Enhancing maths understanding: An account of practice from collaborative action research in St Mary's CE Primary School

The Research-Practice Partnership

The **School Voices Research-Practice Partnership** aims to support schools in **responding to student diversity** and **improving learning outcomes** for **all**, whilst at the same time **promoting inclusion**. This will be achieved by focusing on **students' voices and dialogues** between teachers and children and young people through **participatory research approaches**.

The Partnership has been partly funded by **UKRI – Higher Education Innovation Funding (HEIF)**. The Partnership consists of a collaboration between: **University of Southampton** and three **hub schools (St John's Primary and Nursery School, St Mary's CE Primary School, Redbridge Primary School)** that were involved in an earlier pilot study. The hub schools and the University of Southampton support other schools in introducing these ideas through collaborative action research, considering the complexities within each school context. For more information - www.schoolvoices.soton.ac.uk

The school

St Mary's CE Primary School is much larger than the average-sized primary school with 642 students. The school's work is underpinned by the motto – 'Be the best version of yourself' and the 'Values of Virtue' – Courage, Compassion and Creativity.

There are three classes in each year group from Reception to Year 6, and the school has a nursery within the early years provision. There are 26 teachers, 30 Teaching Assistants and 6 support staff members in the school. 'Setting', which involves grouping pupils in a given year group into classes for Maths and English, happens from Year 1 in the school.

There is great diversity amongst the students in St Mary's, with 30 ethnic groups and 54 languages spoken. 78.60% students speak English as an additional language (EAL). The proportion of pupils who have Special Educational Needs and disabilities (SEND) is broadly average. Attendance issues are faced especially due to several children travelling to their native places for long durations. Attendance is celebrated for individual attendance as well as 100% class attendance. The focus of the school is to encourage the desired behaviours in every pupil, within an environment where they feel safe to take risks and strive to be better in their learning.

Research focus and process

This project at St Mary's was conducted across three different maths sets, each tailored to the specific needs and abilities of the pupils involved. While the overall aim was to explore ways to make mathematics more accessible, enjoyable and effective, the research questions and methods were adapted to suit each age group and attainment level. Student researchers worked closely with their teachers throughout the academic year. The project involved three sets: Set 1, comprising Year 4 pupils, and Sets 2 and 3, both consisting of Year 3 pupils. The focus of each is outlined below.

Set 1 – Year 4

Focus: Using concrete resources to help children understand abstract concepts through hands-on experiences.

Research questions:

- **Do you learn about numbers through stories or fun activities?**
- **Do you use objects or tools to help you understand Maths?**

This set involved high-attaining pupils who already had strong conceptual understanding. Given the level of ability in this set, concrete resources were not used all the time.

Set 2 – Year 3

Focus: Improving mental fluency in mathematics through explicit teaching of mental strategies.

Research questions:

- **What strategies boost children's attainment in mental mathematics?**
- **Does mental fluency improve overall mathematics attainment?**
- **Does explicit teaching of mental mathematics strategies improve children's overall enjoyment of mathematics?**

Pupils in this set focused on developing speed and accuracy in mental calculations. The project explored specific strategies for mental maths, testing their effectiveness and considering how they influenced both performance and enjoyment. The project involved trying out new techniques, comparing them to existing habits, and reflecting on which were most effective.

Set 3 – Year 3

Focus: Using concrete and pictorial tools to support understanding in maths.

Research question:

- **Do you use objects or tools (like counters or number lines) to help you understand Maths?**

In this set, pupils explored how different tools and objects could help them solve abstract mathematical problems more accurately. Students were at the lower ability level in this set.

Participatory methods

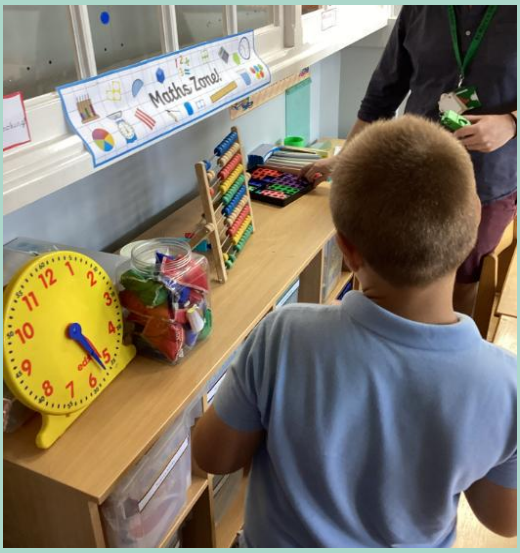
Student researchers engaged with a variety of hands-on activities and tools across designed to deepen understanding and make maths learning more accessible and enjoyable. While the participatory research involved pupils as collaborators in exploring learning experiences, these approaches focused on embedding active, practical and collaborative learning within maths lessons. Common tools such as Numicon and place value charts helped visualise numbers and operations, while real-life scenarios and interactive tasks encouraged engagement and practical application of mathematical concepts.

