What maths looks like at Lipson Vale.
2024-2025

Our approach to teaching mathematics at Lipson Vale Primary School

Curriculum Design

'Teaching for mastery' is embedded at Lipson Vale. Mathematics teaching for mastery assumes everyone can learn and enjoy mathematics. Mathematical learning behaviours are developed such that pupils focus and engage fully as learners who reason and seek to make connections. Teachers continually develop their specialist knowledge for teaching mathematics, working collaboratively to refine and improve their teaching. Curriculum design ensures a coherent and detailed sequence of essential content to support sustained progression over time. The curriculum is designed to incorporate the' 5 Big Ideas': coherence, representation and structure, mathematical thinking, fluency, and variation.

Planning

Mathematics is planned for following the Early Years Foundation Stage (EYFS) Statutory Framework (2021) and National Curriculum Programmes of Study (2014). Planning, from EYFS through to year 6, is based upon the White Rose Maths Schemes of Learning. Several other materials are used to support planning including the Development Matters Guidance (2021), NCETM, DFE Mathematics Guidance: key stages 1 and 2 (2020), Power Maths and NRICH.

We plan a coherent journey (supported primarily by White Rose Maths), taking into consideration formative assessment of what the children already know and what their next steps are. Key learning objectives are identified on 'small steps' assessments grids which are stuck into children's books at the beginning of a unit and each objective is triangle assessed on there. A coherent learning journey through the maths is shown on PowerPoints and also reflected on working walls.

Lesson Design

Maths lessons are designed to make links to prior learning to ensure all can access the new learning. Each block and lesson consists of carefully sequenced steps in progression to build secure understanding. The lesson begins with a recap of the previous learning within the block. The teacher then introduces the new learning for that day and examples, representations and models are carefully selected to expose the structure of mathematical concepts and emphasise connections, enabling pupils to develop a deep knowledge of mathematics. Pupils are taught through whole-class interactive teaching, enabling all to master the concepts necessary for the next part of the curriculum sequence. In a typical lesson, the teacher leads back and forth interaction (ping-pong), including questioning and discussion, explanation, modelling, paired/group tasks and independent tasks, enabling pupils to think, reason and apply their knowledge. In Year 2 onwards, a series

of learning opportunities are carried out by the children in between whole class teaching. In EYFS and year 1, teachers deliver a shorter daily maths input. The pupils then complete maths activities throughout the week during their independent and group learning time linked to the maths input.

Fluency is also taught in addition to the maths lessons. In EYFS and KS1, teachers deliver a regular fluency session following the Number Sense Programme/Number Facts Fluency Programme. In LKS1, teachers deliver a regular multiplication and division (times table) session, following our school programme. In UKS2, children also have regular fluency sessions where key facts are recapped and built upon.

In KS1 and KS2, children also recap previous learning through the use of 'Flashback 4' tasks.

Elicitation

Elicitation is carried out prior to the planning and delivery of a new block of learning. This takes the form of carefully designed tasks and questions that expose current understanding through an assessment of the pre-requisites needed for the new unit. Development Matters Guidance (2021), The National Curriculum Programmes of Study (2014) and DFE Mathematics Guidance: key stages 1 and 2 (2020) will be used to identify pre-requisites and assessment tasks/questions. Information gathered through elicitation is used by the teacher to inform planning. It provides information about content that needs recapping, the sequencing of small steps and highlights individual children who may require additional support or be a potential 'rapid grasper'. Elicitation is also used throughout a block of learning and sequences are altered and adapted throughout the block based upon emerging needs.

Assessment and marking

AFL is embedded within maths teaching. Formative assessment will take the form of elicitation tasks, careful questioning, live marking of learning tasks and rich discussion of answers, ideas and misconceptions. The aim is that children are given immediate feedback on their learning to enable misconceptions to be noticed and unpicked in the moment and to inform teachers next steps and for all children to be moved on and challenged in a timely fashion. This feedback will take the form of 'live marking' during the lesson so immediate feedback can be provided. This also allows teachers to adjust lessons accordingly and address misconceptions rapidly. If verbal feedback has been provided, this is indicated in the books using symbols outlined in our marking policy. Sometimes, it may be appropriate for children to mark their own or others learning and peer or self-marking will be evident in books. Written comments may be recorded in books; however we feel that verbal

feedback has more impact on children's learning. If mistakes are made, it is expected that corrections are made.

