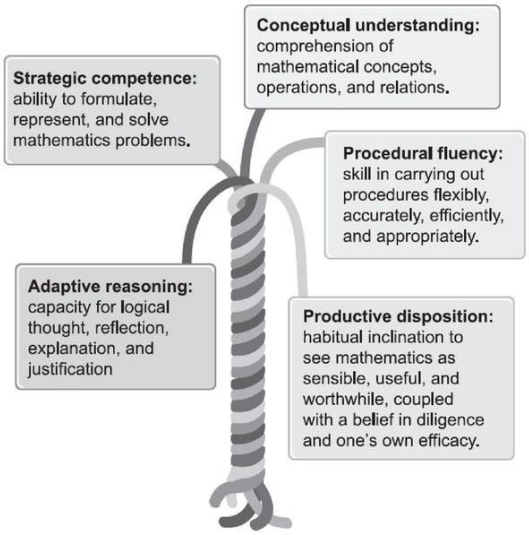
Author	**Mr Galt**
Date Updated	**March 2022**
Audience	**All teaching staff**

Mathematics Policy

INTRODUCTION:

Philosophy:

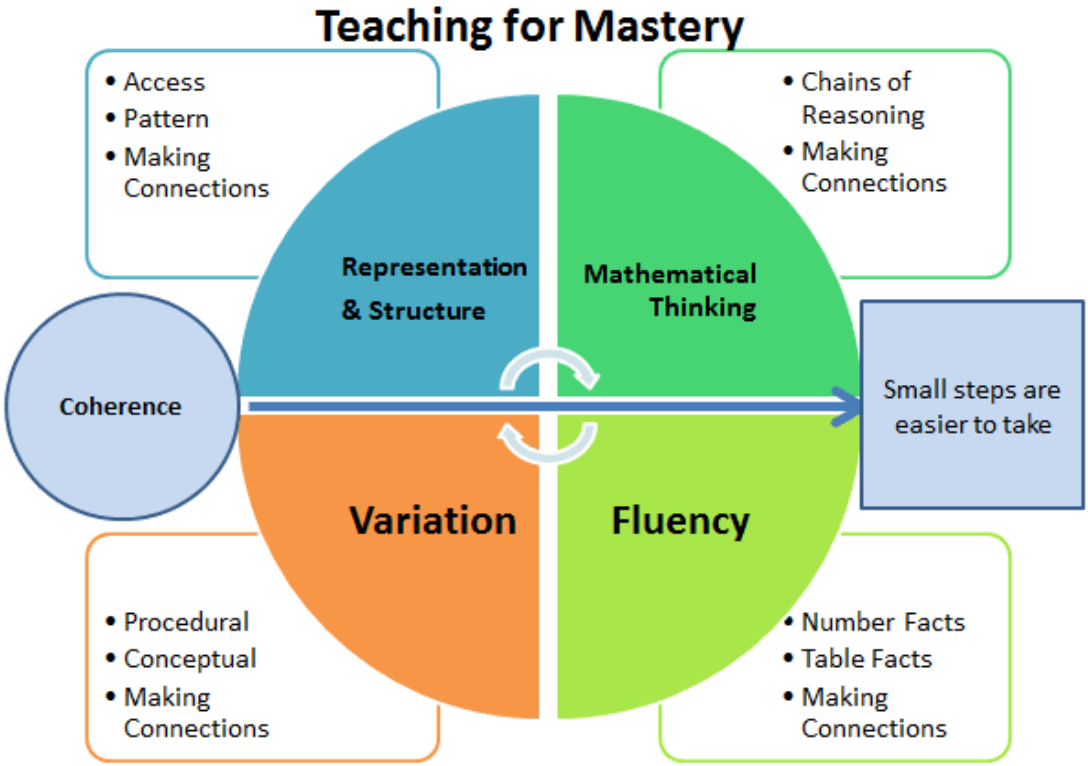


These strands—interwoven and interdependent—describe a set of knowledge, skills, abilities, and beliefs based on a body of research in cognitive psychology and mathematics education.

