



Family, Faith and Fascination

Maths Policy

with COVID-19 Addendum

Boutcher C.E. Primary School

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Introduction

'Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. 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.' (DfE 2013)

Mathematics pervades many aspects of our lives and can help us to make sense of the world. With this in mind this policy promotes the basic and wider understanding of mathematics, and hopes to instill an enjoyment in the subject by supporting children to engage with it and helping them to be successful at it to promote further learning. We encourage a teaching practice that will result in children making *sustained* progress. To that end we have ensured that we have adopted an evidence-informed approach to what works when teaching mathematics. The policy attempts to provide an ambitious yet practically achievable framework for the teaching mathematics.

The school has committed to following *Maths, No Problem!* - a Department for Education recommended teaching scheme that supports the *mastery* approach to teaching mathematics. While the scheme usefully provides many resources to help with delivery this pedagogy, we recognise that it will take some time for all teaching staff to become as confident and as effective in teaching with the mastery approach as we would like. We are beginning our second year using the scheme but recognise the need for continued professional develop. We are beginning our the second year of professional development with the NCETM's *Maths Hub* work groups, which focuses on embedding the mastery practice further. This involves a KS1 and KS2 teacher receiving training on a half-termly basis over the next two years. These teachers will then disseminate useful findings through INSET training, most likely through after-school INSET.

A mastery approach involves a significant shift in expectations - particularly directed at those who may not otherwise attain highly. Some schools aim to implement the mastery scheme gradually, starting with the school's newest cohort. By implementing this across the school, we appreciate that some of the expectations for *all* may be difficult to maintain. We will endeavour to learn how best to accommodate those with a less secure understanding within this scheme. For that reason it remains that the judgement of teachers may determine that the order or structure prescribed by *Maths, No Problem!* is not followed strictly. We place trust in teachers' professional judgement to amend or add planning, resourcing, interventions or assessments accordingly. The advantage of implementing this immediately across the school is that all teachers will become familiar with the scheme and training given will be relevant to all.

Foundation Stage: Reception

In Reception, the priority is for children to develop a deep and secure understanding of the foundations of mathematics - an understanding that is grounded in the concrete, practical and pictorial. Through providing children with mathematical activities that encourage children to recognise the nature of number and its many different representations, we hope to nurture an interest in the subject and help them to see that it is a helpful lens through which to understand and interpret the world.

While there may be opportunities for children to learn about mathematics through interaction with their peers and discovery, there remains the expectation that the teacher will *teach* children the early learning goals in such a way that *all* children are given the opportunity to develop their sense of number deeply. This is of great importance, as it will make consequent mathematical concepts more accessible.

In keeping with our aim to implement a mastery approach to teaching maths, we will make use of the NCETM's resources to support the teaching of maths in Reception - using their suggested activities inspired by episodes of *Number Blocks* to gradually build a secure understanding of number moving gradually through each number to deepen and secure children's understanding of each one. Through doing so we hope that no child will be left behind as the starting point should be accessible to all.

In Reception children will become familiar with using concrete resources that act as useful models for thinking about number and different representations. Children manipulating number in different representations serves to deepen their understanding of number and begin to build mental models for thinking about number.

Throughout the curriculum, opportunities exist to extend and promote mathematics. Teachers need to ensure they seek to take advantage of these cross-curricular links, where possible and practical.

Maths No Problem!

We teach Maths using the Maths No Problem scheme, an approach to teaching maths developed in Singapore. Problem solving, fluency and relational understanding are at the heart of the scheme. It uses the Concrete Pictorial Abstract (CPA) approach and allows pupils to spend enough time to fully explore a topic in terms of representation and structure, reinforcing it with practice, before moving onto the next one. All ideas are built on previous knowledge and pupils have ample opportunity to develop relationships between topics.

Lessons typically are broken into four parts:

1. Anchor Task – the entire class spends time on a question guided by the teacher. The children are encouraged during this time to think of as many ways as possible to solve the question as possible.
2. New Learning – the teacher introduces and explains the new learning for the lesson, providing precise explanation.
3. Guided Practice – children practice new learning in groups, pairs or individually guided by the teacher.
4. Independent Practice – practice on your own. Once children have mastered the concept they use their reasoning and problem-solving skills to develop their depth of learning.

