Responding to the Ofsted Report
Coordinating Mathematical Success: the mathematics subject report[1]

In order to support **Primary teachers and leaders** with how to respond to the recently published *Coordinating Mathematical Success: the mathematics subject* report (July 2023), the ATM/MA Joint Primary Group have produced the following short document.

Our document is set out in three sections:
1. Linking the language of the Ofsted report to the National Curriculum.
2. Areas in the Ofsted report we welcome a focus on.
3. Areas in the Ofsted report we suggest warrant further consideration.

Our first section draws attention to some of the new language that Ofsted uses, and offers a commentary about how we may view this in light of the current mathematics National Curriculum (DfE, 2013).

The second and third sections each focus on areas that feature prominently in the Ofsted report. To support teachers and leaders to engage in a pro-active way, we pose a discussion question, which is linked to the focus area, followed by further questions. All questions are designed to prompt thinking, discussion and reflection. References from the Ofsted report that link to each question are also included. These references may also prompt further discussion in that they either confirm, or conflict with, particular views and statements.

There are a number of ways that teachers and leaders could use our document.
- It may be given out as a reading and reflection task.
- One of the areas/questions from the latter two sections could provide a focus for a PD session.
- Leaders may choose one or more of the questions as a focus for broader research.
- SMT may use this commentary as part of an audit and action planning task.

Other papers published by the Joint ATM/MA Primary Group:

Responding to the 2021 Mathematics Ofsted Research Review: A practical guide for the classroom practitioner. (July 2021)

The Teaching and Learning of Multiplication Bonds: A position statement. (May 2021)

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[1] In this commentary we focus on the primary elements of the Ofsted report

Section One: Linking the language of the Ofsted report to the National Curriculum.

England's National Curriculum (NC) for mathematics has three clearly stated aims: to develop fluency, mathematical reasoning and problem solving. There has been much professional development on unpacking exactly what each of these mean and teachers (and pupils) now have these aims firmly embedded in their discourse about teaching and learning mathematics.

We note that while the Ofsted report again (as in the Ofsted research review) uses the language of declarative, procedural and conditional knowledge, the report itself states these 'are not necessarily terms that Ofsted would expect pupils or teachers to use'. Given that teachers are more conversant with the language of fluency, we think it would be helpful to look at where and how the Ofsted terms intersect with the NC aims.

Fluency

The NC's aim for fluency includes the statement that 'pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately'. So clearly **declarative knowledge** is an aspect of developing fluency.

It is important to emphasise that the nature of ***declarative knowledge*** in mathematics is different from the sort of ***declarative knowledge*** that might be drawn upon in other curriculum areas.

One might 'know' (in the sense of being able to say without much pause for thought) that Paris is the capital of France, or that four multiplied by five is 20. So, each of these 'facts' could be considered as examples of ***declarative knowledge***. But the essential natures of such 'facts' are very different - one must be told that 'Paris is the capital of France', commit it to memory, and knowing this fact about Paris does not in any way help anyone know what is, say, the capital of Germany.

Declarative knowledge (knowing facts) in mathematics is very different, as was so clearly articulated in the Cockcroft report:

> *Facts* are items of information which are essentially unconnected or arbitrary. They include notational conventions—for example that 34 means three tens plus four and not four tens plus three—conversion factors such as that '2.54 centimetres equals 1 inch' and the names allotted to particular concepts, for example trigonometrical ratios. The so-called 'number facts', for example 4 + 6 = 10, do not fit into this category since they are not unconnected or arbitrary but follow logically from an understanding of the number system. (Mathematics counts (Cockcroft Report) 1982, p71, original emphasis).