At the end of each block of learning, in KS1 and KS2, children are assessed using the White Rose end of unit assessment and their score recorded on the small steps grid in their books. Any misconceptions or gaps still evident at this point, will be addressed as appropriate and may take the form of 1:1/small group intervention or addressed through whole class teaching. In KS2, NFER maths tests are also completed at the end of every long term. Performance on these assessments along with teacher assessments of small steps are used to inform attainment and progress judgements. If any children are not making expected progress, the teacher and maths co-ordinators will work collaboratively to investigate why this may be and put things in place to enable them to catch up. By the end of each year, our aim is for all children to have mastered the RTP (Ready-to-progress criteria) for their relevant year group.

Representations and Manipulatives

Manipulatives (physical objects used to teach maths) and representations (such as number lines) can help pupils engage with mathematical ideas. However, how they are used is essential. They need to be used purposefully and appropriately to have an impact, exposing mathematical structures. There must be a clear rationale for using a particular manipulative or representation to teach a specific mathematical concept. Manipulatives should be available to ALL learners of ALL ages but they shouldn't become too reliant on them as the eventual aim is that children understand the maths abstractly. They should be temporary; they should act as a 'scaffold' that can be removed once independence is achieved.

Initially, children will need a lot of guidance and support in the use of manipulatives and representations. When children are familiar with them and how to use them, they will then be encouraged to independently select appropriate ones to support them. This is helpful because the teacher can see how well the pupil has understood the concept by assessing the relevance of the resources chosen. It also promotes high–level thinking – pupils have to ensure that the resources chosen are made relevant to the problem and represent it adequately.

Each year group has access to laminated representations (e.g. number lines, number tracks, tens frames, place value charts, part whole diagrams, bar models and Gattengo charts) which are used in lessons along with manipulatives (e.g. bead strings, numicon, cubes, double sided counters,

base ten, place value counters). We use a range of representations to help children understand specific concepts (conceptual variation). Comparing different representations can help develop children's conceptual understanding. The ability to draw on multiple representations is an important aspect of pupils' mathematical understanding (Hiebert & Carpenter, 1992; Greeno & Hall, 1997). Visual representations enable pupils to make connections between their own experience and mathematical concepts (Post & Cramer, 1989), and therefore gain insight into these abstract mathematical ideas (Duval, 1999; Flevares & Perry, 2001).

CPA approach (make it, draw it, write it)

The concrete, pictorial and abstract approach permeates all maths that takes place at Lipson Vale Primary School. Planning ensures that children are given opportunities to 'make it' using concrete objects/manipulatives, 'draw it' by drawing pictorial representations and 'write it' by writing the abstract numbers and symbols. This approach makes maths accessible to all by introducing abstract concepts in a concrete and tangible way. Making or drawing a model makes it easier for children to grasp the abstract. CPA should not be seen as three distinct stages, as we go back and forth between each stage to reinforce concepts to enable children to see the connections in the representations. Manipulatives and pictorial representations should be used alongside the abstract.

Concrete 'make it': Concepts and bought to life by using physical (concrete) objects. Manipulatives play a key role in this as they are the concrete resources used to support pupils thinking as they explore abstract ideas. Using something 'real' to make sense of the maths takes away the need to imagine or visualise at the early stage of learning a new concept. Every abstract concept is first introduced using physical, interactive concrete objects/manipulatives.

Pictorial 'draw it': Visual representations of concrete objects/manipulatives are used to represent concepts and solve problems by both teacher and pupils.

Abstract 'write it': abstract symbols and numbers used.

