



# Woolden Hill Primary School

Achieving Success, Creating Futures Together

## Maths Policy

**Approved by:** Sarah Sadler

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## **Rationale**

This policy outlines the intent, implementation and intended impact for the teaching, leadership and assessment of mathematics at Woolden Hill Primary School. The school's policy for mathematics follows the 2014 National Curriculum Framework and the Early Years Foundation Stage Framework.

## **Our Mission**

At Woolden Hill we will strive to ensure that all children achieve high aspirations and celebrate success through a creative and inspiring curriculum. We will foster mutual respect for all and develop confident, independent and resilient learners who are effective citizens in an ever-changing technological society.

## **Our Values:**

*"At Woolden Hill we will ensure all children achieve high aspirations and celebrate success through a creative and inspiring curriculum. Pupils will receive modern teaching and learning experiences that enable pupils to achieve future ready skills so that they can thrive within and beyond their time at school. Equipping our pupils with technological fluency and an agile mindset that embraces innovation will prepare them to face almost anything. Technology is used to drive continuous improvement and provide the equality, inclusion and accessibility tools required for all members of the school community to achieve their very best.*

*Woolden Hill provides learning spaces which enable pupils to access hybrid learning opportunities to develop the 21st Century skills they require to embrace the shift required to navigate career paths to come. Woolden Hill recognises that the window to the world is more accessible than ever before. Pupils will have opportunities to embrace this through making connections and developing their communication beyond the school walls. This will enable pupils to foster mutual respect for all and develop confident, independent and resilient learners who are effective citizens."*

## **Our school aims:**

- To inspire and motivate children to develop curiosity, academic success and develop high aspirations for the future.
- To develop pupils who are independent, resilient and have the ability to persevere when challenged.
- To develop technologically competent and resourceful pupils to ensure that they can interact adapt to the ever-changing global community.
- To keep our children safe and teach them the skills to make decisions which allow themselves to be safe through controlled risk taking.
- To celebrate and share personal and collaborative achievements to create a school-wide culture of success.
- To encourage children to make choices which promote a healthy body and mind. Our children will have respect and tolerance for themselves and each other.

## **Intent**

Woolden Hill Primary School began its transition towards Teaching for Mastery in 2017 and our maths teaching and learning journey continues to grow. Through our work with the East Midlands South Maths Hubs, our teaching is based on the five key ideas of Teaching for Mastery: Coherence, Representation and Structure, Variation (procedural and conceptual), Fluency and Mathematical Thinking.

Our overarching intent is to instil a love of a mathematics in our children and staff; we want our children to be life-long mathematicians and to understand how mathematics is essential to everyday life and that it is critical to science, technology, engineering and finance. Through developing children's curiosity and gaining an appreciation of the beauty and power of mathematics, we want all children to enjoy the subject and to experience success.

In our teaching and learning, we understand the importance of metacognition and developing self-regulation in children to become independent learners. Through our work on Growth Mindset, we have developed a culture where the children (and staff) understand that mistakes help us learn and we should not be afraid of getting things wrong. To embed this further, we regularly give the children the opportunity to self-mark and reflect; this allows the children to have a feeling of success as well as developing their resilience and perseverance.

We have embedded the three aims of the National Curriculum in our teaching: fluency, reasoning and problem solving. We believe that all three of these are equally important to develop well-rounded mathematicians.

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 nonroutine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

### **Curriculum Drivers**

At Woolden Hill Primary School, through the delivery of a high-quality knowledge led mathematics curriculum.

Our curriculum is planned entirely around a thematic approach. This allows pupils to see the purpose of learning across all subjects and ensure they fully understand the learning intentions and outcomes. Where possible, our outcomes have a real-life context and will involve the local community or national organisations. We believe that we need to build a curriculum to ensure that our children are the change agents for the future. Staff at Woolden Hill use cognitive science to ensure that children develop knowledge, skills and understanding in a way that they can retain new information in their long-term memory. As part of our work on cognitive science, our staff understand the importance of revisiting concepts regularly to keep them in the working memory. We have also taken an approach of ‘lingering longer’. This means spending longer on concepts to ensure the knowledge is embedded.