Research by Nunes (2009) identified the ability to reason mathematically as the most important factor in a pupil's success in mathematics. It is therefore crucial that opportunities to develop mathematical reasoning skills are integrated fully into the curriculum. Such skills support deep and sustainable learning and enable pupils to make connections in mathematics

Nunes, T. (2009) Development of maths capabilities and confidence in primary school, Research Report DCSF-RR118 (PDF)

Our curriculum is based on a 'mastery' approach underpinned by the 'big five ideas' of mastery, as defined by the NCETM. They are as follows:



PLANNING:

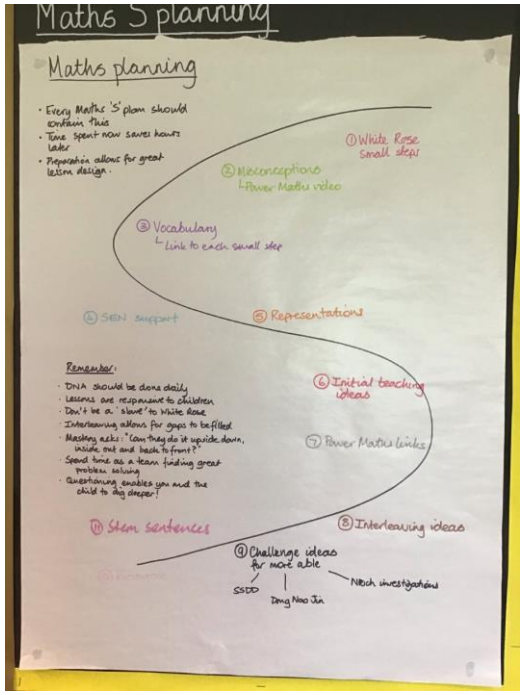
Long Term Planning – Block Overview:

The White Rose Maths Scheme of Learning has identified the order and length of time for each curriculum block in KS1 and KS2. Teachers may adapt this to suit the needs of their children or a change in the length of a term; however the principles must still be followed e.g. place value is always taught first in the year.

Medium Term Planning – 'S' Plan:

An 'S' Plan should be constructed at the start of each curriculum block during PPA time. The most important aspect of this stage is the discussion about pedagogy between the professionals and this shouldn't be rushed. This could be done electronically or by hand (then a photograph taken and added on to network).

1) **First, map out the National Curriculum Objectives for the block in order that you will develop them.**
2) **Second, add in the necessary 'small steps' to be developed for each objective. The White Rose scheme has a suggested list of these for each block, but using your knowledge of the children you may need to build in extra steps to ensure understanding.**
3) **Finally, difficultly points, teaching points and stem sentences should be added. This part is crucial and where the discussion between professionals comes in.**



Teachers may wish to also add / draw in different images and representations to be used. Refer to the example S plan in the PPA room for the different categories to include. The S plan must include a key so the chosen colours are identified.

Questions to consider at this stage of planning:

- What vocabulary and stem sentences should the children be using?
- Which images and representations should the children be seeing (conceptual variation)?
- Which concrete resources (e.g. Numicon) and pictorial representations (e.g. bar model) will support this?
- Where does procedural variation need to be built in? What might it look like?
- What are the key concepts that children must understand (e.g. inverses, part-whole relationship)?
- What are children's likely misconceptions? How will you address them?

Teachers should not yet too concerned about what the children will DO each day – that comes at the short term stage.

Short Term Planning – Weekly Planning Grid:

Only once an 'S' plan has been constructed should weekly planning be started. There is no set format for this but a suggested template is available on the network. This should be a relatively quick process as the order of objectives and small steps has already been agreed, and important learning experiences have already been determined. This is the practical stage when the final details of the learning are 'nailed down'. Alongside this, resources such as arithmetic activities containing procedural variation should be constructed jointly.

Questions to consider at this stage of planning:

- How will you ensure there is at least an element of problem solving and reasoning <u>every single day?</u>
- Which of the 14 key questioning strategies will you develop?
- Which mathematical super powers will you develop?
- How will you ensure a balance of different types of problem solving and reasoning (see key resource list)?
- What content will need to be revised as part of a 'Do Now Activity'?
- How will you extend the children who grasp concepts rapidly? Do they need another activity or does the procedural variation provide the challenge?
- What support will be available for the SEN and children with low prior attainment? How will they be supported to work independently as well as with an adult?

