The Orchards Primary Academy

Where learning has no limits and personal growth is endless…

Our Approach to Mathematics

Contents

1. The Research behind the Approach

The Maths Mastery approach in the UK has gained significant attention over recent years, with many schools adopting its principles. This approach emphasizes depth over speed, focusing on ensuring that all students fully understand mathematical concepts before moving on to new ones. Below is a research-led overview of what the key studies and reports say about this approach.

1. The NCETM (National Centre for Excellence in the Teaching of Mathematics)

The NCETM has been a strong advocate for the mastery approach in the UK. It emphasizes that mastery is built on three key principles:

• **Fluency**: the ability to perform calculations quickly and accurately.

• **Reasoning**: the ability to explain why something is correct.

• **Problem-Solving**: applying mathematics to a variety of contexts.

The NCETM has highlighted that the mastery approach is based on research from high-performing jurisdictions such as Shanghai and Singapore, where mastery teaching has been shown to reduce the achievement gap by ensuring all students progress at the same pace.

2. EEF (Education Endowment Foundation)

The EEF has conducted several studies on the effectiveness of Maths Mastery in UK classrooms. One of their large-scale evaluations (2018) on Key Stage 3 students found that students who were taught using the Maths Mastery approach made slightly more progress compared to those who received traditional teaching methods. The report emphasizes that mastery teaching can be effective when implemented with fidelity but highlights the need for professional development to support teachers. *EEF Key Stage 3 Study (2018)*: "Students in schools adopting a mastery approach made more progress in mathematics than pupils in schools using other teaching methods, though the effect was small."

3. Professor Robert Coe

Robert Coe, an educational researcher, supports the notion that mastery approaches have the potential to raise achievement across a wide range of abilities. He argues that a focus on depth of understanding, as opposed to surface-level procedural knowledge, aligns well with cognitive science theories of learning. In his work for the *Institute for Effective Education*, Coe emphasises that mastery promotes retention and transfer of knowledge by allowing students more time to deeply process information. *Coe et al. (2014)*: "Mastery learning, by focusing on a clear progression of skills and allowing students time to consolidate learning, can lead to greater depth of understanding and improved outcomes."

4. Debra Myhill and Steve Higgins

Research conducted by Debra Myhill and Steve Higgins from the University of Exeter highlights that mastery teaching supports metacognition and self-regulation in students. By encouraging pupils to think about how they learn and articulate their mathematical reasoning, the mastery approach fosters deeper cognitive engagement. Their work suggests that this method could be particularly effective for low-attaining students, as it allows more opportunities to revisit and consolidate core concepts. *Myhill & Higgins (2016)*: "Mastery pedagogy gives students the tools to think critically about their own learning processes, helping to develop mathematical resilience and problem-solving skills."

5. The Shanghai Maths Project

In 2014, the Department for Education (DfE) introduced the Shanghai Maths Project in a bid to improve mathematical outcomes in English schools by importing the mastery-based pedagogical style used in Shanghai. The findings from the Shanghai exchange program suggest that a focus on collaborative problem-solving, a coherent and cumulative curriculum, and whole-class teaching leads to higher attainment. *DfE (2016)*: "The Shanghai Maths Project highlights the importance of coherent progression and consistent practice, with students required to demonstrate mastery of one concept before moving on to the next."

6. Dr. Helen Drury

Dr. Helen Drury, founder of *Mathematics Mastery*, has been a significant figure in the promotion of this approach in the UK. She argues that mastery teaching empowers students by removing the need for 'catch-up' interventions later in their school careers. Her research suggests that by focusing on depth, rather than acceleration through topics, students develop a more secure foundation in mathematical concepts, leading to longer-term success. *Drury (2014)*: "By ensuring all students work towards the same learning goals and mastering each concept in depth, we can build greater mathematical confidence and resilience across all ability levels."