Our pedagogical approaches to teaching and learning are equity, evidence and engagement.

<b><u>Equity</u></b>	<b><u>Evidence</u></b>	<b><u>Engagement</u></b>
<ul style="list-style-type: none"> <li>• Equity and equality of opportunity, <u>entitlement</u> and experience</li> <li>• Consistently high expectations, <u>quality</u> and standards for all pupils</li> <li>• A mastery Curriculum, excellence in SEND programme</li> </ul>	<ul style="list-style-type: none"> <li>• Research informed pedagogies</li> <li>• Formative assessment strategies embedded in Teaching and Learning</li> <li>• Use of evidence from Cognitive Science Research – eg importance of metacognition and self-regulation</li> <li>• Balance of direct instruction and enquiry</li> <li>• strong self-evaluation</li> </ul>	<ul style="list-style-type: none"> <li>• Authentic purposes and contexts for learning based on our local school make up</li> <li>• Emphasis on first-hand experience</li> <li>• Purposeful, structured play in the EYFS; drama, strong emphasis on outdoor learning, <u>sport</u> and The Arts</li> <li>• Pupil autonomy and choice</li> <li>• Cross-curricular connections</li> </ul>

Our curriculum uses our knowledge of cognitive science. We block subjects to help children reduce their ‘forgetting curve’ and use a spiralised approach overtime to ensure that children can return to key concepts to link their understanding and create lasting memories of knowledge and skills.

## Implementation

### How mathematics is planned and taught:

Teachers use the White Rose planning scheme to support their long-term planning. White Rose suggests how long to spend on each block of learning, but the length of time spent is down to individual teachers to decide what is best for their classes' learning. Teachers work collaboratively to plan mathematics using the learning journey planning format. The teachers look what the prior learning was then build the current teaching upon that. Teachers use the White Rose progression maps for overall National Curriculum coverage. See attached flow diagram showing how a maths lesson is planned out.

To support our planning, we use various high-quality resources:

- NCETM PD materials <https://www.ncetm.org.uk/resources/50639>
- White Rose Schemes of learning <https://whiterosemaths.com/resources/primary-resources/>
- NCETM Mastery Assessment documents <https://www.ncetm.org.uk/resources/46689>
- Gareth Metcalfe's 'I See Reasoning' and 'I See Problem Solving'. <http://www.iseemaths.com/>
- NRich resources <https://nrich.maths.org/>
- Interactive representations from mathsbot - <https://mathsbot.com/>
- Third Space <https://mathshub.thirdspacelearning.com/>
- [Numberblocks https://www.ncetm.org.uk/resources/52060](https://www.ncetm.org.uk/resources/52060)

For the wider curriculum we block learning and re-visit practice over time through a spaced practice approach (Learning Scientists, 2016) as research suggests this will lead to better long-term retention of knowledge. Retrieval practice is a fundamental part of our mathematics curriculum as it is proven to strengthen memory and make it easier to retrieve the information later (Rosenshine, 2012, Jones, 2019, Barton, 2017). Opportunities for retrieval practice occur in many places in the mathematics curriculum:

- **Flashback 4** to activate prior learning forms the start of every lesson in KS1 and KS2. This revisits mathematical concepts from last lesson, last week, last month and last year.
- **Times Tables RockStars**- Completed at least three times a week in KS2 and once a week in Year 2 (from Spring 1).

### Planning and Teaching in EYFS

Maths is taught as part of the Area of Learning designated as 'Mathematics' in the EYFS Curriculum. The ELGs are made up of two strands: Number and Numerical Patterns. The children receive four whole class, teacher led math's teaching sessions per week. Key weekly objectives are embedded through enhancements in the continuous provision, which the children can independently access.