Key points:

- A highly effective approach to teaching maths based on research and evidence - the small manageable steps used to explain new concepts avoids overloading children's short-term memory
- Builds students' mathematical fluency without the need for rote learning
- Introduces new concepts using Bruner's Concrete Pictorial Abstract (CPA) approach
- Pupils learn to think mathematically as opposed to reciting formulas they don't understand
- Teaches mental strategies to solve problems such as drawing a bar model
- Lessons are designed to enable children to practise and apply new knowledge within other areas of the mathematical curriculum.

Pedagogy

To ensure a high standard of teaching and learning in all classes, we need consistent and effective pedagogical practice within and between year groups. Effective teaching within maths requires the development of strong subject knowledge, high expectations, effective use of assessment and feedback, and regular opportunities to retrieve and consolidate.

Developing Subject knowledge for Direct Instruction

The *MNP!* scheme provides Teacher Guides that explain the rationale behind the approach to teaching each discrete piece of knowledge within each lesson.

Explanations are broken into small steps and carefully planned so its necessary that teachers fully understand and learn these before teaching them. Understanding and believing in the reasons behind the teaching is vital to its success. It allows the teaching to remain and concise and engaging. It enables strong and consistent direct instruction in the classroom, with teachers able to deliver content with clarity, confidence and precision. Teacher Guides draw attention to the importance of the CPA approach that must be adopted by all so children can experience the diversity of mathematical representation and structure .

Each class teacher is responsible for being prepared for lessons in mathematics for their class. While they should largely follow the scheme mentioned outlined above, trust is placed in teachers' professional judgement to deviate from it when they deem it appropriate.

High Expectations

Teachers should have high expectations of all children's learning and provide appropriate support so that they can achieve. We explicitly teach precise vocabulary and expect pupils to use these when articulating their mathematical reasoning.

We expect all children to engage with the learning. Questioning must be used to maximise pupil participation: all teachers should employ a no hands-up approach and provide opportunities for all to share answers on whiteboards.

Children are expected to make the most of the opportunities to practise in each lesson and understand that it is needed if they are to experience success.

Assessment, Feedback and Marking

Lessons must be responsive to the needs of the children: sped up or slowed down or levels of support adjusted following in-lesson assessment.

Effective questioning provides quick indicators of understanding and immediate opportunity to provide instructive feedback.

Work completed within the lesson is assessed promptly and feedback given as close as possible to the time of the work being completed. This live feedback within a lesson may be verbal or written.

Within lessons children should be receiving as much feedback as is practical and possible, both individual and whole-class. Immediate feedback allows children to assess their own understanding and learn from mistakes there and then. There should be regular opportunities for discussion of answers and strategies to support pupils' reasoning skills and check and deepen their understanding.

Interaction and dialogue should focus on key ideas and concepts (including misconceptions and difficult points) and effective, efficient strategies of working mathematically. The NCETM advises that *'the most important activity for teachers is the teaching itself, supported by the design and preparation of lessons. Marking and evidence-recording strategies should be efficient, so that they do not steal time that would be better spent on lesson design and preparation. Neither should they result in an excessive workload for teachers.'*

Teachers should aim to distinguish between a pupil's simple slip and an error that reflects a lack of understanding.

- For slips, it is often enough to simply indicate where each slip occurs, particularly when the teacher's/school's approach is to encourage pupils to correct them;
- If errors demonstrate lack of understanding, the teacher may decide to take alternative courses of action, For instance, with a small number of pupils, the teacher may arrange same-day intervention, while for a large number of pupils, the errors will be addressed in the next lesson.

Evidence shows (Black and Wiliam 1998) that pupils benefit from marking their own work. Part of this responsibility is to identify for themselves the facts, strategies and

concepts they know well and those who they find harder and need to continue to work on. Children will tick or make corrections.

Retrieval and consolidate

The mastery approach involves children studying mathematical topics in depth one at a time. Wherever possible MNP expects the application of past learning within each new topic.

