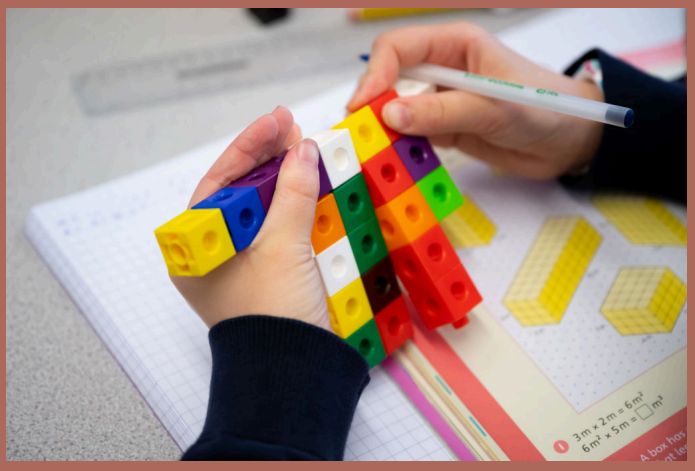
Maths

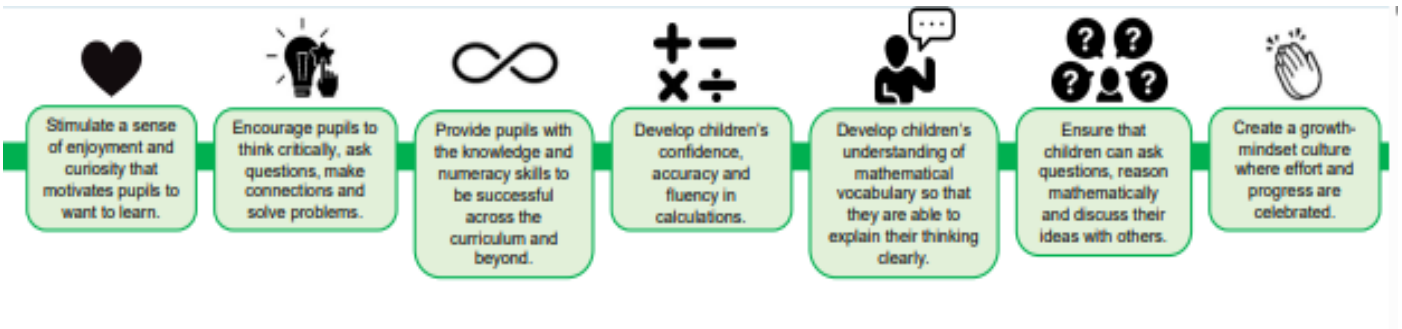
‘The Lovelace Way’

Curriculum Intent, Implementation and Impact Document



Intent

At Lovelace we believe that all children are born mathematicians.



We believe teaching for mastery is the most effective approach for our children to become confident and proficient mathematicians. The National Centre of Excellence in Teaching Mathematics (NCETM) states:

> "Mastery means pupils of all ages acquiring a deep, long-term, secure and adaptable understanding of the subject. The phrase 'teaching for mastery' describes the elements of classroom practice and school organisation that combine to give pupils the best chance of mastering maths."

Teaching for Mastery means pupils are taught through whole-class interactive teaching where there is a key focus on all children working together, on the same lesson content, at the same time. This ensures that all children can master concepts before moving to the next part of the curriculum sequence, allowing no pupil to be left behind.

The Five Big Ideas were first published by the NCETM in 2017.

The fundamental characteristics that underpin teaching for mastery are outlined as the 5 Big Ideas and include: coherence, representation and structure, variation, fluency and mathematical thinking.

1) Coherence - Teaching is designed to enable a coherent learning progression through the curriculum, providing access for all pupils to develop a deep and connected understanding of mathematics that they can apply in a range of contexts.

2) Representation and structure - Teachers carefully select representations of mathematics to expose mathematical structure. The intention is to support pupils in 'seeing' the mathematics, rather than using the representation as a tool to 'do' the mathematics. These representations become mental images that students can use to think about mathematics, supporting them to achieve a deep understanding of mathematical structures and connections.

3) Variation - The purpose of variation is to draw closer attention to a key feature of a mathematical concept or structure through varying some elements while keeping others constant.