Once a week, every child will have opportunity to work in small

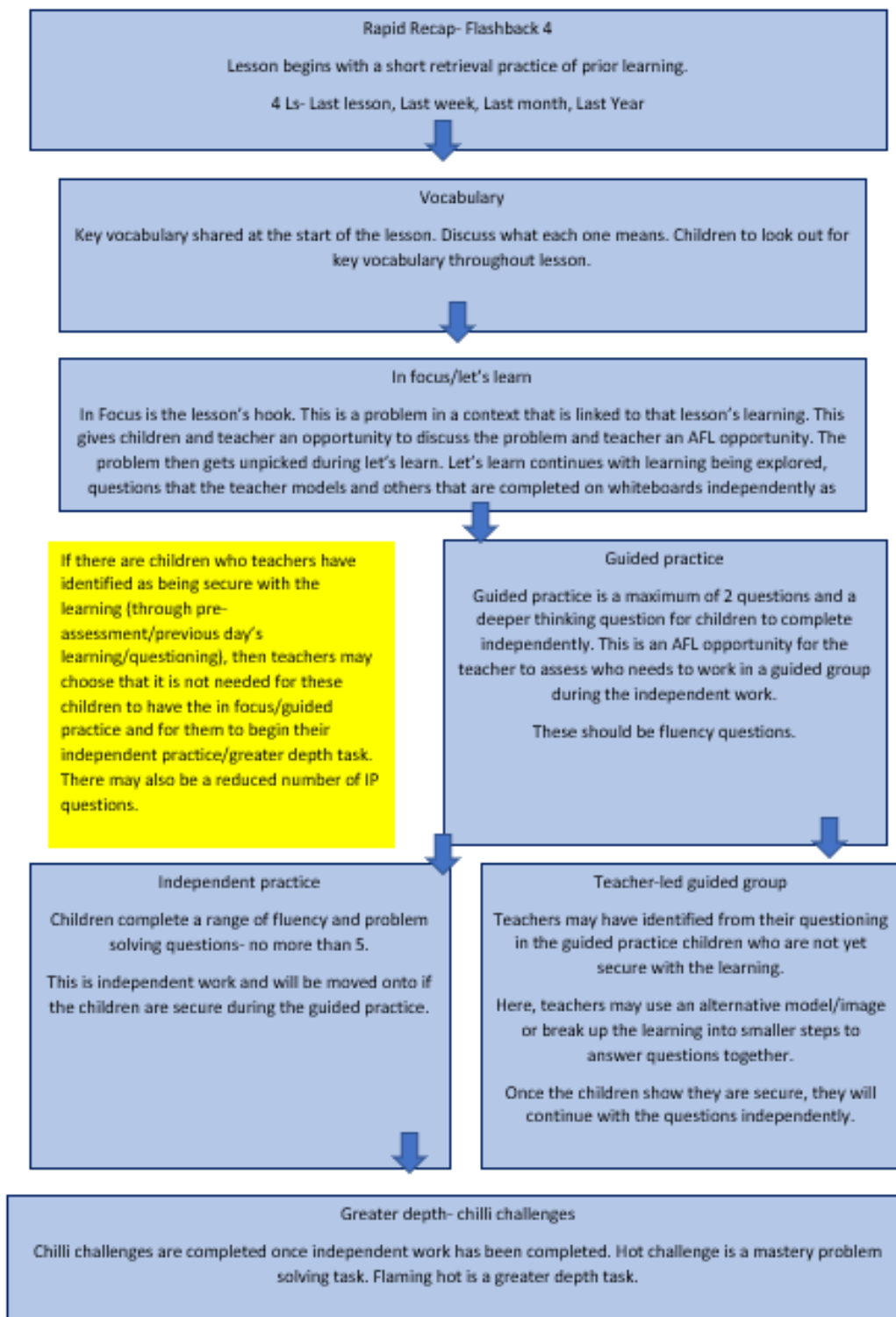
groups with an adult to focus on an area of the weekly whole class learning. Children are given opportunities to work on maths activities both indoors and outdoors. These activities are based on the road map for Reception math's outcomes.

In Reception, we plan using the NCETM Mastering Number project. Each term we join moderation and training in the next step of planning and teaching. Each week, the learning progresses through skills in recognising the construction of numbers and the patterns within counting. Following the school's lesson structure, each Math's lesson begins with revisiting prior learning and builds on prior knowledge. The progression of skills allows time for children to develop 'mastery' in the key areas of Mathematics without moving onto a new concept too quickly.