Fluency

Memorisation and repetition of key facts are important aspects of learning. Evidence from cognitive science research suggests that learning key facts so they can be recalled automatically 'frees up' working memory. It can then focus on more complex problem solving, rather than reaching cognitive overload trying to calculate simple operations. In terms of procedural fluency and conceptual understanding, one should not be prioritised over the other. Learning is most effective when the two are fully integrated.

We focus on supporting the children's fluency within the four operations through a dedicated 10-15 minute regular (daily if possible) fluency session. In foundation and KS1, we follow the Number Sense programmes - Early Years Number Sense and Number Facts Fluency. The programmes are research-informed, highly visual, and systematic and structured. The Early Years Number Sense programme develops subitising, manipulating, and partitioning of numbers to 10, supports children to see their different properties and promotes talk and reasoning. The Number Facts Fluency programme is followed in KS1 where children's fluency in a defined set addition and subtraction facts to 20 is secured. The core facts are taught alongside 12 calculation strategies. Learning and applying these strategies gives children a deep understanding of number and number relationships. Using these strategies children can then "use what they know to work out what they don't know". Explicit teaching of derived fact strategies is an effective route to fluency in addition and subtraction facts for all children. Children will also use the 'Numbots' programme both in school and at home to support their fluency .

In lower KS2, the focus then shifts to multiplication and division facts through the delivery of a precise times table programme beginning in Year 1 but being a focus within lower KS2. In Year 3 and 4, pupils will become fluent in multiplication and division facts up to 12x12 and beyond through a progressive teaching programme, where one times table is focused on for a half term. At the start of each year, children's knowledge of a defined set of pre-requisites will be elicited with a focus on the structure of multiplication and division to ensure they are ready. The White Rose 'Multiplication and Division A' units will be not be taught as a whole unit in the Spring Term in these year groups. Instead, at the start of each half term pupils, a new times table will be introduced through 3 whole class teaching sessions where current fluency will be elicited and the new times table taught in depth, followed by being the focus of regular 10-15 minute fluency sessions for the rest of the half term. During these fluency sessions, children will see it, hear it, make it, draw it, drill it, explore it, relate it and solve it. It is hoped that in combination, these elements will ensure children are fluent in a times table by the end of a half term.

In upper KS2, pupils will continue to recall, apply and build up on the facts learn in KS1/LSK2. They will recall their number facts and apply them within problems. They will also practise and discuss efficient mental calculation strategies during dedicated regular fluency sessions. It is imperative that children have a secure number foundation as this will enable them to use these skills in the end of key stage statutory assessments.

In KS2, children will use the 'Times Table Rockstars' programme both in school and at home to support their fluency.

Calculations

We follow the 'White Rose' calculation policies. The progression in skills within each operation is clear and the key representations linked to each concept presented visually, The policies enable a consistent and progressive approach to teaching mental and written calculation methods.

Questioning

"Good learning starts with questions, not answers." *Guy Claxton, Professor in Education and Director of CLIO Development, University of Bristol.*

Effective questioning is a powerful AfL tool and questioning is used throughout maths lessons to elicit, gauge and challenge children's understanding. Questioning also encourages engagement and leads to rich class discussions. Teachers facilitate an environment where children are expected to listen and respond to one another by building on or opposing others' ideas. Children are expected to use sentence stems and precise mathematical vocabulary to reason and justify.

An unbiased attitude towards responses is key; the teacher neither validates nor rejects an answer or a theory for two reasons. If the answer is confirmed correct, the rest of the class no longer need to think for themselves. Open questions such as 'how do you know?' are used to avoid this. It is up to the whole class to justify and reason the theory correct or incorrect. Teachers avoid 'telling' the students the answers, and the pupils have to work out why it must be correct – a more powerful type of learning that helps link concepts together.

Teachers use a range of open questions; they require longer, more thought out answers than those that only need a simple, short response (closed questions). This means these types of questions usually won't have either a correct answer or a wrong answer. Some examples include: Are you sure? How do you know? What do you notice? What's the same and what's different? Can you convince me? Is there another way? Is it always, sometimes or never true? Can you imagine? I think I know what you mean, are you saying…?

