesson. Marking is carried out, where possible, as part of the lesson whereby children have immediate feedback and can identify if they need intervention to ensure that they keep up and that all can master concepts before moving to the next part of the curriculum sequence. Our approach is for no pupil to be left behind – a 'keep up not catch up' approach.

Pre-Teaching

In addition to daily interventions, pre-teaching is used with children who are less confident at maths and who may struggle with the concepts being taught. The children who attend pre-teaching sessions are changeable depending on prior assessment. Children who engage in pre-teaching start the lesson feeling much more confident and are able to access the learning of the lesson, which allows them to move along at the same pace as the rest of the class. During pre-teaching sessions, children work on a one-to-one or small group basis. At Emmaville we use a variety of methods to pre-teach:

- Going through a question you'll ask in the following lesson.
- Playing a game using the skills that may be needed.
- Covering the language that will be useful to children's understanding.
- Teaching a common misconception, as the children in the session will then be able to help others when they make these familiar mistakes. This has been exceptionally effective in raising the status (and self-esteem) of these learners, who aren't usually called on by other children to help them.

Stretch and Challenge for High Potential Children

At Emmaville, we recognise that inclusive, high-quality teaching ensures that planning and implementation meets the needs of all children, and builds in high expectations for all pupils. Low threshold, high ceiling activities are woven into planning and daily lessons to ensure that all learners are challenged. We also use concept cartoons and 'prove it' questions to make our classrooms 'think tanks' – rich in dialogue and argument that extends and stretches our children's maths understanding.

Assessment - Impact

At Emmaville we see assessment as a vital tool in the teaching of mathematics, designed to monitor children's progress and measure attainment. It is also used to inform future planning by staff at our school, or the child's next school. Teachers are responsible for assessing and recording children's progress in mathematics. Opportunities are built into lessons that allow the teacher to check for understanding. This may include posing questions to probe or extend thinking, revisiting skills or clarifying ideas, or pulling small groups of children to reteach or enrich. Our assessment coordinator and maths coordinator facilitate tracking and analysis alongside the headteacher and class teacher. Assessment standards are checked both in school and through external moderation opportunities. These include

- During the daily maths lesson, children will be asked to self-assess and sometimes peer assess their work, which is recorded as a traffic light in their books alongside their learning objective (younger children will be supported to do this).
- Children's work is marked promptly and in accordance with the school marking policy. Where possible, immediate verbal feedback and in-class marking is utilised to reduce teacher workload and help identify children who require same-day intervention.

- Teachers assess the standard of work against the key objectives for each year group and compare and moderate work to standards as displayed in the national curriculum. This data is recorded and assessed through termly pupil progress meetings with the headteacher, the assessment coordinator and the class teacher to facilitate tracking and to set targets.
- Children's books are scrutinised by SLT throughout the term with a health check completed half termly where feedback is provided.
- Half-termly observations of a small group of children from each year group will be carried out looking at particular skills or concepts learnt. The 'sample group' will be taken by the maths coordinator who will use the NCETM Primary Assessment materials to assess their knowledge of the objectives of the national curriculum.
- Termly moderation meetings within the Ryton cluster of primary schools where teachers share children's work and agree their understandings of expected curriculum levels of children's achievement and progress. The process supports teachers to compare their own judgments to either confirm or adjust them.

Statutory Summative Assessment

- Reception Baseline Assessment will be carried out during the first 6 weeks of Reception Year.
- EYFS profile will be completed for every child in the final term of their Reception year to assess their development; to make the transition to Year 1 smoother; and to help the Year 1 teacher plan a curriculum that will suit all of the pupils in their new class.
- Summative standardised tests (SATs) with statutory tests at the end of Years 2 (ending 2023) and Year 6.
- Year 4 Multiplication Tables Check.

Summative Assessments

- NCETM Primary assessment materials are used to monitor the progress and attainment after each taught unit of work
- Baseline assessments are carried out at the beginning of each academic year in KS2 to establish any topics that need additional focus
- Weekly times tables assessments are used to monitor the embedded knowledge of tables Y2 – Y4
- Fortnightly arithmetic assessments are used in KS2 to monitor children's knowledge of number and place value
- Half termly tests will be used to inform meetings with parents of the child's progress and to set targets.

At the end of the academic year, children's assessments are passed on to the next teacher and to the maths coordinator to identify areas for improvement. The report will also include whether a child has reached end of year age related expectations in mathematics as in the other core subjects.

Continued Professional Development (CPD)

At Emmaville, we recognise that our maths subject knowledge is critical to successful teaching and that by increasing the quality of our teaching we eliminate lower thresholds of teaching. CPD is seen as a priority and an integral part of our school culture. Courses providing CPD are discussed with staff regularly and are highlighted in performance review meetings recognising that they should be relevant to the needs of the individual teacher.

- We recognise that collective participation in CPD is important; termly staff CPD sessions are hosted with a focus on areas of maths which have been identified as weak from baseline assessments in the Autumn term. Staff 'Bring and Brag' examples of a specific aspect of our maths teaching from every year group e.g. fractions. Teachers scrutinise how the topic was taught in each year group, and how it was understood, and any examples of common misconceptions or good practice are explored. The sessions also help us to understand progression across year groups.
- Collaborative planning and non-judgemental lesson observations and feedback on collective focus of a specific aspect of pedagogy are carried out termly.
- CPD and courses provided by LA and external agencies, including online courses, which staff have attended, are fed back and discussed in our staff meetings. An audit of CPD attended by staff is closely monitored
- Visits to other schools to watch maths lessons are encouraged.
- Our maths coordinator attends termly subject-leaders' meetings, hosted by the local authority, to ensure that we have knowledge of up-to-date policy and research.
- In 2018 we became part of the Maths Hub Primary Teaching for Mastery Work Group and continue to work with a Primary Mastery Specialist, and are part of a Teacher Research group with 6 other local schools.
- In 2019 we became part of the Maths Hub Early Years Teaching for Mastery Work Group and are currently working with an Early Years Mastery Specialist.
- In 2021 we became part of the NCETM's Mastering Number programme the programme helps children develop solid number sense, including fluency and flexibility with number facts. The programme also involves high quality professional development for teachers.
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In 2022 we became part of the Maths Hub Sustaining programme and have chosen to research further the concepts of representations in maths and maths fluency alongside six other local schools.

Role of the Maths Coordinator

Our maths coordinator takes the lead in providing curriculum development at Emmaville by promoting and supporting the progress in mathematics of all children to achieve the highest possible standards. This includes working with the headteacher, governors and staff to:

- Carry out lesson observations and book scrutinies and giving feedback.
- Attending maths subject leaders' meetings termly to ensure that we have knowledge of up-to-date policy and research.
- Half-termly observations of a small group of children (sample) from each year group looking at particular skills or concepts learnt using the NCETM Primary Assessment materials to assess their knowledge of the objectives of the national curriculum.
- Supporting staff by providing relevant information about CPD opportunities and hosting staff CPD sessions in mathematics.

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