Planning is updated through in the moment interactions. Observation and assessment are used to identify children who are working towards expectation. Weekly math's interventions are then planned around their needs. The activities can range from problem solving to play based learning and are specific to the child's gaps in learning and taught through their interests and learning styles.

## Key Stages One and Two:

In Key Stage 1 and 2 children have a daily mathematics session of approximately 60 minutes. Teachers in Key Stage 1 and 2 also plan and provide opportunities for children to use and apply maths knowledge and skills in other areas of the curriculum.



### **Effective teaching of Mathematics:**

Woolden Hill Primary School prides itself on being a research informed school. Following staff training on Rosenshine's Principles in Action (Sherrington and Caviglioli, 2019), involvement in the Teacher Research Groups and Teaching for Mastery (McCourt, 2019) school teachers are expected to actively present material and structure lessons using the ten principles of instruction below. These principles not only facilitate the memorising of information but allow pupils to understand it as an integrated whole, and to recognise the relationships between the parts. This **does not** mean that every lesson needs to follow the exact structure or sequence and this is **not** intended to be used as checklist for each lesson; these elements can occur at different points in a lesson, or over a sequence of lessons, and can be integrated in different ways and at different times.

Incorporated in maths lessons in KS2 is the use of Century Tech. This is a blended learning opportunity that can be used as part of pre-teaching, post-teaching assessment or within the lesson as part of the independent activities. Children complete 'nuggets' through their pathway on Century Tech to revisit previously taught concepts or as part of their current learning. Microsoft OneNote is also used within maths lessons in KS2. Completed independent work can be found in maths books, as well as on OneNote. In KS1, Maths learning can be found within maths books, as well as on tapestry. These are part of our blended learning approach to our curriculum.

### **Principles of instruction:**

1. **Flashback 4** – lessons begin with a short review of previous learning to re-activate recently acquired knowledge.
2. **Present new material using small steps (in focus and let's learn)** – recognise the limitations of the working memory by breaking down concepts and procedures into small steps.
3. **Ask questions** – teachers need to ask large numbers of questions to check for understanding
4. **Provide models** – a central feature of giving good explanations. These may include concrete models to aid abstract concepts, worked narrative examples modelling a process
5. **Guided Practice** – give time to guide student practice supported by modelling, corrective feedback and re-teaching where gaps remain.
6. **Check for student understanding** – teachers use their questioning to ascertain from as many children as possible what they have understood? A range of questioning strategies below can be used to do this (see below).
7. **Obtain a high success rate** – teachers need to engineer a high success rate (around 80%) where children are reinforcing error-free, secure learning, improving fluency and confidence providing a platform for independent practice. However, it is still important pupils are challenged here (a success rate a 90%+ is too high).
8. **Provide scaffolds for difficult tasks** – temporary aids may be required to support children in developing a level of independence but are withdrawn at the right point so that pupils don't become reliant upon them.
9. **Independent Practice** – here teachers need to construct learning so that students are able to do challenging things by themselves without help. It is important that the material that students practise is the same as during guided practise for appropriate levels of success to be secured
10. **Weekly and Monthly Review** – to ensure that previously learned material is not forgotten and break the forgetting curve. A variety of retrieval techniques can be used to do this.

### **Questioning and Reasoning Strategies used at Woolden Hill:**

- How do you know? Justify Why?
- What's the same? What's different?
- Explain how you got your answer? What did you do?

- What do you notice?
- How many different ways can you show me?
- Think – Pair – Share
- Cold call (no hands up)
- Phone a friend (bounce to a friend if a child isn't able to answer initially)
- Probing questions (staying with a child to probe deeper to check understanding)
- Say it again better (ask children to rephrase answers a second time to build a deeper, high-quality answer)
- Agree, Disagree, Add your own... (to structure class discussion around a question)
- Whole class response: choral, whiteboard, ABCD, thumbs up + down for true or false

### **Classroom environment**

Every classroom has a maths working wall where key concepts, representations, models, vocabulary, problem solving symbols and methods are developed with the children and displayed to develop the overall learning journey. This allows the whole class to have ownership of their learning and to be able to refer to key concepts through the learning journey.