- **Conceptual variation** involves varying how a concept is represented to draw attention to critical features. Often more than one representation is required to look at the concept from different perspectives and gain comprehensive knowledge.
- **Procedural variation** considers how the student will 'proceed' through a learning sequence. Purposeful changes are made in order that pupils' attention is drawn to key features of the mathematics, scaffolding students' thinking to enable them to reason logically and make connections.

4) Fluency - Efficient, accurate recall of key number facts and procedures is essential for fluency, freeing pupils' minds to think deeply about concepts and problems, but fluency demands more than this. It requires pupils to have the flexibility to move between different contexts and representations of mathematics, to recognise relationships and make connections, and to choose appropriate methods and strategies to solve problems.

5) Mathematical Thinking - Mathematical thinking is central to how pupils learn mathematics and includes looking for patterns and relationships, making connections, conjecturing, reasoning, and generalising. Pupils should actively engage in mathematical thinking **in all lessons**, communicating their ideas using precise mathematical language.

At Lovelace, we follow the National Curriculum for Maths and the White Rose Scheme of Learning to enable us to deliver a progressive, dynamic and relevant curriculum. We also use the NCETM mastering number programme in KS1 to develop mathematical fluency. These NCETM/White Rose progression maps demonstrate how the learning in each content area builds across each year:

Progression Maps for Key Stages 1 and 2 | NCETM

White Rose Curriculum Progression Year 1 to 6.pdf

Implementation

Teachers use a small step journey approach to lessons, slowly guiding the children through the new concepts being taught, generally covering representation and structure, formal written methods/calculation and problem solving with reasoning. Teachers adapt lessons accordingly to fit the learning needs of their classes. Testbase provides year group appropriate problem solving questions and Nrich provides mathematical challenges and problem solving opportunities. All lessons are planned to include all of the following five big ideas (explored in more detail above):

- Coherence
- Representation and structure
- Variation
- Fluency
- Mathematical Thinking

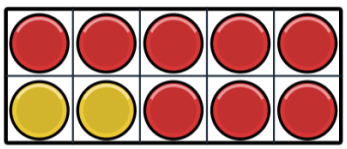
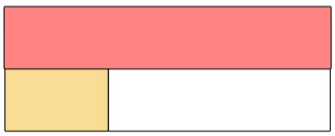
Manipluatives and representations

Representations define how we 'show' children maths, they are a key interlinking step to link concrete to abstract and are sometimes referred to as pictorial representations.

Manipulatives are crucial when introducing new concepts at the 'concrete' stage e.g. Tens frames, Dienes, Numicon, Cuisenaire rods, pegs, straws, geoboards, place value cards, dominoes, cards, dice, bead strings, Rekenraks, two-coloured counters, place value counters, number sticks, tens frames.

As the children progress through the school they need to move back and forth between the use of Concrete (doing, see above), Pictorial (seeing, visual representations e.g. bar modelling, pictures & diagrams) and Abstract (numbers, symbols, maths notation) throughout the teaching. Resources are carefully chosen and planned for by our teachers and are available for all children.

Many of the manipulatives above can be drawn out by children to show their learning and understanding. They are taught how to use these representations and are encouraged to use them all the way through the school.

Mathematical Problem Solving

Our aim is to build confident and resilient mathematicians at Lovelace. Mathematical problem solving activities are therefore an integral part of our maths curriculum. Primary mathematical problem solving involves using mathematical knowledge, logic and reasoning to tackle unfamiliar problems. At Lovelace we use mathematical problem-solving to encourage children to think mathematically. Problem Solving gives pupils the opportunity to use their mathematical skills and knowledge to solve mathematical challenges and real-world

problems.

We prioritise Mathematical Problem solving because it gives children the confidence to:

- develop critical thinking; notice and have a go;
- talk about their understanding of a problem;
- notice patterns, make connections and generalise;
- take risks and learn from mistakes;
- reflect on and make informed decisions;
- share their ideas and justify methods;
- work systematically
- check their solutions.

Key Vocabulary and Questioning

Key vocabulary is mapped out and explicitly taught in every lesson. Pupils explore knowledge and conceptual understanding through engaging activities and an introduction to relevant, specialist vocabulary. The development of vocabulary encourages children to discuss mathematical concepts with confidence.
Teachers use a range of questions to support children's learning. Inquiry-based questions enable children to discover and explore mathematical concepts and relationships. When a child experiences a difficulty or makes a mistake they are asked to tell their teacher what they **do** know. This approach fosters mathematical thinking, reasoning and problem-solving skills. It encourages children to ask themselves 'What do I know and how can I use it?'. These open-ended questions give children confidence and encourages diverse perspectives, promotes deeper thinking and allows students to make connections whilst expressing their reasoning.

