

THE LAP APPROACH TO TEACHING MATHEMATICS (OUR CORE OFFER) 2023 - 2024



Autumn 2023

CONTENTS

- Our Approach and Rationale
- Maths Curriculum Intent Statement
- Principles of our Mathematics Lessons
- Typical Lesson Approach and Rationale
- How Learning is Layered
- Children's Books - Demonstrating Depth
- Fluency in Number Facts
- CPD
- Assessment Points
- Implementation and Impact
- Child Friendly Curriculum Intent



Our Approach and Rationale

Our approach to teaching mathematics is based on evidence informed practice. Since the 2014 changes to the National Curriculum, the Trust has worked with other schools nationally (through visits and sharing of expertise) who were part of the textbook pilot scheme, as well as through the Maths Hubs Teaching for Mastery Programme to develop an effective pedagogical approach that meets the needs of both single and mixed age settings. Schools within the trust have taught using the Maths No Problem! Textbook and both teachers and leaders have received extensive training through this organisation on a teaching for mastery approach. Over time, alongside classroom-based research, we have further refined this to develop an approach that teaches through problem solving and reasoning to enable every child to flourish in the three aims of the national curriculum: problem solving, reasoning and fluency.

Our aim is to develop mathematical thinkers. Our consistent maths approach enables:

- All staff to have a shared language and common pedagogical principles to ensure high quality teaching and learning of mathematics in all classrooms.
- Not only coverage of the knowledge and skills of the National Curriculum but daily immersion in a reasoning and problem-solving culture that supports children to excel as mathematicians
- Maths lessons that have a clear structure and follow evidence informed principles.
- An alignment with the Trust principles of 'How we teach' which is underpinned on Rosenshine's Principles of Instruction.
- A reasoning-rich environment which encourages children to articulate their thinking, justify their answers, explain methods and find multiple solutions
- Problem solving daily, where multiple solutions are valued, thereby developing greater resilience when faced with unfamiliar problems
- A culture where children learn through daily collaboration with peers.
- Daily opportunities for children to be celebrated as mathematicians as children engage in each other's thinking and approaches to mathematical problems.



Maths Curriculum Intent Statement

As mathematicians, our children will develop a deep conceptual understanding through exploration, reasoning and problem solving of all areas. We expect our children to explain and articulate their understanding and become fluent in number so they can use known number facts to make efficient choices with calculations. They will make connections and discover patterns to take creative approaches when faced with challenges and show appreciation of the beauty and power of Mathematics. We aim to develop resilient learners and our children take time to deepen their understanding of mathematical structures through the use of resources and representations.

In essence our Trust aim is to create positive mathematical thinkers, not procedural calculators.

Principles of our Mathematics Lessons

Elicitation task

In preparation for the teaching sequence, children complete an elicitation task to demonstrate their depth of understanding of this area of mathematics from the previous year's curriculum. This also serves to retrieve knowledge in this area from the long-term memory, in preparation for the teaching sequence. Using this elicitation, teachers consider what preparation for the coming teaching sequence children will need. This may involve retrieval and practice sessions before the current year group content is taught. Guidance for this initial part of the teaching sequence is found in the document "Assessment in Maths". Lesson outcomes will be based on National Curriculum objectives and the Non-Statutory Guidance Ready-to-progress (RTP) criteria. Throughout the teaching sequence, teachers make use of the RTP assessment questions as a formative assessment towards year group expectations.

Teaching through problem solving

In line with Dienes research on the six stages of learning our lessons start with a problem that all children can access and children are expected to work collaboratively to solve, exploring and discovering the maths for themselves, before scaffolding up and applying concepts to different contexts, in pairs and then independently.

Dialogue rich lessons

Vygotsky's work talks of rich discussion and peer talk and this is a fundamental part of this aspect of the lesson, as children talk and work together to internalise their thinking and restructure their thoughts regarding the problem.

Use of manipulatives

Children will be offered a range of manipulatives (as outlined in our calculation policy) to develop conceptual understanding for all learners, relevant to the age of the children and the stage in the sequence. Teachers use these to expose the structure of the mathematics rather than to 'do' the mathematics. In this way, new concepts are introduced using Bruner's Concrete, Pictorial and Abstract approach. Although we recognise that this is not a linear process and at various points throughout the lesson and teaching sequence children will move between these three approaches.

