



*Family, Faith and Fascination*

# **Maths Policy**

## **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 recognise the need for continued professional develop in this area and have sought support through becoming part of one the NCETM's *Maths Hub* work groups. 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 judgements 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. Given the uncertainty of staff turnover within any given school and the greater impact this can have on smaller schools give

## Foundation Stage: Reception

In Reception, the priority is for children to develop a deep and secure understanding of the foundations of mathematics - and 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 more 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.

Previously we had split the teaching of mathematics into two parts *Concepts* and *Fluency*, which are taught separately but are very much related. Generally speaking, the aim was that in a week there were to be four *concepts* lessons, three *fluency* lessons and one *quiz* a week. We anticipate that this may change significantly when using the new scheme as proposed lessons may not fit in the time previously allocated for *concepts*. The scheme's sequence of lessons will stand in place of the *concepts* lessons but the intention is that *fluency* and the weekly *quiz* will remain.

## *Concepts*

These four morning lessons involve whole-class teaching with mixed-ability pairing. The school will move its focus towards raising standards so that children's spread in attainment is narrowed. Poorly implemented differentiation can increase the spread of attainment, so it is vital that this is addressed as it can mean that children are not able to engage in meaningful, purposeful and beneficial whole-class teaching and dialogue.

The focus of the whole-class teaching starts with the delivery of new concepts through clear and precise explanation while providing opportunities that encourage children to think and attend to what has been taught. Formative assessment from past lessons and during class time should inform the support children might need. Those children who find the tasks too tricky will be guided by the teacher / teaching assistant to an easier version of the same task or they will be provided with additional resourcing so they can access what is relevant to the problem. Those children who appear not to be challenged, on the other hand, will be given a trickier version of the same or a similar task. We aim to use the following pedagogies within our practice (note that many of these are equally applicable in the below described *fluency* lessons):

- Delivery of new concepts through clear, precise explanation. Developing strong subject knowledge is key for this, including consistent use of the correct mathematical vocabulary. The use of examples *and* non-examples to avoid misconceptions through enhancing the initial conception can be an effective means of developing understanding.
- Worked examples / explicit teaching: breaking new knowledge and processes down into manageable steps.
- Timesaving strategies, i.e. avoid asking children if they already know part of what you're teaching; this sort of 'guess what's in my head' questioning is unnecessary and wastes time. Instead questions should target identifying whether children have understood something you expect they would, following an explanation.
- Before children engage in investigations or problem solving, teachers ought to ensure that the children have enough subject knowledge for most children to be able to be successful. This is to avoid children undertaking tasks that are of such difficulty that they may end up developing misconceptions and experiencing total failure - both of which are more damaging than good. Once it is established that pupils have the requisite knowledge, there should be a focus on making mathematical problems '*real*' (through the use of more *acting* and *physical resourcing*) rather than imaginary. It will be important for pupils to understand that

there is a problem to be *solved* rather than a mathematical question to get *right*. Equally, children should be taught how to investigate systematically before being asked to begin their own investigations.

- Pupils should be able to share their thinking / reasoning articulately when speaking or clearly in written form - children should be encouraged to think logically and justify ideas using accurate vocabulary. This may be through explaining the mathematical thinking behind a solution or through developing strategies to win mathematical games for example.
- Differentiation should be responsive to what happens during the lesson or what happened in the lesson before: in planning this should take the form of either providing an 'easier' version or providing additional resourcing so all can access what is relevant to the problem or topic. There should also be a more difficult version available or extensions available to those who appear to have a secure understanding.

### *Weekly Concepts Quiz*

Low stakes quizzes should be taken every week to revisit previously taught topics. However, there will be occasions where curriculum coverage takes priority. There is a strong body of evidence suggesting that regular testing leads to more significant changes in long-term memory. Furthermore, 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.

### *Fluency: written methods and counting*

There are three shorter afternoon lessons a week called *fluency* lessons. While Concepts lessons are encouraging *thinking*, the fluency lessons give children the tools and language for thinking. Fluency in maths is just as it sounds: being 'fluent' in maths in the sense that you might be fluent in a language. The better you are at the 'language' of maths, the easier it is to *think* about mathematical problems. These lessons provide children with the opportunity to commit such mathematical knowledge to their long-term memory, which is important if we acknowledge the suggested findings of Cognitive Load Theory. The more 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 within *Concepts* lessons. Being fluent in the different *procedures* of maths and *counting* decreases the strain on a child's short-term memory.