To ensure all areas are revisited, children also complete daily low stakes quizzes. These '5-a-days' provide an opportunity for regular spaced retrieval practice, which research findings indicate aid long-term retention of knowledge, and another daily opportunity to interact and assess where children are with their learning, indicating either understanding or the need for some sort of intervention. That intervention may be immediate and one-to-one or take the form of responsive whole-class feedback. Performance at a given task in one lesson does not provide a good indication of future performance, so regular quizzing can provide a more accurate picture of where a child might be. Through revisiting tasks children have a better chance of being able to retrieve knowledge in the future

Teacher may also incorporate retrieval practice into other times in lessons where it is helpful, taking the form of questioning with all pupils responding on whiteboards.

The content of these 5-a-days should include questions from a range of areas they have previously been taught. They may also involve revisiting knowledge that must be fluent and automatic to the learner, so all questions may ask learners to recall certain number facts or procedures. This is especially important when we acknowledge the suggested findings of Cognitive Load Theory. The more mathematical knowledge children have committed to their long-term memory, the more of their working memory can be freed up to understand new material, solve problems or engage with investigations. Being fluent in the different *procedures* of maths and *counting* decreases the strain on a child's short-term memory.

Summative Assessment

Mathematics assessments will continue to take place on a termly basis using the PUMA (Rising Stars) assessments, which provides a useful benchmark as the results can be compared to national averages based on a large sample set.

Along with the knowledge of pupil understanding gained from lessons, teacher should use the quizzes and termly assessments to reach a judgement to determine whether each pupil is working *below*, *towards*, *at* or *above* year group expectations.

This judgement will indicate the extent of pupils' progress - which is shared with parents / carers during open days throughout the year.

Displays

Each classroom should have a mathematics display, which should act as an aid to learning: this may provide relevant worked examples, or draw attention to important

or inspiring knowledge, or topic-related vocabulary. Teachers are encouraged to make sure most of these are created during a lesson – such as worked examples that pupils can look back to.

Workload

As is suggested by the NCETM, time saved on planning and marking within *written methods and counting* should be redirected towards assessment, and the planning and delivery of engaging and thought-provoking concepts lessons to develop pupils' understanding. Over the last few years, measures have been taken to reduce the teacher workload while aiming to secure high quality and effective teaching.

Times tables

To encourage children to learn times tables and division facts, children aim to fill in 'times table and division grids' within a set time limit. These grids contain 52 times tables facts to recall. To recognise successful completion, results are recorded on a times tables achievement grid displayed within the classroom. Children may only move onto a new number once they have completed both the multiplication and division grids with the given time limit. Ideally these tests will be completed three days of each week. The national expectations are that the following relevant times tables and division facts should be known:

Y2: 2s, 5s, 10s

Y3: 2s, 5s, 10s, 3s, 4s, 8s

Y4: 2s, 5s, 10s, 3s, 4s, 8s, 6s, 7s, 9s, 11s, 12s

Since these are now tested at the end of Year 4, it is important that teachers aim to incorporate the learning of times tables in school - and as far as possible to encourage parental support at home to ensure these facts are learnt. Pupils should regularly use *Times Tables Rock Stars* at home to further improve their knowledge. Knowing times tables facts is of considerable benefit to pupils; when known these facts can make so many aspects of easier to understand.

Homework

Opportunities should be provided for children to practise their mathematics at home. Homework should be set on a weekly basis and it can take various forms including the use of the online resource, *Mathletics*. *Mathletics* serves as a useful assessment tool since it marks any homework set and can provide a useful indication of pupil understanding. Children are given instant feedback and the opportunity to attempt to learn from their mistakes. In KS1 children have access to *Numbots*, an online resources that motivates children to improve their knowledge of addition and subtraction facts.

Presentation

Children must be set high expectations for the presentation of their work. The date should be written in numbers, making sure there is only one digit per box. The date is to be written and below should be short, concise description of the task focus, e.g. *Long Division*. We will begin to circle question numbers/letters to avoid them becoming mixed up in their calculations. It is important that teachers aim to pick up on and highlight any presentation errors.