Relationships and connections

We teach to expose the interconnectivity of mathematical ideas and provide learners with varied opportunities to move fluently between different representations of mathematical ideas. Children are often asked to show another way of solving a problem or to make sense of a different representation in the context of the same problem, to develop flexibility and what Richard Skemp terms, relational understanding, "a more meaningful learning in which the pupil is able to understand the links and relationships which give mathematics its structure." Children are often asked to engage with other children's methods and critique these to develop a depth of understanding in the concept.

All can achieve

In line with Piaget's research, we believe that children need to find learning challenging to discover new things. We appreciate that new ideas will be accommodated with: time, exploration, talk, concrete resources and conceptual understanding, as outlined above. We make no preconceived judgements about who will struggle in a lesson or who will grasp a concept more quickly. We expect the teacher to judge this throughout the lesson and feedback accordingly. A child who is quick to grasp a concept in one lesson, may not in the next. Therefore we have no groupings in our classrooms, but mixed attainment pairs and we only refer to one lesson at a time.

Scaffolding and deepening

We expect the majority of our children to move through the programme of study for their year group at broadly the same pace, respecting teacher's professional judgement in making decisions about readiness to progress to the next stage, although this will not be into new content from a year group above. Rapid graspers are challenged through rich and sophisticated problems and expected to demonstrate their reasoning, explain their thinking to others and be able to model the concept in more than one way. Those taking longer to master have extra time to consolidate, pre-teaching and 'keep-up' interventions as appropriate, whilst receiving appropriate scaffolds through well-planned quality first teaching in the classroom. Where possible interventions take place in the maths lesson or on the same day, with children given time to apply independently before the next lesson, in order to keep up. All children are given opportunities to go deeper in their learning through journaling prompts (e.g. explain, prove, another way) and scaffolds within their independent work.

Pupils will spend enough time to fully explore a concept before moving on to a different topic. Each teaching sequence is designed to provide minimal step progression through concepts so that all pupils can move forward together at broadly the same pace.

An idea is well formed and reinforced by ample practice. New knowledge is then used in subsequent lessons so that all ideas build on top of each other and pupils have ample opportunity to develop relationships between the topics. Ideas are revisited as pupils' progress through the years, each time at a higher level.

Typical Lesson Approach and Rationale

Starts with an anchor problem and discussion

This anchors the lesson in a contextualised problem to be solved, which is likely to have more than one method to solve it. This enables mathematical thinking from the outset. As lessons start with a problem every day and children know that different approaches are valued and discussed they develop more resilience with problem-solving and are more likely to have a go.

There is no introduction – the lesson begins with the problem to solve

Features of an anchor problem:

- Simple enough so all children can access - scaffolds are provided to support.
- Copy of the problem in front of children on desks
- Everyone has access to the same shared experience – even if they don't reach a conclusion
- Grapple/problem solving by children from the start
- Opportunities to represent the problem with concrete materials or in pictures (mini whiteboards) – manipulate to get a sense of the problem then articulate.
- Talk partner discussion (shared whiteboard)
- All children active and influential
- Mixed ability pairs
- Children making mistakes

The teacher's role is to stay helicopter, observing and assessing the conversations for the anticipated responses to ensure careful sequencing, selecting and layering of methods when the class come back together.



Explore possible methods for solving the problem

This links conceptual with procedural fluency: “I know how and I know why”.

The teacher will carefully select and sequence the order in which children share their thinking to scaffold the learning. They scribe on the flipchart labelling it as say ‘John’s method’ as they go.

It is vital that children engage with each other’s methods and this does not become show and tell.

- teacher skilful questioning (short bursts) mainly turn to your partner questions:
 - ◊ why did they do it that way? where did that number 5 come from? Do you agree? Are they right? Are you sure?
- Teacher pulling out the skill they are focusing on that lesson last (ready on IWB to model)
- Children may come to board to do or explain with additional support from the rest of class (teacher involves whole class)
- Teacher exploring misconceptions – “My friend says you can do it like this...is he right?”
- Children proving/disproving each other’s methods
- Children own the learning – are you sure? Is he right?
- Children likely to have a go at another child’s method or the next step in their method

The teacher is a facilitator – questioning, using other children to scaffold so that the class build a consensus and understanding rather than the teacher validating. The teacher will also support children to see the connection between their ideas, critique them and connect them to previous learning.

Opportunity to practice together and apply ideas

Developing procedural fluency with conceptual understanding: “I can do because I understand”.

Children are given another similar question to work on with their partner. The solution is worked through together on the board with the teacher modelling and thinking aloud, pausing at various points in the explanation to ask for clarity, check they have heard correctly, getting children to check they are right – each time asking everyone to turn and talk to their partner, rather than asking individuals questions. The class co-construct the solution using one of the preferred methods.