Teacher Subject Knowledge:

Strong subject knowledge is vital for staff to be able to deliver a highly effective and robust maths curriculum. The WhiteRose scheme of work includes notes on common misconceptions to strengthen teachers subject knowledge and support ongoing CPD. Further CPD opportunities are provided by the leader of Maths at Lovelace as well as external agencies.

Inclusion

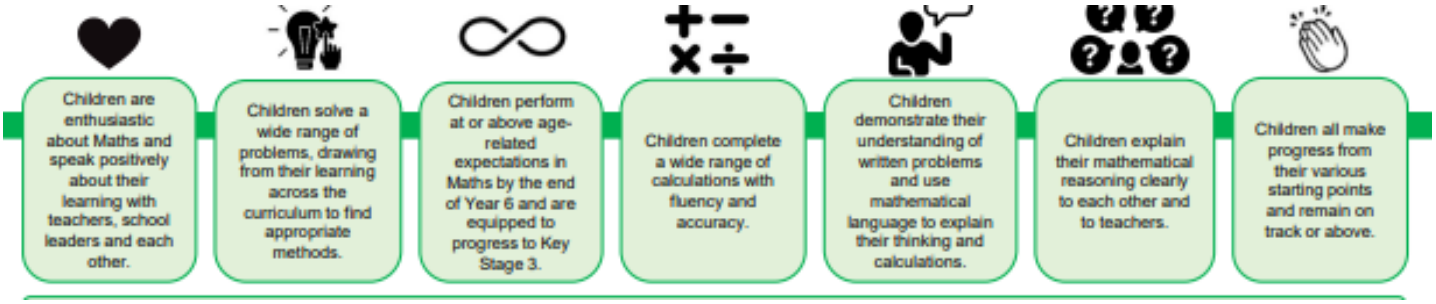
Adopting the Teaching for Mastery approach enhances inclusivity by ensuring the majority of children master small steps of learning together. However, we understand that some children may need more bespoke changes to their everyday provision. In maths we tailor instruction to meet individual children's needs and ensure all students have access to adaptations they need including different manipulatives or equipment. Pupils may have access to pre teaching, interventions or catch up activities to ensure they make good progress.

Lovelace 'Wow' Opportunities:

Every year the children are given the opportunity to experience maths 'wow' enrichment activities, this will include one of the following: a workshop from a visitor; STEM inspiration days, problem solving enrichment activities and real-world mathematical challenges which require mathematical solutions - being given a budget and pizza menus and ordering the best deal for 'lunch' for their class.

Impact

Our aim at Lovelace is that our pupils develop curious minds, reasoning skills and an unquenchable thirst for knowledge through a love of maths. We believe that our children will have the necessary tools to confidently, critically and meaningfully question and explore the mathematical world around them. Our aim is for the children at Lovelace to become critical thinkers with a secure range of problem-solving skills and mathematical fluency to enable them to have future academic success, successful careers and a lifelong love of the subject.



Assessment

Formative Assessment

Formative assessment is underpinned by assessment for learning (AfL) strategies - the use of whiteboards, live marking, listening to pupil discussion, observing and questioning the children. It is an integral part of every lesson and provides valuable feedback on the children's attainment and progress. This diagnostic assessment identifies what pupils already know and what gaps may exist in their skills or knowledge. This information informs planning and allows teachers to make adaptations to reinforce or extend the children's learning.

Summative Assessment

At Lovelace, we recognise the value of summative assessments and ensure every year group gets some experience of doing a test. OFSTED acknowledges that summative assessment is necessary and is most successful when approaches are kept 'low key'. We are keen to give the children the experience of being tested so that they can work confidently and independently when faced with unfamiliar mathematical problems.

All year groups collect formative data at the end of each half term and summative data at the end of each term. From Year 2, NFER papers are used as summative assessment tools. In upper KS2 children are given experience of past SATs papers to inform planning for next steps and identify misconceptions and those in need of interventions in order to achieve success before the statutory SATs papers are taken during the Summer term.