Below is a summary of the specific activities conducted for each group:

Set 1 – Year 4

- Observation of classes using concrete resources such as Numicon, base-10 blocks, fractions bars, and place value charts to support understanding and address misconceptions, particularly with larger numbers and decimals.
- Use of maths stations or rotating hands-on tasks to explore various manipulatives.

- Introduction of maths games to make lessons more fun and engaging.
- Use of times tables songs to support multiplication skills (MTCS).
- Maths stations or rotating hands-on tasks
- Use of different types of manipulatives: Numicon, base-10, fraction bars, place value

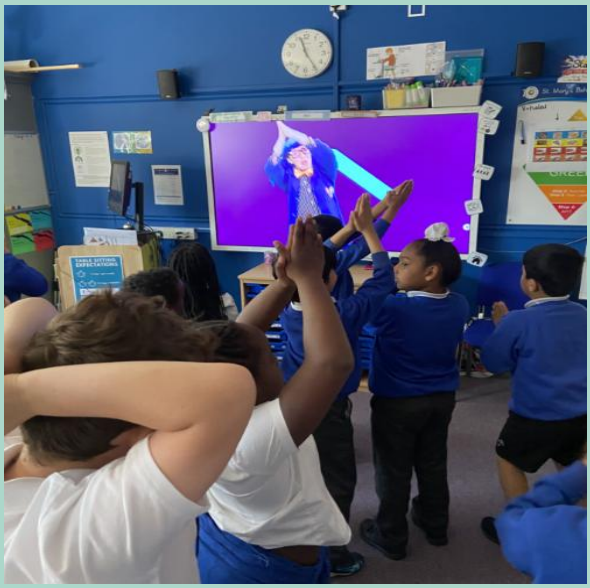


Set 2 – Year 3

- Adapted mental maths tests with extended time to reduce anxiety and better assess fluency.
- Class discussions focused on the use of mathematical language to deepen understanding.
- Explicit teaching of how to derive new facts from known facts, supporting strategy development.
- Regular use of digital tools such as Hit the Button to reinforce and speed up recall of number facts.

Set 3 – Year 3

- Explicit teaching on how to use concrete resources like counters and number lines to support understanding.
- Maths songs and call-and-response chants to reinforce multiplication facts through rhythm and repetition.
- Outdoor games, such as “What’s the Time, Mr. Wolf?” adapted to practice 3 times tables and other multiplication games.
- Maths quizzes used to practise recall in an engaging way.
- Talking frames that provide structured prompts to help pupils explain their mathematical reasoning.



Outcomes

A hands-on approach makes maths more enjoyable and easier to understand: Pupils consistently reported that using practical tools and resources made maths more enjoyable and accessible. Activities such as working with Numicon, place value charts and maths stations helped them to visualise numbers and grasp concepts more clearly. Children in Set 2, for example, specifically mentioned that maths had become their favourite subject.

Increased confidence and positive feelings towards maths: Pupils also mentioned that they had increased confidence in using concrete resources, although some noted that these tools could occasionally be distracting. Indeed, children in Set 2 expressed increased enthusiasm, with many naming maths as their favourite subject.

Improved learning performance: Throughout the project, pupils demonstrated clear progress in their mathematical skills, problem-solving abilities and confidence. Many were able to work more efficiently and demonstrate a better understanding of key concepts. Specifically, pupils in Set 2 worked at a faster pace, progressed beyond their initial level and achieved higher average scores in summative assessments. They also demonstrated more concise and proficient verbal reasoning. Pupils in Set 3 demonstrated measurable improvement, achieving a 9% increase in correct answers in tests.

Maths valued as real-life learning: Activities connected to everyday contexts helped pupils see maths as relevant and practical, increasing motivation and engagement.

Key ideas emerging

Learning enriched by collaboration between teachers in different sets: Sharing strategies and experiences across different groups encouraged mutual support and broadened teachers' approaches to maths learning.

Cultivating a growth mindset: The importance of encouraging pupils to aim for continuous learning and improvement, rather than settling for what is comfortable, emerged strongly from classroom practice.

Focus on purposeful, contextually relevant activities: Effective learning arises from activities that are meaningful and tailored to pupils' needs and interests, rather than simply increasing the quantity of tasks set.

Teachers' and Students' thoughts

> It was so great to see maths being used in real life ways but we were so impressed by how much fun everyone was having while learning maths. Using these resources really helped make learning easier and more exciting.

Student researcher

> One thing that I really enjoyed about doing that [the project] with the researchers was the fact that we were able to take those different ideas but apply it within a set of 3 settings.

Teacher

Teacher team

- Faye Bauck (Headteacher)
- Rhiannon Frape (Associate Assistant Headteacher)
- Baljot Sandhu
- Xamdi Cabdullahi

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Research team

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We would also like to acknowledge the participation of many children and other staff in the school who have contributed in various ways.