The Assessment for Learning check

- Continuing to develop procedural fluency with conceptual understanding
- A couple of similar type questions on the board to work on individually or in pairs, using the modelled method/s on the flipchart
- On whiteboards
- Teacher assessing and moving to independent work when ready
- Teacher keeping those who need longer to master to go through and re-model and apply to a few other examples as additional practice before going to independent practice

Independent practice

Worked examples may be given to support the transition to independent application.

This should be intelligent practice (not the same thing over and over) and should include the opportunity to master the skill one way on a couple of questions before varying so “I can use my understanding to solve a new problem”.

Reasoning questions are given early in the practice as fluency develops from this and ALL children need opportunities to demonstrate depth of thinking and mathematical thinking in writing as well as the oral opportunities earlier in the lesson. See the ‘book examples’ folder on teams.

Feedback in the moment

This is given through live marking and children are given immediate intervention through verbal feedback or additional scaffolds at the point of need in the lesson.

Children are encouraged to deepen their thinking in the questions they have already responded to through explaining or proving them or showing an alternative approach. They may journal about questions that challenged them and why, draw diagrams to show their thinking and devise their own examples (and non-examples) of a concept, as well as apply to other rich and sophisticated problems, which make them think, “I can use what I know to attempt to solve a new problem”. This is further exemplified in our Trust feedback policy.

How Learning is Layered

Long term planning

The Trust’s long-term planning document is the National Curriculum 2014 Programme of Study. This should always be a teacher’s first starting point for reference, particularly the first two pages which highlight the 3 aims underpinning all Trust CPD, teaching and learning activity in mathematics. They also detail the vision for the pedagogical approach to which Maths is taught in the LAP, which is further exemplified in the front page of this document. This document:

- clearly states an expected pathway of progression across the Key Stage
- breaks down the Key Stage progression into a yearly plan
- reflects the school’s vision and national priorities

The progression in knowledge and skills is mapped out by year group and the White Rose Maths teaching sequences are linked to this [here](#). The White Rose Long term plans, coupled with the DfE ready-to-progress criteria map out the coverage of **what to teach** in a coherent order. The full non-statutory guidance document gives guidance on **how to teach** it through the linked NCETM PD materials and Ready to progress (RTP) powerpoints. This supports the recommendations from the ACME (2016) report, ‘Influences and impact: policies for high-quality mathematics education’ which says highly effective teachers of mathematics have mathematics-specific knowledge, which includes knowledge about mathematics and knowledge about teaching mathematics.

Teachers use the [WRM mapping document](#) and [Maths Non-statutory Guidance document](#) when writing medium term plans to track back children’s expected prior learning and to see where their teaching fits into the overall end point for that mathematical concept.

Medium term planning

These structure the teaching sequences in lessons.

Teachers start medium term planning by looking at the NC objectives map (see above), the [DFE Non Statutory Guidance, Ready-to-Progress criteria](#) for their year group and the [NCETM Primary Assessment Materials](#) to keep teaching focused on the big ideas and key concepts and not just ploughing through objectives. Teachers are clear on the end point for pupils in this sequence and how this relates to concepts taught before and in future (the RTP criteria support this)

Teachers use this to framework to design their medium-term plan through a sequence using the 'S plan' format. This starts with the big idea/outcome children should be able to do and plans backwards looking at the incremental steps of learning and breaking objectives down into small conceptual steps. In line with NCETM Guidance ([Primary Magazine 87, Digging Deeper, Planning in Mathematics, May 2016](#)) This document should show:

- Key conceptual ideas and making connections:
 - ◇ What are the steps in understanding needed along the journey?
 - ◇ What is the best way to order these steps?
 - ◇ How are these steps going to be connected?
 - ◇ How is this journey going to be connected to prior learning?
- Difficult points:
 - ◇ What are the common misconceptions within this area?
 - ◇ Which parts are difficult to teach and difficult to learn?
- Representations:
 - ◇ Which models and images will best support understanding of the different parts of the journey?
 - ◇ How does the representation expose the structure of the mathematical concept involved?
 - ◇ Which models and images will expose the difficult points and misconceptions and support understanding in these areas?
 - ◇ Which contexts will support the children to make sense of the maths and give the maths meaning and purpose?
 - ◇ What language will the children be expected to make sense of and use?
 - ◇ How will the children be expected to represent their thinking and understanding at different points on the journey?
- Variation:
 - ◇ How can variation be used to support the understanding of the structure of the mathematics?
 - ◇ What needs to be varied to expose the difficult points and misconceptions?
 - ◇ How can variation be used to ensure depth of understanding?

