Mathematics Policy

2022 - 2023

So, teach us to number our days that we may get a heart of wisdom.
(Psalm 90:12)

Document Control

Owner

The owner of this document is the Headteacher. All requests for change should be directed to them. Any printed copies of this document are for reference only; the definitive version is the computer file held on the school office administrator's computer.

Revision history

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Approval

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1. Introduction

At Youlgrave, All Saints C of E (VA) Primary School our mathematics curriculum follows the Programme of Study and Aims of the National Curriculum (2014).

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.

2. Aims

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 develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- ✓ **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.

Our vision for mathematics:

- ✓ To promote a positive attitude towards mathematics in all pupils.
- ✓ To ensure all pupils are engaged in and are enjoying exploring mathematics.
- ✓ To enable all pupils to find links between mathematics and other areas of the curriculum, including Science.
- ✓ To ensure all pupils progress in mathematics and are challenged appropriately through an in depth understanding.

- ✓ To use a wide range of concrete, pictorial and abstract representations to develop all pupils' relational understanding of mathematics.
- ✓ To ensure all pupils are confident using mathematical vocabulary when reasoning about mathematics.
- ✓ To promote a growth mind set in all pupils, particularly when Problem Solving.

3. Teaching and Learning – A 'Mastery Approach'

The teaching and learning of mathematics at Youlgrave, All Saints' should include aspects of the following Mastery Approach strategies in every lesson and/or over a series of lessons:

Concrete, pictorial, abstract (CPA) is a highly effective approach to teaching that develops a deep and sustainable understanding of maths.

Concrete
Concrete is the 'doing' stage; using concrete objects to model problems. Instead of the traditional method of mathematics teaching, where a teacher demonstrates how to solve a problem, the CPA approach brings concepts to life by allowing pupils to experience and handle physical objects themselves. Every new abstract concept is learned first with a 'concrete' or physical experience.

For example, if a problem is about adding up four baskets of fruit, the pupils might first handle actual fruit before progressing to handling counters or cubes which are used to represent the fruit.

Pictorial
Pictorial is the 'seeing' stage; using representations of the objects to model problems. This stage encourages pupils to make a mental connection between the physical object and abstract levels of understanding by drawing or looking at pictures, circles, diagrams or models which represent the objects in the problem.

Building or drawing a model makes it easier for pupils to grasp concepts they traditionally find more difficult, such as fractions, as it helps them visualise the problem and make it more accessible.

Abstract
Abstract is the 'symbolic' stage; where pupils are able to use abstract symbols to model problems (Hauser).

Only once a child has demonstrated that they have a solid understanding of the 'concrete' and 'pictorial' representations of the problem, can the teacher introduce the more 'abstract' concept, such as mathematical symbols. Pupils are introduced to the concept at a symbolic level, using only numbers, notation, and mathematical symbols, for example +, –, x, ÷ to indicate addition, subtraction, multiplication, or division.

4. What are Fluency, Reasoning and Problem Solving?

Fluency

Fluency comes from deep knowledge and practice. This is the first stage of pupils' understanding. When assessing pupils, if a child is fluent in a concept, they will be assessed as '1' on the (KPI) Assessment sheet.

Fluency includes - conceptual understanding, accuracy, rapid recall, retention and practice.

- Accuracy – Pupils carefully completing calculations with no or few careless errors.
- Pace – Pupils are able to quickly recall the appropriate strategy to solve the calculation and progress through a number of questions at an age appropriate pace.
- Retention – Pupils will be able to retain their knowledge and understanding on a separate occasion to when the concept was first introduced.

The key to fluency is deep knowledge and practice and making connections at the right time for a child.

Reasoning

Verbal reasoning demonstrates that pupils understand the mathematics. Talk is an integral part of mastery; as it encourages students to reason, justify and explain their thinking. This is tricky for many teachers who are not used to focusing on verbal reasoning in their mathematics lessons. Teachers might, for example, get young learners to voice their thought processes. Older students could take part in class debates, giving them the space to challenge their peers using logical reasoning.

Problem Solving

Mathematical problem solving is at the heart of the Mastery Approach. Pupils are encouraged to identify, understand and apply relevant mathematical principles and make connections between different ideas. This builds the skills needed to tackle new problems, rather than simply repeating routines without a secure understanding.

Mathematical concepts are explored in a variety of representations and problem-solving contexts to give pupils a richer and deeper learning experience. Pupils combine different concepts to solve complex problems, and apply Knowledge to real-life situations. Through problem solving, pupils are required to select their mathematical Knowledge and apply this to a new concept.