2. The Ark Mathematics Mastery and the CPA Approach

Ark Maths Mastery: Intent, Implementation, and Impact Measurement

1. Intent

The intent of Ark's Maths Mastery program is to transform the way mathematics is taught in schools, aiming to ensure that all students develop a deep understanding of mathematical concepts. This is built on the belief that every child can achieve high standards in mathematics through carefully designed teaching that allows for depth of understanding and mastery of each concept before progressing. Key intentions include:

- **Deep Conceptual Understanding**: Rather than moving quickly through topics, students are encouraged to spend time understanding the concepts deeply.
- **Fluency in Mathematical Skills**: The program emphasizes fluency with numbers and mathematical operations, helping students to become comfortable and accurate in their calculations.
- **Mathematical Reasoning and Problem-Solving**: Students are taught to reason mathematically and to approach unfamiliar problems systematically.
- **Equity in Learning**: Maths Mastery is designed with the goal of closing the attainment gap, ensuring that all students, regardless of prior attainment, can succeed in mathematics.

2. Implementation

Ark Maths Mastery is based on five key principles that guide its teaching and learning strategies:

1. **Coherence**: The curriculum is carefully sequenced to build on previous knowledge, and students master one topic before moving on to the next. Each concept is revisited in different contexts to consolidate understanding.
2. **Representation and Structure**: Abstract concepts are represented visually or with manipulatives (concrete objects) before transitioning to more abstract forms. This approach helps students build a strong foundation for understanding mathematical principles.
3. **Mathematical Thinking**: Students are encouraged to think mathematically by explaining their reasoning and exploring alternative methods for solving problems. Teachers use questioning to prompt students to articulate their thought processes.
4. **Fluency**: Time is spent developing fluency in core mathematical skills, ensuring that students are confident and quick in applying key number facts and operations. Regular practice of these skills is embedded in lessons.
5. **Variation**: The program introduces concepts in a variety of contexts to help students deepen their understanding and apply their knowledge flexibly. The use of varied problems and exercises ensures that students can apply their learning in multiple ways.

Teaching Strategies

- **Whole-Class Teaching**: Lessons are delivered to the whole class, with all students working through the same mathematical problems. Differentiation is achieved through scaffolding and questioning, allowing teachers to support lower-attaining students while challenging the more advanced.

- **Mastery Curriculum**: The curriculum is structured to prevent acceleration through topics before students are ready, ensuring thorough understanding.

- **Professional Development**: Continuous professional development is provided for teachers to ensure they can effectively deliver the Maths Mastery approach. This includes training in using manipulatives, questioning techniques, and formative assessment strategies.

3. Impact

The impact of the Ark Maths Mastery program is measured through a combination of formative and summative assessments. The focus is on assessing not only students' ability to perform calculations but also their depth of understanding, reasoning, and ability to solve problems.

- **Formative Assessment**: Teachers use ongoing formative assessments during lessons to gauge students' understanding. This includes questioning, observing students' use of manipulatives, and reviewing their work. These assessments allow for timely interventions where students may need additional support.

- **Summative Assessment**: End-of-unit tests and termly assessments are used to measure students' progress against mastery goals. These tests are designed to assess students' fluency, conceptual understanding, and problem-solving skills.

- **Impact on Pupil Progress**: The impact is measured through students' progress in internal assessments, as well as national assessments such as SATs and GCSEs. The goal is for all students to meet or exceed expected progress in mathematics.

- **Tracking Attainment**: The Ark Maths Mastery program tracks student performance over time to ensure that the mastery approach leads to improved outcomes. Schools use data from both internal and external assessments to monitor progress and adjust teaching strategies where necessary.

- **Evaluation of Teaching Practices**: The effectiveness of the program is also evaluated by reviewing teaching practices through lesson observations and feedback. This ensures that the core principles of Maths Mastery are being applied consistently and effectively across classrooms.