As this Cockcroft observation points to, in mathematics there is not a clear delineation between ***declarative knowledge*** and ***conditional knowledge***: declaring that 'five multiplied by five is 25' might eventually be a 'known fact' but until then a pupil might need to derive it from knowing that four multiplied by five is 20, and indeed should be encouraged to do so. In the light of this, we advise caution in interpreting the first point in the section on ***declarative knowledge*** where the Ofsted report states 'The curriculum should identify and sequence key facts, formulae, concepts and vocabulary. This helps pupils to avoid *relying on derivation*, guesswork or looking for clues' (our emphasis). While agreeing that guessing and clue spotting are unhelpful strategies, pupils should still be encouraged to use ***conditional knowledge*** to derive number 'facts' until they have attained fluency in these.

The Ofsted report also notes 'In many schools, staff wanted pupils to learn key mathematics facts by heart.' We think this statement also needs to be read with caution as it can be read as confusing ends with means - we concur with the aim, the end, of pupils knowing key mathematical 'facts', but teaching through 'learning by heart' is not the way to embed such knowledge in an interconnected network of mathematical understanding.

No explicit mention of ***procedural knowledge*** is made in any of the National Curriculum's three aims, although we take 'apply knowledge rapidly and accurately' to encompass ***procedural knowledge***.

Problem solving

The Ofsted report largely associates ***conditional knowledge*** with strategies for problem solving, actually having the subhead of '**conditional knowledge (strategies)**'. As with ***declarative knowledge***, ***conditional knowledge*** in mathematics can have many aspects. One in particular is how formal mathematics can arise from more everyday ***conditional knowledge***. For example, even very young pupils can reason that, say, 4 people equally sharing 9 apples will each get more than 5 people sharing 8 apples: such everyday conditional knowledge can effectively form the basis for comparing the fractions $\frac{4}{9}$ and $\frac{5}{8}$ (without recourse to a common denominator). ***Conditional knowledge*** is much broader than learning strategies.

Reasoning

The National Curriculum's aim of reasoning including **'**following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language' effectively describes many of the different forms that conditional knowledge can take, although describing such process as a noun (knowledge), rather than a verb (to reason) runs the risk of reducing such actions to another collection of things to simply learn, rather than engage in.

The importance of continuing to have the NC's aims at that forefront of mathematics teaching and learning

The National Curriculum is clear in the intention that each of the three aims – fluency, problem solving and reasoning – should be given equal weighting in the curriculum. Moving away from this toward discussing the curriculum in terms of declarative, procedural and conditional knowledge could lead to concluding that each of these 'knowledges' is of equal importance: this could lead to a skewing of the curriculum in favour of recall and procedures, a tipping towards fluency to the detriment of the other two aims.

Section 2: Areas we welcome a focus on.

Area	Discussion Question	Further questions	Report reference
Meeting the needs of all pupils	How do we meet the needs of all pupils so that they can be active and influential participants in maths lessons?	● How do we use teaching assistants to support pupils in lessons? ● When do interventions take place? Do they support pupils to 'keep up', such as pre-teaching and same-day intervention? ● Do we 'slow the pace of learning' to ensure all pupils understand? ● How do we manage support for older pupils? ● How are teaching assistants supported to develop their own subject knowledge for maths teaching? Do we include them in maths CPD sessions?	13 Case study. *Teachers were encouraged to slow the pace of learning, if necessary, to make sure that pupils mastered this knowledge before moving on.* 25. *The 'keep up, not catch up' approach, often directly referred to by leaders, made sure that pupils really understood and remembered what was being taught before moving on. Many pupils with SEND were following the same curriculum, with support and adaptations in class. For example, they received the same teaching as the main class, and then the teaching assistant supported them during their independent practice. However, this support may circumvent, rather than close gaps in knowledge.* 26. *Some of the more effective examples of additional help included pre-teaching and same-day interventions.* Report recommendation: *All schools should provide continuing professional development for teaching assistants, and other adults working with pupils, to help them to understand the intended school mathematics curriculum and the way it is put into practice.*
Use of representations	How can we use representations to support pupils to understand mathematical structure?	● Do we use mathematical language and representations consistently across the school? How do we know? ● How do we decide which representations to use, and when, and how to make connections between them? ● Do pupils use representations (concrete, pictorial and abstract) to demonstrate their understanding? ● Do pupils use mathematical language to explain their own thinking and understanding?	29. *…teachers were using mathematical language and representations consistently.* 34. *Teachers often used the concrete-pictorial-abstract to teach new ideas and methods. Pupils were often able to use the objects used in demonstrations themselves. This is helpful for pupils, and leaders were keen for this to happen.*
Mathematical thinking and reasoning	Is reasoning and mathematical thinking part of every maths lesson?	● How does reasoning and mathematical thinking look the same and how does it look different from reception to Y6? ● How do we engage all pupils in communicating their thinking?	21. *Leaders in all schools wanted pupils to be able to reason and solve a wide range of problems.* 24. *A lack of conditional knowledge ultimately leaves pupils unable to choose the best method when completing a mixed set of questions, for example during a test.*

