

Anon Primary School Mathematics Developmental Review

The purpose of the review

To work with the mathematics subject leader and senior leadership team to ensure that:

- The school has an accurate and robust view of the current strengths and areas for development.
- Practical actions to address improvements are identified.

Activities which informed the findings

- Joint lesson observations across foundation stage and both key stages
- Book and planning scrutiny
- Pupil discussions
- Discussion with teachers
- Regular discussions between the Head teacher, deputy head teacher and mathematics consultant

Strengths on which to build:

- The headteacher and deputy head teacher have a very good understanding of mathematics teaching and learning and are keen to ensure this is improved on in the school. They were able to identify areas that need developing and were actively involved in discussions on the actions needed to be taken to improve mathematics.
- Practical activities, where used, supported children in their learning and understanding. In some lessons in KS1 children were learning through doing e.g. measuring using scales, discussing properties of shapes using practical resources.
- In a Y3/4 class, children were engaged in their learning of the place value of digits when the teacher included a novelty aspect in the lesson. Children were able to say the value of each digit and explain how they knew.
- In one of the foundation settings children had many opportunities to engage in mathematics during free flow and as part of their daily routine. This now needs to be extended to across all the foundation stage unit as part of both indoor and outdoor learning.
- In some classrooms interaction with the mathematics displays was encouraged e.g. an 'estimation station' where children could estimate the number of balls in the jar on a post-it to place on the display.

Emerging issues

These issues acted as barriers to better pupil progress:

- The learning objective didn't always match the learning intended with some tasks the children were doing not supporting their progress towards mastering the learning.
- Planning did not always link learning from one lesson to the next so children weren't always making the link to previous learning and to their next steps in learning. The 'learning journey' was not often evident in planning or during the lesson. Sometimes this meant that the tasks given to children were not supporting the learning objective.
- There was some lack of planned differentiation, most frequently showing as slow pace for the most able. Children were not always sure of what they were learning or why.
- Much of the teaching, questioning and tasks were closed and did not challenge children to think, reason, explain and make connections in their learning. Children completing tasks were mostly trying to follow a procedure without understanding the purpose of what they were doing and why.
- Teachers did not use effective strategies to accurately find out what pupils can do or what they understand. Questioning would not accurately pick up and explore misconceptions. More frequent use of 'Assessment for learning' strategies, including better questioning would make the successes or the barriers obvious to pupils and teachers and mean that the lessons could be adjusted in response to progress.
- Teacher subject knowledge may be stopping them from adapting the learning and teaching according to needs that unfold during a lesson. In some lessons teachers didn't appear to fully understand the concept or objective they were teaching so weren't able to explore it with the children challenging them or identify and address misconceptions.

- Practical ‘manipulative’ resources needed to be used more to support children in developing conceptual understanding. In some classes children who did not understand what they were learning weren’t provided with visual images or resources that would help them overcome barriers.
- Vocabulary was not always used by teachers or other adults correctly and wasn’t always displayed to support effective talk in mathematics. Children were not always encouraged to use the appropriate mathematical vocabulary.
- The learning environment didn’t fully support mathematics learning. There are too few learning prompts for mathematics and what is there is not often used. There wasn’t any observation made of children choosing a resource that would help them with their mathematics.