Interleaving:

Although we 'block' our curriculum, links should always be made with the whole of mathematics. For example during a unit on measure, children would apply of their calculation skills previously learned in the year. Additionally, teachers need to be aware of what children have learned prior to that year group. So, although the Y5 teacher may not have taught the 'statistics' unit by Christmas, the children will have learned about statistics in Y4 and so should be expected to apply those skills where relevant. To this end, we use interleaving when giving problem solving tasks. This means that about 75% of the content would be related to the block being studied, but the other 25% would revise previously learned materials. 'Same Surface Different Depth' (SSDD) problems can also be used, where one stimulus related to the block being studied is used but different areas of mathematics are explored; see Barton, 2017.

Teaching time:

- A daily maths session is to be provided of at least one hour (KS1) and 75 minutes (KS2). Mathematics should also be embedded across the school's curriculum, making purposeful links where possible (e.g. handling data in science, or measuring accurately in DT).
- On a Monday, calculation and arithmetic are taught discretely using the ideas of <u>procedural and conceptual variation.</u>

<u>TEACHING & LEARNING ELEMENTS:</u>

Lesson structure:

Generally, a lesson will take the following structure:

- Rapid Recall Y1 – Y4 / Times Tables Y5 – Y6
- Do Now Activity – recap prior learning
- New Learning – age related expectations

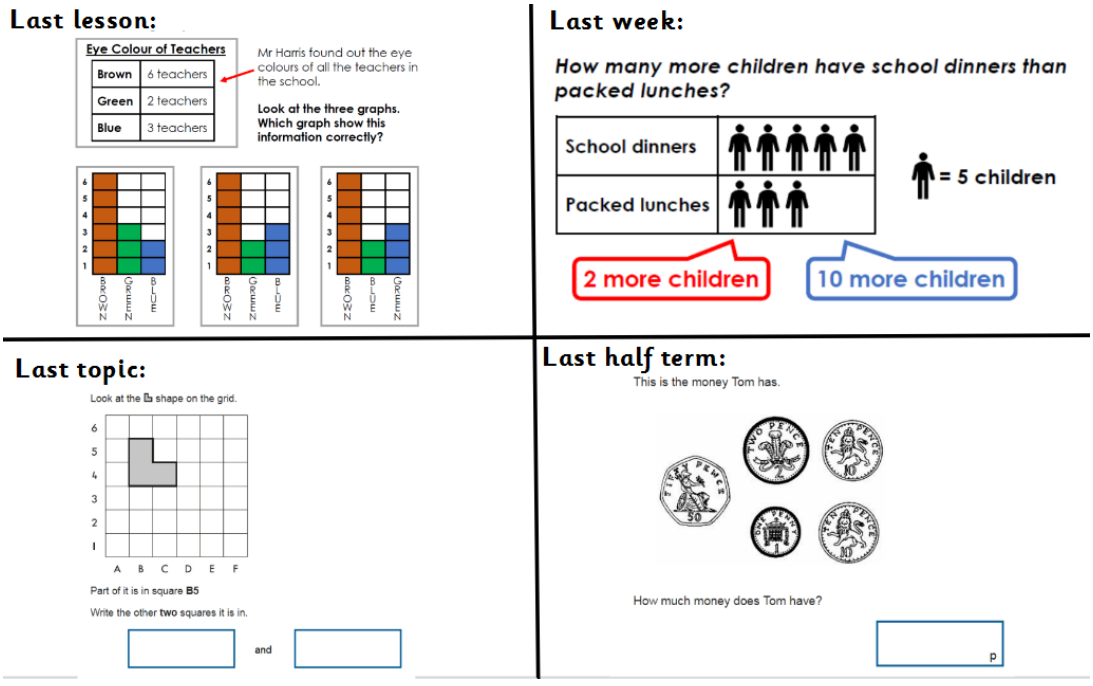
- Fluency
- Reasoning
- Problem solving
- Dong Nao Jin – Digging deeper challenge at Greater Depth FOR ALL

Learning maths facts by heart - Rapid Number Recall:

- We use the 'Rapid Number Recall' system to ensure children know their mathematical facts by heart, up to Year 4.
- In Years 5 and 6, times tables and revised for 5 minutes each day.
- Children are placed on their age-appropriate stage (Stage 1 – EYFS, Stage 2 – Year 1, etc) unless they have a very specific need or significant gaps in their learning.
- Children who have gaps from the previous stage should have these filled as an intervention and through home learning. The objectives are progressive – a child who does not yet know their 3x table should not try to learn their 6x table until the 3x table is mastered.
- They are taught each day in fun, varied and lively ways and practised at home; parent guidance is sent out to support this.
- They are tested on the objective at the end of teaching (at the end of a week/fortnight for example)
- Children should complete the step by the end of the year.
- Children needing an extension should consider different contexts (e.g. multiples of 10, money, decimals)

An example of review and recall is a 'Do Now Activity' (DNA):

Lessons should begin (after rapid recall) with a 'Do Now Activity' which is split into four parts. It should recap prior learning relevant to the lesson (last lesson and last week) and also recaps prior learning from previous topics (last topic and last half term).The questions could be a set of arithmetic questions, a reasoning puzzle – whatever the teacher decides is appropriate. The teacher can identify children struggling with the prior learning and can do a mini PI there and then for those children so that they can access the lesson. This gives the teacher an indication of who may need support during the lesson.



Example Year 2 DNA

Ensuring deep learning:

As a rule of thumb, we follow these steps to ensure deep learning of new content:

1. Recap relevant previous learning.
2. Use a contextual question as a 'scene setter'.
3. Draw out initial misconceptions and discuss why they are not correct.
4. Explore the objective using different concrete manipulations.

5. Illustrate the objective using different pictorial representations.
6. Discuss the links between the concrete and pictorial representations.
7. Establish abstract representations.
8. Practise routine questions with a variety of different forms.
9. Present any questions that are special cases (e.g. using zeros and ones).
10. Apply learning to more open questions.
11. Solve questions that require multiple steps of working.
12. Apply learning to problem solving questions.
13. Make non-numerical generalisations about the learning objective.

Calculations:
See the Calculation policy for details of how written calculations are taught at HGPA.

Problem solving & reasoning:
Problem solving & reasoning should be at the heart of our mathematics curriculum. Some lessons will focus directly on problem solving; other lessons children will learn mental methods or written calculations for example but in ALL lesson, reasoning strategies should be used, including the fourteen key strategies detailed in the Rising Stars guidance.

Teachers design tasks that develop their Mastery of Maths in multiple contexts and question structures. Misconceptions are used as a teaching tool and during the subsequent follow-up work, teachers give feedback relating to this learning as per the marking policy.

Vocabulary / Sentence Stems:
Each year group has a defined list of key vocabulary. Vocabulary for the theme for that week/fortnight/half term (e.g. multiplication & division or fractions) should be on display and referred to. The children should be taught to use it in their mathematical reasoning. We also use Sentence Stems (e.g. I have _____ equals groups of _____. This is ____ x ____) and 'I say, you say' to encourage the internalisation of vocabulary and understanding of concepts. We also expect children to answer and speak in full sentences.

Pushing for challenge:
All children should have the chance to work at 'greater depth'. Extension tasks, challenges and puzzles should be available for each lesson to ensure children get the chance to grapple with the most demanding content. Teachers use their judgment about when to move children onto these tasks. These challenges encourage a deeper level of mathematical thinking and are carefully chosen and designed by the teacher. Careful consideration is taken as to what resources that may be required and the time necessary to complete the given task.

Groupings / differentiation:
Generally, the whole class will be taught the same content at the same time. Rather than standard 'three-way differentiation', all children should be given the scaffolds and support they need to work at the age-appropriate level, and all children should have the opportunity to work at 'greater depth'. During the course of a lesson, groupings may be made with children at similar stages in their learning, but children should not be placed in fixed 'ability groups'. Most times, children will work independently (especially in KS2), but sometimes children may work in pairs or collaboratively in other groups, if it is appropriate to the content of the lesson. There should always be individual accountability (e.g. Kagan structures) in collaborative work.