- Going deeper:
 - ◇ What opportunities are there for demonstrating creativity and imagination?
 - ◇ What contexts would provide opportunities to explore and generalise about the mathematics at a deeper level?
 - ◇ Where are the opportunities to go deeper within every lesson?

The resulting plan should be a flexible model which helps to shape the teaching sequence but is responsive to ongoing formative assessment.

Short term planning

Planning should be daily and purposeful for the teacher.

Teachers use the [DfE NSG RTP materials](#) and [White Rose block overview](#) to organise the teaching sequences for maths in their class, which:

- Gives an overview of what is to be taught and when
- is based on age appropriate content to ensure children move through the curriculum at broadly the same pace
- Suggests possible steps in learning for each area of mathematics
- draws on key representations to use that support children to see and understand the structure of the mathematics

Teachers use the Trust calculation document, which is based on the progression from the NSG. They use the white rose planning framework to support the alignment of similar concepts within mixed age classes, but remaining focused on the key RTP criteria for their year group to ensure a cohesive journey through the mathematical learning that enables links and connections to be made with other mathematical concepts. Where possible, teachers teach similar concepts to the whole class together, with appropriate differentiation to ensure that each year group accesses age-appropriate content. The non-statutory guidance supports this.

Any materials that are used to support learning and teaching pedagogy are interrogated by teachers, to look at why those specific examples have been chosen and how the representations expose the structure of the mathematical concept being taught. Teachers have the flexibility to supplement these resources with others, as they feel appropriate to the needs of the children.



Children's books - demonstrating depth

Based on the work of John Holt (1964) and more recently the NCETM (2015) we believe that a child really understands something (and has therefore mastered it) in maths if they can:

- Describe it in their own words
- Represent it in a variety of ways (e.g. using concrete materials, pictures and symbols)
- Explain it to someone else
- Make up their own examples (and non-examples) of it
- See connections between it and other facts or ideas
- Recognise it in new situations and contexts
- Make use of it in various ways, including in new situations

Children should therefore have opportunities to demonstrate the above in both lessons and independent application. This will involve them communicating their own ideas and thoughts and not just filling in boxes in a worksheet.

Fluency in number facts

All classes have a daily 15-minute fluency session, in addition to the main maths lesson. In KS1, the focus is on additive fact fluency and in KS2 the focus is on multiplicative fluency, although additive fluency is still taught to maintain the use of the 12 key strategies taught in KS1 and applying them to different numbers, appropriate to the year group. We believe that children who can recall facts **enjoy** and are able to **secure** the maths curriculum easier than the children who can't recall these facts.

Additive facts

The trust has a systematic approach to the teaching of additive facts, outlined in the [Numbersensematics](#) and Mastering Number materials. Children start with subitising numbers and quantities up to 10 and then look at the composition and decomposition of numbers to 10 before learning 12 key strategies to support them in deriving key number facts. The aim of these sessions is for children to use these strategies to calculate to automaticity, rather than relying on counting. In the main maths lesson and continued into KS2 children are expected to use these strategies when working with the formal written methods and calculating with larger numbers.

Sessions rely heavily on visual imagery and the use of concrete apparatus, supported by animations and key representations, with plenty of time to practice the strategies being taught. These are supplemented with activities parents can do at home to support the learning and involve them in their child's learning.

As a Trust we also use the [Numbots](#) app as a practice tool for home learning to consolidate many of the strategies taught. We know that this programme was based on the same research as the Numbersensematics programme.

More details can be found in our 'How to teach a Numbersensematics session' doc

Multiplicative facts

Unlike the learning of additive facts, our KS2 sessions focus on a key verbal sound pattern and learning and memorising the multiplicative facts using this same pattern, with one fact a day, through practice. The teaching of relationships and deriving facts is taught separately in the main maths lesson.

Again, children learn the tables systematically, one table at a time and one fact at a time, using the same sound pattern and only one way round (biggest number first) but within each table they are reminded of the facts they should know, based on the laws of commutativity. This reduces the number of facts children need to learn.

Children mark their daily test through chanting, using the memorised sound pattern and only reading the facts with the biggest number first. The chanting is where the learning happens. Children have the times table they are learning up on the board or in front of them and they can refer to this if they want to, gradually reducing their use over time, as they become memorised.