Recommended actions

Develop reasoning in mathematics

- Plan in the use of open questions in mathematics that will make children think, reason and explain their understanding. Expect children to answer questions in a sentence that contains ‘because’. See attached for possible talk prompts. Have children ‘convince me’ whether they have a correct or incorrect answer.
- Teachers to consider the vocabulary of mathematics appropriate for each lesson that they, children and other adults, will use. The key vocabulary to be written in planning and to be displayed/written and referred to at appropriate times during a lesson.
- Begin some lessons with an open activity that will require children to determine what they know from the information given and what they can work out. “I know this, so I also know this”. Allow time for children independently or in pairs to determine how they are going to address the problem or challenge before discussing with others. Minimise teacher talk and instruction and, instead, draw out from children what they think they need to do and why. Sentence and talk frames to be used to support children in their explanations. Examples of these include: It can’t be __ because; It might be __ because; I agree/disagree because __; What if we __.
- Ensure ‘real life’ mathematics is linked to learning so children can make connections between mathematics they do in the classroom to how they use it in life. This will help them develop deeper conceptual understanding and to make sense of problems they encounter.
- Provide opportunities for children to determine which method of calculation they are going to use (mental, jottings, formal written) depending on the numbers being used. Have them explain why they consider this is the most efficient.
- Develop estimation in all areas of mathematics. Have children create benchmarks that will support the estimation. E.g. ‘If 100 looks like this, how many do you have?’ Develop the language of estimation (about, more than, less than, almost, half, between etc.).
- At regular intervals provide opportunities for teachers to share ideas for tasks which are effective in stimulating thinking and collaboration and have a clear mathematical learning outcome.
- Encourage children to represent their mathematics thinking using resources, pictorial or symbolic representations. Use these to support children in explaining their thinking.
- Develop routines which build pupils’ independence and confidence. Offer checklists or prompts which encourage them to think for themselves, use the expertise of their partner, their group, other members of the class and the resources available.

Planning a mathematics learning journey

- Support teachers in considering and planning for the learning journey of a unit of work. (see attached slide with questions to consider when planning). This will ensure there is links in the learning during each lesson and between lessons. This can be a mind map of the overall unit with, initially, the first two days planned in more detail. Joint planning of this mind map within a year group will help each teacher understand the learning journey. During the unit ongoing assessment information can be used to adapt the remainder of the planning to meet children’s needs.
- Ensure planning includes key vocabulary, questions and resources that will support learning. When planning teachers to consider misconceptions children may have and include some of these in the planning sometimes using these as teaching points.

Improving the learning environment - Making mathematics a focus all around the school

- Raise the profile of mathematics around the school by looking for opportunities where mathematics can be used in everyday routines/activities.
- Provide opportunities for use of mathematics in the classroom and whole school learning environments: number lines 0-1000 in the corridor; estimation stations; mathematics questions/riddles/facts in public that children can refer to as they move around the school; problem or puzzle on display to which children and adults can contribute information or answers.
- Provide an opportunity for teachers to visit each other's classrooms on a learning walk to identify opportunities where mathematics could be included in the learning environment. Provide time for teachers to develop this then revisit to monitor the progress.
- Use real life to complement mathematics taught in the classroom e.g. arrays in the environment (window panes, cupcake trays, chocolate, stamp books etc.); fractions (link to measures, parties, food etc.)
- Encourage children and parents to find mathematics opportunities at home and in the outside world. Children can bring in photographs, packaging, and advertisements that show examples of mathematics. Have visiting parents or adults show how they use mathematics in what they do.
- Make practical resources for mathematics available in classrooms for adults and teachers to use. Ensure that resources are used to develop conceptual understanding and link these to the symbolic representation.
- Use mathematics displays in classrooms to support the learning journey – examples of children's work showing progress in learning across the unit, vocabulary and questions that support and extend the learning.

Developing mathematics subject knowledge of adults

- Use NCETM (www.ncetm.org) self –assessment tool to identify areas where weak subject knowledge is amongst adults in the school. Address through CPD (training, planning and classroom support). Teachers can use information from this website when they are planning for a unit of work.
- Ask teachers to identify areas of mathematics that are hard to teach, hard to learn. Use Overcoming Barriers in mathematics resources to support the teaching and learning of these. Link to the training of the subject knowledge to these identified areas.
- Explore the progression in an area of mathematics (e.g. calculations, shape and space) as a whole staff so teachers will understand how what they teach fits into the 'big picture'.
- Monitor planning and books to check progression in area is evident.