Resources

Throughout the school we have a variety of resources in designated areas around school. Resources are added to regularly. Each classroom will be resourced with materials to support the delivery of maths: such items might include tens frames, number tracks, number lines, multiplication tables, 100 squares, 2D and 3D shapes, unifix cubes, multilink cubes, dice, dominoes and other smaller items. Larger materials such as scales, trundle wheels and measuring cylinders will be held centrally in the cupboard in the hall. Resource shortages should be notified to the coordinator who has responsibility for ordering equipment as required.

Evaluation and Monitoring

Mathematics is monitored regularly throughout the school by:

- book scrutiny
- peer-led lesson observations
- reviewing and monitoring of planning (presently aiming to do this once every three weeks unless a teacher asks for or requires additionally input)
- Assessment and analysis of data
- learning walks

Following this evaluation and monitoring, the coordinator should aim to provide as much relevant support as possible.

Equal Opportunities

It is important that:

- our expectations do not limit pupil achievement
- we provide options for those struggling in any given topic either through resources to help or alternative tasks
- we aim to challenge and extend children when appropriate

Parental Involvement

It is important that parents and carers are actively involved in children's education. In order to help keep them informed of what is happening within school we run annual

information sessions, which look at current developments with school and new methodologies for delivery the teaching of mathematics and also any new statutory changes such as curriculum or assessment/testing arrangements. When a child is struggling to retain expected knowledge in maths, teachers are advised to ask parents for their support to ensure their child is receiving the regular practice required that cannot be provided in school easily.

Role of the Coordinator

As well as taking part in much of the evaluation and monitoring and support mentioned above, the coordinator should keep colleagues aware of recent research and relevant developments in literature through staff meetings, aiming to do so once every half-term.

COVID-19 Addendum

From 20th March 2020 parents were asked to keep their children at home, wherever possible, and for schools to remain open only for those children of workers critical to the COVID-19 response - who absolutely needed to attend. After this lockdown, there was a gradual easing of restriction that led to the reopening of school. January 2021 saw another lockdown. In March schools reopened. What follows describes the actions that were taken to make sure children continued to have a worthwhile and quality experience of mathematics.

Lockdown 1 (Spring/Summer 2020)

Based on the experiences of parent teachers of home learning, we gained a better insight into what might be a realistic amount of work to expect to be completed by pupils at home, particularly with the limited support available to those children whose parents would be working at home. The work had to be achievable independently to sustain motivation. Since some children had limited access to electronic devices (with some receiving paper copies of work and answers with explanations), it was best not to try to teach new content as this would unfairly disadvantage some children and widen the gap in attainment.

With this in mind, teachers collectively agreed only to set work that had already been covered with a view to consolidating past learning rather than starting anything new. The work set consists of 5-a-days, which comprise five maths questions (two arithmetic focused and three reasoning focused) and activities set on *Mathletics*, an online learning platform that nearly all Boutcher pupils were already familiar with through homework tasks.

- 5-a-days were set on Mondays, Wednesdays and Fridays.
- *Mathletics* activities were set on Tuesday and Thursdays.

For 5-a-days, teachers select questions knowing that they had already covered that area of the curriculum so it should at very least be familiar to the child. This did not mean all work should have been completed easily with minimum effort. Children forget. But - as research demonstrates - forgetting is an important part of remembering. If children persevere but still cannot come up with a solution they

know they'll be given the answers and explanations afterwards so they can arrive at an improved understanding. Additionally, if a child is struggling, we encourage them to make use of the internet to search for educational videos that might support them with the question. If that fails, teachers may direct students to helpful videos and tutorials.

For *Mathletics*, the same approach is taken - teachers select a range of activities for children to complete that reflect the areas of the curriculum already covered. Activities always offer support and explanation for each activity - so children know where they can find help. If this still isn't enough, then children are encouraged to work backwards - something they may be able to do as the activities reveal the correct answers when they make a mistake.

The aim of home learning was to consolidate and secure mathematical knowledge so that when pupils returned to school they would have a better foundation upon which to quickly build new concepts. If this knowledge is properly secured, then the acquisition of new concepts will be faster.