Children also have access to manipulatives to support them in their learning: number lines, place value charts, multiplication grids, fraction walls, Numicon, dienes, cubes, bead strings and other key resources. These manipulatives are also used online as part of our blended learning approach.

### **Feedback**

At the end of the Guided Practice and Independent Practice, children will self-mark their answers in orange pen. This enables the teacher to assess which children need support/challenge and allows the children to self-correct. Teachers mark positive praise in purple and next steps in green. Children are provided with next step feedback to ensure they master their learning (see Formative Assessment and Feedback Policy).

### **Chilli Challenges**

Children are challenged through the lessons with directed questioning, but they can also be challenged through deeper thinking tasks in the input and the guided practice. After the independent work, the children have 2 chilli challenges to complete- hot and flaming hot. The chilli challenges focus on the Greater Depth skills of open-ended challenge, creating own tasks and proving and justifying their reasoning (<https://nrich.maths.org/11336>).

### **Multiplication Tables**

Throughout the year groups in Woolden Hill, children are developing and consolidating their multiplication knowledge in line with our arithmetic and mental strategies document and age-related National Curriculum expectations. This includes a variety of tasks:

- Counting stick
- Multiplication games
- TTRS booklets – 60 questions in 3 minutes
- MTC simulation practice
- TTRS online

### **Inclusion and Equal Opportunities (challenge for all):**

In line with our mission statement, we believe every child will have equal opportunity to achieve their full potential and access an ambitious and coherent curriculum that leads to deep learning and an understanding of a sustainable world. Regardless of race, gender, cultural background, ability or Special Educational Needs or Disability.

If a child has a special educational need of disability, we will do our very best to ensure we meet that child's individual needs when accessing the mathematics curriculum. We comply with the requirements set out in the SEND Code of Practice. If a teacher has concerns about the progress of a child, then they will liaise with the in school SENDCO to arrange appropriate assessment of need and set up personal provision through initially writing a Personalised Provision Plan. In some cases, where the demands of the curriculum may be too much, this may involve the use of pre-key stage targets to track small step progress for this child or differentiation within the classroom environment to meet the needs of that child.

## **Impact**

### **Assessing Progress**

#### **Formative Assessment:**

Pupils' progress will be assessed using regular formative assessment in lessons through strategies such as questioning, regular retrieval practice, quizzing, independent learning tasks, post assessments and assessment of work in books and feedback.

At the end of a unit, they will be assessed formatively through the use of a **post assessment** task. This post assessment is a combination of RtP assessment questions, SATs style questions (for relevant year groups) and white rose questions. These post assessments will be completed in books, on OneNote and Teachers will use these assessments to provide further feedback or re-teach concepts where necessary to close gaps and ensure pupils have mastered the curriculum content at that point.

#### **Assessing long-term learning:**

#### **Summative Assessment:**

Summative assessment in Mathematics takes place at the end of every term in line with the School and Trust Assessment Schedule. In years 1, 3, 4 and 5 this take the form of Rising Stars Assessment and in years 2 and 6 it is previous SATs papers.

In year 4, the children complete the Multiplication Tables Check (MTC) in June each year.

Years 2 and 6 also take part in the Statutory Assessment Tests (SATs) that take places in May each year.

#### **Tracking Pupil Progress:**

In mathematics children are tracked in multiple ways:

- Insight data
- Weekly arithmetic scores
- Half termly times table scores (for applicable year groups)
- Tracking of EYFS to end of KS1 **statutory assessment data** and end of KS1 statutory assessment data to end of KS2 statutory assessment data
- Baseline assessment in EYFS and tracking against Early Learning Goals

Individual progress is reported to parents through two termly Parents' Evenings and an end of year report.



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**Barton C, (2017) How I Wish I'd Taught Maths: Lessons learned from research, conversations with experts, and 12 years of mistakes**

**Barton, C. (2020) Reflect, Expect, Check, Explain: Sequences and behaviour to enable mathematical thinking in the classroom**

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McCourt, M. (2019) Teaching for Mastery

Rosenshine. B. (2012) Principles of Instruction: Research-Based Strategies That All Teachers Should Know. *American Educator*, 36 (1) p12-19.