In summary, Ark Maths Mastery's intent is to provide every child with the skills and understanding they need to succeed in mathematics, implementing this through a structured, coherent curriculum with strategies for developing deep understanding, fluency, and reasoning. Impact is measured through a mix of formative and summative assessments, tracking both short-term progress and long-term attainment.

3. Multiplication and Number Club

At our school, we utilise **Times Tables Rockstars** and **Number Club** as key tools to enhance students' multiplication skills. **Times Tables Rockstars** provides a fun, engaging platform where students practice their times tables in a game-like format, helping them to increase both their accuracy and speed in recall. Through regular practice and competition, students become more confident in their multiplication knowledge, with the platform adapting to their individual learning pace.

In addition, **Number Club** supports our approach by offering targeted practice for younger students or those needing reinforcement in foundational multiplication concepts. By combining the structured, gamified learning of Times Tables Rockstars with the more tailored support of Number Club, we ensure all students develop strong multiplication fluency, laying the groundwork for success in more advanced mathematical topics.

The **99 Club** is a multiplication-focused challenge designed to encourage children in primary schools to improve their fluency with times tables. It typically involves a series of progressive challenges, starting with basic multiplication and moving up to more complex times tables and division facts.

The structure is often tiered, with students starting at the **11 Club** (solving 11 multiplication questions within a set time) and progressing through the ranks — 22 Club, 33 Club, and so on — until they reach the **99 Club**, where they aim to complete 99 multiplication and division questions correctly within a set time frame (usually 5 minutes).

The challenge encourages regular practice, improves speed and accuracy, and provides a sense of achievement as students move up the ranks. Many schools use it as a motivational tool to promote healthy competition and reward progression, often incorporating certificates or rewards as students advance through the different levels.

4. Our Ark Calculation Policy

The **Ark Maths Mastery Calculation Policy** aims to provide a clear, consistent approach to teaching mathematical calculations across all year groups. The main objectives of the policy are to:

1. **Develop Conceptual Understanding**: Ensure that students grasp the underlying principles of mathematical operations before moving on to formal written methods. This is achieved through the use of concrete resources (e.g., counters, cubes), pictorial representations, and then abstract approaches.
2. **Promote Fluency**: Help students become fluent in performing calculations, ensuring that they can use both mental and written methods confidently and accurately across a range of contexts.
3. **Support Progression**: Establish a structured progression for teaching calculations, from simple methods to more complex ones, ensuring students have a firm foundation before moving on to more challenging operations.

4. **Consistency in Teaching Methods**: Provide consistency across the school so that students encounter the same methods and vocabulary throughout their mathematical education. This allows students to build on prior learning without confusion.

5. **Encourage Mathematical Reasoning**: Ensure students can explain their thinking and the steps involved in their calculations. This helps develop their reasoning skills and deepens their understanding of mathematical processes.

6. **Foster Problem-Solving Skills**: Equip students with the calculation skills necessary to tackle a variety of mathematical problems, promoting flexible thinking and the ability to apply their knowledge in different situations.

Please see separate policy.

5. Our Approach to supporting Arithmetic

At our school, we incorporate daily **"Tough 10"** arithmetic tests through **Vocabulary Ninja** to provide students with regular, focused practice of key arithmetic skills. This daily rehearsal helps reinforce fluency and accuracy in calculations, building students' confidence and competence over time. The bite-sized, consistent practice allows children to strengthen their arithmetic recall and develop speed in their responses. This is progressive and builds up across the school year.

Additionally, **half-termly arithmetic tests** serve as important milestones for evaluating students' progress. These tests provide us with valuable data on how well students are retaining and applying the skills they have practiced daily, helping us to identify any areas where further support may be needed.

We also dedicate **one lesson per week** solely to teaching strategies for quick application of arithmetic. This structured time allows students to explore different methods and techniques to improve their efficiency and accuracy when performing quick calculations, giving them the tools to apply their knowledge effectively in a range of contexts.