Following the *written methods booklet*, the prescribed method for one of each of the four operations (addition, subtraction, multiplication or division [incl. fractions]) will be practised, as will counting objectives. This is subject to change though as we will adapt the written methods booklet to correspond to the methods taught within *Maths, No Problem!*

The *fluency* lessons involve extensive modelling and formative assessment. The teacher should be teaching groups or as many individuals as they can, and when not doing so should be giving immediate feedback with a teaching assistant. When a pupil continues to

struggle with a new method - despite support - then you should ensure that the child is confident with the step before. Those struggling will typically receive more attention during these lessons.

The aspiration is that all pupils will complete the same calculations - in line with year group expectations (this is important since *Working At Greater Depth* has nothing to do with increasing the size of the numbers in calculations). The National Curriculum advises that children do not go beyond the objectives for each year group - instead children should *master* the skills of each year group to provide a more solid foundation for future years and find further challenge through extension questions in fluency or through the tasks given in Concepts lessons.

The written methods booklet is to be used by staff for consistency, and may be used at home by parents so that procedures may be taught and practised at home confidently. Staff will use this booklet as a resource to save time on planning - since they will be able to follow its steps and instructions when teaching the *written methods* and *counting* lesson.

Those who successfully and quickly complete the questions provided should move onto challenging extension questions that give children an opportunity to *think* deeply and to use mathematical language in their reasoning. This means all children are provided with an opportunity to work at *mastery* level and *greater depth*. The lesson should conclude with the teacher going through the answers as pupils mark their own work, making corrections as they go. Those who did not complete the extension questions will be afforded the chance to benefit from the problems and solutions being shared at the end.

Marking will make clear which pupils need intervention work there and then in the lessons or - if possible - during additional intervention time. All staff will be able to deliver the interventions effectively with minimal planning or resourcing as they will have the booklet to guide them in teaching the procedures. Interventions should be delivered as early as possible to have the best chance of reducing the spread of attainment.

In addition to the procedures and methods described above, we should provide opportunities for pupils to develop mental strategies for solving calculations, including through the learning and rapid, accurate recall of number facts and patterns. In fact we are currently reviewing just how much of the time should be dedicated to developing fluency for mental methods and how much should be dedicated to written methods.

## Planning and teaching

Each class teacher is responsible for being prepared for lessons in mathematics for his or her 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.

Resourcing for lessons should demonstrate the various challenges available to children who find the initial tasks unchallenging, together with the relevant support or scaffolding to allow the learning to be more accessible to those who are struggling too much. Formative assessment opportunities should be available to improve pupils' chances of remaining motivated and being challenged in lessons.

## 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.

## Feedback: Marking and Formative Assessment

Teachers will use their own judgement and use of formative assessment to ensure a flexible approach is adopted which recognises the pace of learning with the classroom. 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 in purple pen.

## 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. However, we anticipate that these tests will contain content not yet covered following the new scheme of work. We may decide to overcome this by including the coverage within quizzes and gradually building the difficulty to suit the content of the test - or by using some fluency lessons to cover concepts that require more teaching.

Between each of these assessments, weekly low-stakes quizzes should be taken. Again, expectations for this are sensitive to the implementation of the new scheme. In these quizzes a number of skills should be regularly revisited.

Using the NCETM's questions to support assessment are useful for gauging how well pupils understand concepts so may be used within these quizzes. According to the NCETM, *'these provide an opportunity to develop and demonstrate a depth of understanding and proficiency which will ensure that learning is likely to be both sustained over time and built upon in the future'*. Where an individual pupil's progress is a concern then more detailed monitoring and recording may be justified. It is not a routine expectation that next-steps or targets be written into pupils' books. The next lesson should be designed to take account of the next steps.

Along with the knowledge of pupil understanding gained from lessons, teacher should use the weekly 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.

## 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. 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.

## 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 additional 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.