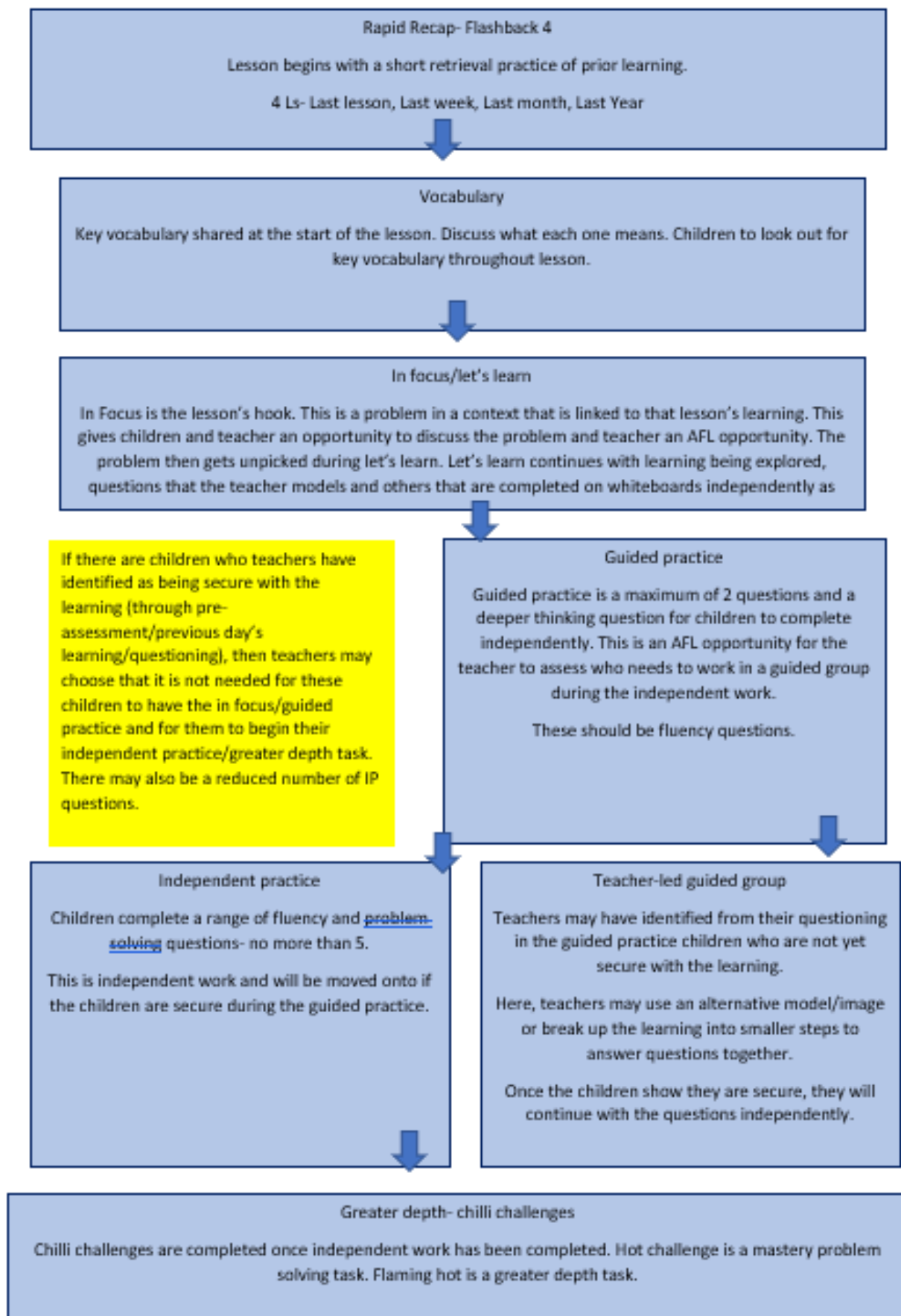
Sherrington, T. and Caviglioli, O. (2019) *Rosenshine's Principles In Action*.