Problem solving is more than just word problems but the Read, Understand, Choose, Solve, Answer and Check (RUCSAC) approach can be applied to this style of question:

1) Read/Look at the problem
2) Understand the problem by underlining or discussing: What is the problem about?
3) Choose – Choose the operation required, the number facts or the approach.
4) Solve – Solve the problem by completing jottings on the page.
5) Answer – Complete the answer to the problem.
6) Check – Have I correctly answered the given problem or is there another step?

5.Teaching and Learning - Mathematical Talk

A mastery classroom should never be a quiet classroom. The way pupils speak and write about mathematics transforms their learning. Mastery approaches use a carefully sequenced, structured approach to introduce and reinforce mathematical vocabulary.

To encourage talk in mathematics, teachers may introduce concepts by including sentence structures (stem sentences). Pupils should be able to say not just what the answer is, but how they know it's right. This is key to building mathematical language and reasoning skills. This gives pupils the confidence to communicate their ideas clearly, before writing them down.

Teachers then maintain a high expectation upon pupils to repeat and use the correct mathematical vocabulary to explain their understanding verbally and in their reflection comments. By also displaying the vocabulary during the lesson, pupils will be able to use this independently.

When questioning and encouraging mathematical talk, teachers should provide regular, purposeful opportunities. For example:

- Show me how to complete the calculation.
- Teach your friend how to complete the calculation.
- How do you know which operation to use?
- Why have you chosen this method?

- How else can you represent this number?
- What have you learnt today?
- True or False?
- Odd one out?
- Sometimes, always, never?

6. Teaching and Learning – Lesson Structure

Pupils in Reception, Year 1 and Year 2 are taught in mixed ability groups (classes) and follow an integrated mathematics curriculum. In Years 3 – 6 the pupils are set so that they are taught objectives matching their current ability.

Mathematics is taught for at least one hour per day (or five hours per week). However, when required, teachers may choose to include additional mathematics lessons in their weekly timetable.

'The expectation is that the majority of pupils will move through the programmes of study at broadly the same pace. However, decisions about when to progress should always be based on the security of pupils' understanding and their readiness to progress to the next stage. Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.' (National Curriculum 2014)

Lesson Structure

All mathematics lessons at Youlgrave, All Saints' follow the following structure:

- ✓ Starter Activity – to promote fluency of arithmetic and the 'non-negotiable' concepts.
- ✓ Introduce New Learning using the Mastery Approach (See 'Planning'). Power Up follows a structure of Discover, Share, Think Together.
- ✓ Reflective Plenary (Purple Pen).

Starter Activity – to promote fluency of arithmetic

The purpose of this activity is to promote fluency of arithmetic and enable pupils to recap on the 'non-negotiable' aspects of mathematics. The starter activity should be up to 10 minutes and could include:

- Power Up activity.

- TT (Times Tables) Rockstar Paper; a based 3-minute practice/teacher set times tables practice. Beat That Maths activities on Monday and Friday.
- Verbal Mental Maths games/competitions.
- Quick Fire questions on mini whiteboards.
- Times Table chanting.

Reflective Plenary
At the end of each lesson, all pupils should have made progress by learning a new technique, gaining an improved understanding of a concept or being able to complete a new activity.

7. Planning

At Youlgrave, All Saints' teachers in Years 1 – 6 follow the Power Maths scheme. This provides the yearly overview and Medium-Term planning for each year group. For calculation, Youlgrave, All Saints' Calculation Policy, which follows our Mastery Approach, should be adhered to and displayed in the classroom.

Teachers should write their own Short-Term Planning using the Youlgrave, All Saints' template. This incorporates: precision teaching, modelling, misconceptions and key questions.

Number:
A large proportion of time is spent reinforcing number to build competency and fluency. Number is usually at the heart of any primary mastery scheme of learning, with more time devoted to this than other areas of mathematics. It is important that pupils secure these key foundations of mathematics before being introduced to more difficult concepts.

This increased focus on number will allow pupils to explore the concepts in more detail and secure a deeper understanding. Key number skills are fed through the rest of the scheme so that pupils become increasingly fluent.

Planning should aim for all pupils to master the age group expectations of the National Curriculum by including rich, deep activities. More-able pupils should not be accelerated through concepts, instead they should complete Challenge questions from NCETM (National Centre for Excellence in the Teaching of Maths), White Rose etc. (See resources).

8. Calculation Policy

Staff should be familiar with the policy and should follow this when teaching written methods. The policy demonstrates our Mastery Approach and shows progression through each operation for each stage of learning.

9. Times tables

Times Tables are a mathematics 'non-negotiable' and must be taught and then practised. All times tables to be learnt up to 12 x 12. TT Rockstars is available for the practice of times tables.