Professional knowledge of the children and assessment for learning will identify children needing extra support in mathematics. This could be provided by additional time with an adult, precision teaching, or a precise intervention. Resources, including concrete manipulatives, should be used with all children but these will particularly benefit children with SEN. Rapid Recall may take place to ensure children secure the fundamentals of maths quickly.

Out-of-class work and homework
Rapid Recall practice is the only required homework and should be given out via Class Story in Class Dojo. Children practice in a way that suits them. Children have access to Mathletics and DB Primary to support their mathematical learning at home, and activities can be assigned to pupils on these platforms.

Links between Mathematics and other subjects
Purposeful links to other subjects (e.g. Kandinsky's mathematical based art work) should be where possible and relevant to stimulate the children's interest in the topic, avoiding tenuous links for the sake of it! Topic and Science learning should give children the opportunity to develop and apply their mathematical skills in different contexts.

Working Walls:
Vocabulary cards for the maths currently being learned and not pristine 'wallpaper'. Work and learning prompts, chiefly created by/with the children, should be put up on display, and the wall should be directly relevant to that week's learning. Prompts from previous units should also be kept on display to encourage children to keep using their new knowledge. Other displays in the classroom, e.g. science and foundation subject displays, should showcase excellent mathematics work from across the curriculum.

FEEDBACK:

Research (Black et al 2003) shows that the most effective and beneficial forms of assessment are ones which support learning (i.e. are formative) and are built-in to lesson design. In primary mathematics they require:

- well-structured classroom activities (involving conceptual and procedural variation and intelligent practice);
- regular opportunities for discussion of answers and strategies to support pupils' reasoning skills and check and deepen their understanding;
- interaction and dialogue (between teacher and pupils, and between pupils themselves), focusing in particular on key ideas and concepts (including misconceptions and difficult points) and effective, efficient strategies of working mathematically.

Most 'marking' will take place in **real time**. This will involve primarily verbal feedback, with some prompting and modelling written in the children's book using **red pen** where appropriate.

When marking, it is important for teachers to distinguish between a pupil's simple slip and an error that reflects a lack of understanding.

For slips, it is enough to simply indicate where each slip occurs, and ensure the pupils correct them, preferably in real time, or during the lesson.

If errors demonstrate lack of understanding, for a small group of pupils the teacher will arrange a PI – 'Precision Intervention' - which will be recorded in the books after the work that was incorrect. This could be done in real-time, during the lesson itself, or later that same day.

For a large number of pupils, the lesson will be paused and the misconception addressed immediately, or the errors will be addressed in the next lesson.

Where pupils are doing well and need a new challenge, this should just be given to the child straight away rather than waiting to be written in the book.

Evidence (Black and Wiliam 1998) shows that pupils benefit from marking their own work and we encourage this. Part of this responsibility is to identify for themselves the facts, strategies and concepts they know well and those which they find harder and need to continue to work on. Where appropriate, children can mark their own work in coloured pencil, but the teacher will always check this work too. Rapid Recall tests should always be marked by the children and the answers read out in full number sentences (e.g. "3 times 5 equals 15" not just "15").

It is not an expectation that next-steps or targets be written into pupils' books. The next activity or lesson should be designed to take account of the next steps.

ASSESSMENT:

See the school's assessment policy for further details; specifically those relating to tracking of progress/attainment.

BIBLIOGRAPHY:

Barton, C. (2017) How I wish I'd taught maths. John Catt Education Ltd

Black, P., Harrison, C., & Lee, C. (2003). *Assessment for learning: Putting it into practice*. McGraw-Hill Education (UK).

Black, P., Wiliam D., (1998). *Inside the Black Box: Raising standards through classroom assessment*. Kings College, London

Mason, J. and Johnston-Wilder,S (eds) (2004 a) Learners Powers in: *Fundamental Constructs in Education*, London:Routledge Falmer pp 115-142

NCETM (2016). *Marking and Evidence Guidance for Primary Mathematics Teaching.* NCETM (UK)

SEE ALSO:

- *Guidance for specific initiatives found on Staff Shared/Mathematics/Teaching Guidance*
- *Harrow Gate Academy Calculation Policy*
- *Harrow Gate Academy Feedback Policy*
- *Harrow Gate Academy Assessment Policy*