The Learning Scientists (2016). [Posters and Blogs]. Available at: <https://www.learningscientists.org> [Accessed 6 Sep. 2019].

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Chistodoulou, D. (2016) Making Good Progress: The future of Assessment for Learning

**Appendix 1- Lesson flow diagram.**



## Appendix 2- Maths Learning Journey planning format

**What should they know?**

**Number - multiplication and division**

Pupils should be taught to: solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher

### Maths Journey Planning Sheet

**Topic Title:** Multiplication and division

**Subject:** Maths

**Planning done by:** Vikki/ Chloe

**Subject knowledge links:**

**Y2 TAF**

- count in twos, fives and tens from 0 and use this to solve problems
- recall multiplication and division facts for 2, 5 and 10 and use them to solve simple problems, demonstrating an understanding of commutativity as necessary
- recall and use multiplication and division facts for 2, 5 and 10 and make deductions outside known multiplication facts
- use reasoning about numbers and relationships to solve more complex problems and explain their thinking (e.g.  $20 + 17 = 35 + 4 + 4$ ; 'together Jack and Sam have €34. Jack has €2 more than Sam. How much money does Sam have?' etc.)
- solve unfamiliar word problems that involve more than one step (e.g. 'which has the most biscuits, 4 packets of biscuits with 5 in each packet or 3 packets of biscuits with 10 in each packet?')

**What National Curriculum Objectives will you cover?**

- recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers
- calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication ( $\times$ ), division ( $\div$ ) and equals ( $=$ ) signs
- show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot
- solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

**Key equipment/images:**

**What misconceptions will the children have?**

**What key skill or concept is being taught?**

**Generalisations-What stem sentences might you want the children to repeat and recognise?**

**How will you use the 'ping pong' (see attached approach: Different Examples: Nine-Ten?)**

**Digging Deeper tasks**

**What do they need to be able to do at the end?**

Pupils use a variety of language to describe multiplication and division. Pupils are introduced to the multiplication tables. They practice to become fluent in the 2, 5 and 10 multiplication tables and connect them to each other. They connect the 10-multiplication table to place value, and the 5 multiplication table to the divisions on the clock-face. They begin to use other multiplication tables and recall multiplication facts, including using related division facts to perform written and mental calculations. Pupils work with a range of materials and contexts in which multiplication and division relate to grouping and sharing discrete and continuous quantities, to arrays and to repeated addition. They begin to relate these to fractions and measures (for example,  $40 \div 2 = 20$ , 20 is a half of 40). They use commutativity and inverse relations to develop multiplicative reasoning (for example,  $4 \times 5 = 20$  and  $20 \div 5 = 4$ ).



## Primary Progression – Addition & Subtraction

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Addition & Subtraction: Calculations	<ul style="list-style-type: none"> <li>add and subtract one-digit and two-digit numbers to 20, including zero</li> </ul> <p>Autumn 2 Spring 1</p>	<ul style="list-style-type: none"> <li>add and subtract numbers using concrete objects, pictorial representations, and mentally, including:                             <ul style="list-style-type: none"> <li>a two-digit number and ones</li> <li>a two-digit number and tens</li> <li>two two-digit numbers</li> <li>adding three one-digit numbers</li> </ul> </li> </ul> <p>Autumn 2</p>	<ul style="list-style-type: none"> <li>add and subtract numbers mentally, including:                             <ul style="list-style-type: none"> <li>a three-digit number and ones</li> <li>a three-digit number and tens</li> <li>a three-digit number and hundreds</li> </ul> </li> <li>add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction</li> </ul> <p>Autumn 2</p>	<ul style="list-style-type: none"> <li>add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate</li> </ul> <p>Autumn 2</p>	<ul style="list-style-type: none"> <li>add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)</li> <li>add and subtract numbers mentally with increasingly large numbers</li> </ul> <p>Autumn 2</p>	<ul style="list-style-type: none"> <li>perform mental calculations, including with mixed operations and large numbers</li> <li>use their knowledge of the order of operations to carry out calculations involving the four operations</li> </ul> <p>Autumn 2</p>