We also use [Times Tables Rockstars](#) as a tool to help pupils practise the multiplication table they are currently learning and to practice all the tables together regularly. Time is given in school and at home to use this and progress is celebrated in class and as a whole school.

More details can be found in our 'How to teach a Times tables session' doc.

CPD

There is a Trust CPD offer, which consists of a range of subject knowledge webinars, which can be accessed on demand and are year group specific, as well as face-to-face training on key areas such as reasoning and problem solving.

Within schools, there is a bespoke offer delivered by the maths lead in that school, supported (where appropriate) by the Trust Maths Lead. The key CPD tool that we use to develop teaching and learning is incremental coaching, involving a weekly 15-minute lesson observation, followed the same day by a 15-minute coaching conversation which focuses on one precise action step that can be put into place in class the next day and seen and evaluated the following week.

Maths Development Days (involving the Trust Maths Lead, school maths lead and Head of Academy) and ongoing monitoring and evaluation highlights Academy specific CPD requirements. These are planned into the termly cycle of CPD.

All staff new to the school receive training within their first term on our approach to maths and the pedagogy we use to underpin high quality maths teaching at the LAP and the theory that supports this, as outlined above. Materials to support this can be found in the Maths channel on teams.

Assessment Points

As detailed in our formative assessment and feedback policy, an elicitation task is carried out at the start of each teaching sequence to reactivate and retrieve prior learning from the previous learning, and this informs how the teaching for this sequence is tailored to meet the needs of all learners. Ongoing feedback is given to children throughout lessons and 'live marking' is done in lessons so that children have the opportunity to action this feedback straight away and make greater progress in their learning. Teachers use this feedback to ensure learners have a depth of understanding within the concept, through 'explain, prove and show another way' prompts. Teachers make use of assessment questions from the relevant age-appropriate ready-to-progress criteria (in the non-statutory guidance doc) throughout the teaching sequence to check children's understanding of the key concepts.

For additive facts fluency, baseline assessments are captured using NumberSenseMaths materials and then at the end of each stage, as determined in the programme. This is alongside daily formative assessment on whiteboards and in children's responses.

For multiplicative fact fluency, baseline assessments are captured using the Soundcheck in TT rockstars for Y3, 4 and 5 and this is repeated termly for Y3 and 5 and half termly for Y4 to track progress towards the MTC check. Daily timed tests (out of 40) are captured in the tracking sheet for each school.

This data is reviewed by school maths leads regularly and with the Trust Maths Lead as part of the development day process.

Termly standardisation meetings are held across each hub, with one meeting a year per year group being Trust wide, so that teachers can discuss children's progress against the DfE Ready-to-progress criteria with other teachers in the same year group. Subject leaders facilitate these meetings.

Summative PUMA tests are used at the end of each term, to track the progress of children both within and across school years, using a standardised score. They also provide diagnostic information about topics taught so far, which is integrated into the next term's teaching.

Implementation and Impact

The Maths QA cycle and Maths Development Days

The Maths quality assurance cycle is in place in each school, which aligns with the wider Trust QA cycle each Academy SLT follows to ensure consistency and quality of provision for all our children. This document outlines an evaluation cycle in order for maths subject leaders within school to evaluate the impact of Maths development priorities, quality of teaching and learning and assessment, stakeholder viewpoints and overall effectiveness of maths leadership. It details the monitoring and accountability needed and how this fits with the wider strategic aims of the school and Trust. The document acts as a useful reference point and prompt for reflection for maths leads and their SLT. The cycle feeds into and supports evaluation of each academy's raising attainment plan and academy development plan. The evidence gathered is evaluated by the Head of Academy and Subject leader as part of the termly Maths Development Days held with the Trust Maths lead, which take a deeper look at maths teaching and learning within the school and help set the strategy.

THE LAP APPROACH TO TEACHING MATHEMATICS

Child Friendly Curriculum Intent

As mathematicians, we will develop a deep understanding through exploring the mathematics together with my class and my partner, often using apparatus and drawing pictures. We know that there are always different ways to solve problems as we do them every day, so we are always willing to have a go. We expect to explain how we know something and are ready to prove and convince our friends and teachers. We practice our number facts, so they become automatic to us, and this supports us in all our maths learning.





LEARNING ACADEMY PARTNERSHIP

Suite 4 Zealley House
Greenhill Way, Kingsteignton
TQ12 3SB

www.lapsw.co.uk
cpd@lapsw.org