Area	Discussion Question	Further questions	Report reference
		● How do we plan to develop pupils to reason and solve a wide range of routine and non-routine problems?	35. *Questioning tended to be used well. Familiar sets of questions were almost routine: 'What do you notice?' 'What's the same and what's different?' and 'Convince me'. Many teachers used questioning deftly throughout lessons to check whether pupils were ready to learn the material, to check their understanding and to encourage their reasoning* Report recommendation: *When leaders observe lessons, focus on pupils' thinking and the quality and quantity of practice they undertake.*
Accountability and assessment	How do we balance the needs of individual pupils with the pressures of accountability?	● Do we approach assessment diagnostically, looking at what pupils know and understand? ● How do we plan for and use tests? Do we use them to inform our teaching and to make decisions about meeting the needs of our pupils? ● How do we assess pupils' ability to apply what they know and understand to unfamiliar situations?	Report discussion of the findings: *Accountability measures and wide spreads of attainment tend to influence leaders' decision making and resource allocation for Year 6 cohorts. Allocating additional resources to year 6 leaves leaders with fewer resources to invest in pupils' earlier education.* Report on assessment: *Assessment at the end of a year or phase should assess pupils on what they have learned and rehearsed, rather than on what they do not know and cannot do.* 119. *In a minority of schools visited, pupils were asked to take tests that included topics that they had not studied and questions that were therefore impossible for them to answer. This was particularly the case when the school was using commercial tests …This is an inefficient use of pupils' time, which could be better spent learning new mathematics. It could also harm pupils' perceptions of their mathematical capability.*
Curriculum: geometry	When do we teach geometry and how do we ensure it is not marginalised within the maths curriculum?	● Do we have a shared understanding of the place of geometry and spatial reasoning in developing pupils as mathematicians? ● Do we recognise and utilise opportunities for developing understanding of number through geometry and spatial reasoning? ● How do we assess spatial reasoning and understanding of shape?	Report discussion of findings: *There are examples in some schools of less successful practices. At primary level inspectors encountered curriculums that … allocate geometry to the summer term only or do not provide for enough learning of conditional knowledge.* 52. *Occasionally, assessments did not include geometry, data and work with coordinates.*

Section 3: Areas we suggest warrant further consideration.