We teach times tables using the following progression:

- Year 1 – Be able to count in multiples of twos, fives and tens.
- Year 2 - Be able to recall 2, 5 and 10 multiplication and division facts.
- Year 3 - Be able to recall 3, 4 and 8 multiplication and division facts.
- Year 4 - Be able to recall 6, 7 and 9 multiplication and division facts.
- Years 5/6 - Application of multiplication and division facts to problem solving

From 2019/2020 Year 4 pupils will take an online Times Table test which will be a timed assessment testing their speed of recall for multiplication and division facts.

TT Rockstars
TT Rockstars is an initiative for pupils in Years 2 – 6. It is a fun way to practise times tables. In school, awards are given for pupils who participate and make progress on TT Rockstars.

The 'Sound Check' programme on TT Rockstars follows the exact structure of the 2020 Year 4 Times Table Test.

Pupils are expected to log onto TT Rockstars at home for 15 minutes per week.
In school, pupils complete TT Rockstars in class either through Class Tournaments or through directed time. Each child will have their target times tables set by the class teacher.

10. Resources

When resourcing and planning using Power Maths, teachers to also choose resources which complement it and follow the Mastery Approach: Concrete, Pictorial and Abstract. Teachers have the flexibility to choose resources they feel are most effective to

support the needs of all learners (differentiation) and ensure they achieve the aims of fluency, reasoning and problem solving.

Resources are kept online, in classrooms and in the mathematics cupboard (Class 2). The resource audit is attached.

11. Recording of Learning

Pupils have a square-paged maths exercise book each as well as a Power Maths Practice book. All learning (every lesson) to be evidenced. This could be photographs, worksheets or an explanation of today's learning by the teacher or pupil e.g. 'Today I went outside and measured the perimeter of the playground by using a Trundle
Wheel. I measured each length in metres and then added each value together.'

The presentation of mathematics books should be consistent, age appropriate and show that pupils take pride in the appearance of their work:

- The date to be written as figures e.g. 05.07.18
- The WALT to be at the top of the page on the left-hand side (handwritten or typed) underneath the date.
- When completing computations, it is recommended that the pupils fold the page in half to create two columns – this will save space and help to align place value columns.
- When sticking in question sheets/resources, these to be trimmed to ensure they fit onto the page
- Pencils and rubbers to be used – no pens (except Purple Pen comment).

12. Feedback and Marking

Immediate Intervention is essential. A pupil should leave each lesson feeling successful and any misconceptions or concerns to be addressed immediately. All teachers to follow the Marking Policy. Where appropriate, pupils should have the opportunity to self
and peer mark their work but the teacher should always complete their own marking and assessment.

13. Assessment

Assessment should be regular and used to inform planning and to make the Teacher Assessment judgements at the end of each term.

Formative Assessment – Completed regularly to inform planning
Questioning
Written Work
Half termly TT Rockstar Paper assessment
End of Block Power Up Assessments

Summative Assessment
Each Year: TT Rockstar Baseline Test (Year 2 – 6)
Each Term: Power Up assessments (Arithmetic and Reasoning and Problem-Solving Paper)
Each Term: PUMA assessment
Each Term: Practice SATs Papers (Years 2 and 6)

There are no official grade boundaries for Power Up assessments. However, in line with the KS1 and KS2 SATs, the following is a guideline:

- ✓ KS1 – Year 1 - a consistent score of approximately 60% (15/25) would indicate 'Expected' and 85% (21/25) would indicate 'Greater Depth'.
- ✓ Year 2 - - a consistent score of approximately 60% (21/35) would indicate 'Expected' and 85% (30/35) would indicate 'Greater Depth'.
- ✓ KS2 - a consistent score of approximately 55% (28/50) would indicate 'Expected' and 86% (43/50) would indicate 'Greater Depth'. These tests should be used to inform teacher assessment.

At the end of each term, all teachers attend a Pupil Progress meeting to share data and to discuss pupils who are 'off target'. These pupils should be placed into an Intervention/Booster group with a SMART target.

14. Non-negotiables

To ensure pupils are 'ready' for the next year group's curriculum. Teachers should ensure all

pupils can complete the non-negotiable concepts. This is not at the expense of the rest of the curriculum but are the fundamental requirements to enable a child to progress. Pupils should be assessed against the 'non-negotiable' framework for their year group each term.

15. Classroom Environment

Each classroom will have a dedicated Maths display that is regularly updated to reflect the current objectives or concepts being taught. This display will take the form of a 'working wall' which is changed regularly and is added to each day or week with concepts that the children are using in class. Children's work should be used in addition to teacher made resources or other resources.

16. Homework

Maths homework is sent home each week. This can be in the form of arithmetic skills based or as a consolidation to the week's objective. Homework allows children to develop independent learning skills for Secondary School as well as seeing learning as a lifelong skill. As a school we will be attentive to individual children's home circumstances and support will be give where appropriate.