Return to school (Autumn 2020)

Mastery

The essential idea behind 'mastery in mathematics' is that *all students* need a deep understanding of the mathematics they are learning so that future mathematical learning is built on solid foundations that need not be retaught.

We know where the gaps in curriculum coverage are. Each class's progress through the curriculum can be traced to the point of last entry in their *MNP!* books. For children to have the aforementioned solid foundations, we must teach pupils so that they can finish the key content of their *MNP!* workbooks from their previous year. So lessons will involve teachers teaching last year's content before this year's. Lessons that go beyond the year group curriculum demands may be missed out to ensure that the class progress on the year appropriate *MNP!* books.

We decided against jumping straight ahead with the year appropriate books because doing this would hit the disadvantaged and low achieving hardest, all of whom were more likely not to have engaged with home learning. They would struggle with cognitive overload; there would be too much new content to hold in their short-term memory for them to learn it all. Much better to help children commit foundational mathematical facts to their long-term memory to ease the strain placed on their short-term memories when they encounter the new year group appropriate materials.

Intervention

There will even be pupils who struggle with the content of last year. Teachers *must* aim to take measures to close this gap in lessons, through intervention in school where possible and the setting of additional homework through which pupils practise areas of weakness.

More Time To Teach Maths

'Starting from where the learners is' is an important concept to follow. It is the whole reason we do Assessment *for* Learning. Accordingly, starting at the point pupils stopped adding to their curriculum knowledge will mean we are pitching the work at

the correct level for most pupils. It affords all pupils the opportunity to deepen their understanding and still provides challenge.

The best way to improve at maths quickly is by spending more time doing more maths. Rushing through To that end, teachers must aim to complete two maths lessons a day rather than one. Additional time has been allocated for this purpose. If this is achieved, most classes will complete the past year's work within the first half-term. Two lessons each day should continue until Christmas, allowing pupils the time to catch up to where they would have been had there been no lockdown.

It's a case of spending time to make that time back. It's imperative that we give more time to maths - at least in this term to close that gap. If we were to race through the curriculum to ensure we have coverage, more gaps would emerge and less knowledge would be secured.

Teaching Safely

There are a number of measures that have been taken to reduce transmission of COVID-19 that affect all subjects - such as pupils being positioned in rows, having individual stationary packs and regularly sanitising their hands.

The school's CPA approach to maths encourages the manipulation of objects to enhance understanding of mathematical representation and structure. This requires pupils to handle objects (such as dienes and counters). It may be possible to provide pupils with their own resources that they keep in their packs along with their stationary. However, if pupils must share or manipulate resources, they should do so in groups of two only. Where this is necessary, the objects must be thoroughly cleaned before and after use, and pupils should wash their hands or hand-sanitise before and after using them.

Lockdown 2 (Spring 2021)

Live teaching

Expectations were higher in terms of live teaching. Teachers needed to ensure new content was covered. At least half of each of four live sessions a week were to be dedicated to delivering MNP! teaching. Workbooks were sent home and the teachers needed to ensure they could present new concepts in an engaging way, whether that was using a whiteboard or a slideshow. During live sessions, Teachers were required to ask questions of pupils to ensure they were engaged and to provide useful opportunities for AfL. Children uploaded all uploaded work and teachers used this to inform future teaching and interventions where needed. This took the form of directing children to resources of the teacher creating them.

5-a-days

Throughout this lockdown, children were given regular opportunities for retrieval practice, at least three times a week. These were targeted at consolidating taught materials.

Return to school (Summer 2020)

CPA

Where possible, children were encouraged to use concrete objects in their work during lockdown. However, we recognise this will have been difficult for many children to access. For this reason, it is very important that every teacher is ensuring they are providing opportunities for manipulating concrete resources whenever MNP! suggests.

Prioritising curriculum

Despite best efforts to catch up with the lost learning from the first lockdown, there was simply too much content to cover. MNP! reviewed its lessons and organised them into those key lessons that were necessary to ensure sufficient curriculum and those that deepened understanding but were not strictly required. Teachers focused their energies on completing as many of these 'star' lessons as possible as we feel it would be unfair to leave children in the position of having to start the year on the previous year's content.