Area	Discussion Question	Further questions	Report reference
Being a mathematician	What does it mean to be a good mathematician *today*?	• Do we have an agreed understanding about the qualities of a good mathematician? • Is there a set of rules that defines being a good mathematician or can children/adults show this in multiple different ways? • What is the role of arithmetic as a tool in mathematics? • What is the role of calculators as a tool in mathematics?	*12. In most schools, teachers quickly identified rare misconceptions in declarative knowledge.* *14. Many primary schools' policies for calculation set out how pupils will learn procedural knowledge in a logical way. For example, using the 'grid method' of multiplication helps pupils to understand place value and the concepts that underpin multiplication. However, this can be at the expense of developing automaticity in using efficient and formal methods.* *20. Lack of procedural fluency is likely to be one of the reasons why pupils eventually need interventions in Year 6. Their lack of procedural fluency may not be apparent until they encounter a sample test paper that requires them to choose which method to use.*
Problem solving or solving problems	What is our understanding of problem solving as a) an approach to learning and b) a skill to solve routine and non-routine problems?	• Is it possible to prepare pupils for any question they might encounter? • How do we promote creative thinking if problem solving is not woven into every maths lesson? • How do we encourage pupils to record their thinking in a way that is meaningful to them?	*17. Knowing how to set out written work is another form of procedural knowledge. Textbooks and worksheets also helped to guide and support pupils' presentation, which gave them a sense of pride.* *21 One pupil said to us, 'They do it in a structured way by looking at a problem and then we do a similar one.'*
Assessment and Testing	What is the difference between assessing children and testing children?	• What are the limitations of a written test (e.g. a multiplication test)? • Does all assessment have to be written? • How many tests are too many?	119*. In a minority of schools visited, pupils were asked to take tests that included topics that they had not studied and questions that were therefore impossible for them to answer. This was particularly the case when the school was using commercial tests …This is an inefficient use of pupils' time, which could be better spent learning new mathematics. It could also harm pupils' perceptions of their mathematical capability.*
Differentiation	What does differentiation look like?	• How do we manage the range of ability, the range of thinking time, and the range of prior knowledge in a class? • Do we implement differentiation in the same way across the whole school?	Report main findings: *Generic approaches, such as the expectation that all teaching should always be differentiated, have dissipated.* *27. These pupils' needs might be better met if they were to learn different content practised using different tasks. This could be in groups of pupils with a similar level of attainment.*
Role of practice	How often should children practise?	• What does practice look like in our school?	*8. In many schools, staff wanted pupils to learn key mathematics facts by heart.*

Area	Discussion Question	Further questions	Report reference
		• Do children have a varied diet of using their knowledge in a range of ways? • How important is it for children to know facts (including multiplication bonds) by heart? • What does it mean to be efficient? • Should pupils have one method or a variety of methods/strategies to calculate, and know when it is appropriate to use them? • How and why are mental methods of calculation useful and is this reflected in our curriculum?	Report recommendations: *When leaders observe lessons, focus on pupils' thinking and the quality and quantity of practice they undertake.* *18. Pupils can encounter difficulties when teachers have not prioritised procedural automaticity enough.* *40. Worksheets accompanying schemes of learning were generally well designed. They included worked examples to help pupils understand, and did not contain distracting pictures.* *43. Linked to the issue of limited practice on worksheets, there was often no consensus among leaders on the amount of quality and quantity of practice that gives assurance that pupils have learned what was intended. Leaders and teachers often needed a better understanding of what an adequate amount of practice is.*
Pedagogy	Does our pedagogical approach help or hinder pupils' conceptual understanding and creative mathematical thinking?	• Are pupils able to explain their thinking in their own words to peers and adults? • How do we promote pupil agency in our mathematics lessons? • Are we encouraged to reflect on different styles of teaching and which are appropriate to include all pupils? • Do pupils use a variety of manipulatives to show their understanding? • What is the role of pupils in our classrooms? • Does research verify setting is a good idea for all pupils? • Is it true that classrooms need to be quiet for pupils to learn? • How do we ensure a balance between exposition by the teacher, practical work, dialogue, problems solving and investigational work in mathematics learning?	Report main findings: *… teachers to adopt new and improved ways of explaining and modelling concepts. Often, teachers use physical resources and pictorial representations to help pupils see underlying mathematical structures. They also teach and model new vocabulary, regularly check pupils' understanding and swiftly pick up misconceptions.* *38. In classrooms where pupils faced the teacher, pupils engaged more and were better able to listen and pay attention. This makes sense, as teachers can better gauge pupils' reactions and know whether they need another explanation or worked example. In contrast, pupils found it difficult to concentrate in classrooms where they had been split into multiple groups for teaching and practice, mainly because of the noise.*