Mathematical thinking – oracy, stem sentences and precise mathematical vocabulary

Oracy is a set of skills which allow us to communicate effectively. Expressing mathematical ideas orally helps children to build communication skills. It can also form an important part of developing understanding of mathematical concepts and the ability to reason mathematically. Oracy encompasses

learning to talk and learning through talk; both of these require speaking and listening. Lessons are designed to facilitate the development of both skills so that conversations can occur where mathematical ideas are played with, batted around, developed, refined and changed. Teachers listen carefully to mathematical conversations to gain essential insight into their conceptual understanding, pick up misconceptions and to share great insights they overhear with the whole class.

Mike Askew, in his paper titled 'Private talk, public conversation', discusses the importance of promoting a conversational approach to talk in mathematics. He suggests that there needs to be two aspects of talk in the classroom – private talk and public conversation. Private talk in pairs or small groups that provides the opportunity for children to buy in to the maths being discussed, share their thinking in a secure setting and to rehearse and build upon their ideas that they may share. Public conversation is where these ideas are shared and built upon with the whole class. Hopefully, providing opportunities for private talk increases confidence in sharing with the class. When the idea is shared more publicly, because it is 'our idea' rather than 'my idea', this can feel less exposing to the contributor. We refer to the process as 'Think, pair, share',

Teachers will model, encourage and expect children to use complete sentences, sentence stems and precise mathematical vocabulary during discussion. Mathematical talk is modelled, practiced, and the expectation built up over time. The quality of children's mathematical reasoning and conceptual understanding is significantly enhanced because they are consistently expected to use correct mathematical terminology (e.g. saying 'digit' rather than 'number') and to express their reasoning in complete sentences. Universal sentence stems such as 'I agree with…because,,,' give children a clear 'full-sentence' structure in which to frame their own ideas. Content specific sentence stems are also used to encourage children to use key vocabulary within a full sentence and to internalise these. Sentence stems and precise mathematical vocabulary are displayed on PP presentations and working walls and orally rehearsed within lessons to promote and embed them.

In order to effectively develop mathematical talk, pupils will need to acquire mathematical vocabulary. Precise mathematical language is introduced very explicitly to pupils; its introduction and use carefully planned. Mathematical terms can be fun for children to learn to use correctly and can be an opportunity for a bit of historical or etymological exploration and good stories!

Challenge for 'rapid graspers'

Teachers provide challenge for the 'rapid graspers'. These challenges are embedded throughout the lesson rather than bolt on activities at the end of

a lesson and build on the learning opportunities, focusing on depth of understanding. The challenges are available for all when core learning (learning opportunities) have been completed.

The acronym CAPED is used to support teachers in providing appropriate and varied challenges.

C – Check answers (using estimation, commutativity, inverse)

A - Apply (apply a skill to a different context)

P - Prove it (prove something is correct/incorrect)

E – Explain (explain how they know something/why they believe something to be true/untrue)

D – Draw it (represent the problem through a drawing using a variety of representations)

Working walls

Our working walls are interactive displays which support children in their current unit of learning. They are built upon as the unit progresses, added to during the lesson as learning unfolds and post lesson where appropriate. They act as a recap of prior learning and encourage independence as children should use it to support them in their discussions and tasks. They should Include key representations and models, precise mathematical vocabulary and stem sentences. Current fluency learning e.g. Number Sense strategies and multiplication and division strategies.

SEND

We have high expectations that ALL children will enjoy and achieve in Maths. Class teachers work closely with SENDCo and the matshs lead to ensure oupils indivudal needs are understood and that adaptive strategies are utilised to ensure pupils individual needs are met. This may take the form of additional adult support, personalised curriculum and tasks, use of concrete manipulatives, pre and post teaching and intervention. On occasions, if a child is working significantly below year group expectations (2 years or more), they may be taught a different year group curriculum appropriate to their current level of understanding. This may take the form of attending maths lessons within another year group in the school or being taught in a small group.