

#MathsFest16

A view from Ofsted

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Pi day

To:

- identify current challenges and good/weaker practice in mathematics
- explore Ofsted and Mastery
- bust some myths about:
 - inspection
 - my ability to recite π to 50 dp

Reciting π

- Why would I want to recite π ?
- It would be fun, allegedly ...
- Here it is (courtesy of the internet):
3.14159 26535 89793 23846 26433 83279 50288 41971
69399 37510 (50dp)
- Perhaps more importantly, I recall a way of working it out – if I had to – using a special case of the Leibnitz series:
$$\pi/4 = 1 - 1/3 + 1/5 - 1/7 + 1/9 + \dots$$
- Surely, this is what we want for pupils – to be able to work things out for themselves rather than reciting (by rote) methods and facts that they have been taught.

Pause for thought ...

... what's good about the new National Curriculum/new GCSE?

Discuss!



Opportunities

The new National Curriculum (including the new GCSE):

- captures, in its aims, the best mathematical education for all pupils
- represents greater ambition for all pupils, especially the lower attainers (and pupils in receipt of Pupil Premium)
- emphasises depth over acceleration
- gives us the chance to think afresh about progression, the wider aims and conceptual links. The Programmes of Study, accompanying guidance (primary), and 'working mathematically' (secondary) offer much more, potentially, than lists of content
- provides a context for teachers and schools to learn from each other and together (including through Maths Hubs).

Pause for thought ...

... in your school/your class(es), what challenges do you face and/or worries do you have?

Discuss!



2014/15 survey findings – primary (1)



- New NC seen as more demanding. All schools visited implementing it as expected.
- The ways they are doing this vary, as does the quality:
 - best practice – implementing yearly PoS, taking account of gaps KS2 pupils have due to change of NC
 - more than half following new textbook schemes closely but not always identifying gaps or challenging pupils who grasp ideas quickly.
 - (Note: some textbooks seem to give little weight to reasoning and problem solving, except where explicitly mentioned in the list of content.)

2014/15 survey findings – primary (2)



- Some LAs have devised lists of lesson objectives for the new NC, sometimes annotated to show content that is new content or content new to a year group. Their schools tend to use a mixture of resources to deliver the objectives.
- Many teachers and subject leaders lack awareness of the aims of the NC, and concentrate on delivering the content.
- The best informed teachers and subject leaders
 - know the aims and give increased emphasis to reasoning and problem solving across the mathematics curriculum
 - use practical apparatus and images to support pupils' conceptual understanding

2014/15 survey findings – primary (3)



- Wide variability in the CPD provided for staff.
 - The best reflects a grasp of the challenges, including:
 - development of the NC aims, especially reasoning and problem-solving
 - ensuring pupils understand calculation strategies and make connections between different methods and operations
 - how to challenge and deepen the more able
 - strengthening teachers' subject knowledge.
 - The weakest: limited attention given to the mathematics NC.

2014/15 survey findings – secondary(1)

- Wide variation in emphasis given to the new NC which is not always seen as more demanding than the old NC. (Academies/free schools do not have to follow the NC.)
- Schools visited had chosen the following approaches:
 - Little or no change in KS3 (mix of 2- and 3-year), some giving increased emphasis to problem solving and/or financial mathematics. Likewise, limited change to schemes of work.
 - Introduced NC in Y9 only, with an eye on the new GCSE in Y10 in Sept 2015.
 - Started 3-year GCSE in Y9.
 - Introduced NC in all KS3 year groups.

2014/15 survey findings – secondary(2)

- Many schools' principal focus is the new GCSE. Too many do not seem to realise that getting KS3 right should boost performance at GCSE.
- Too few schools see secondary mathematics as a 5-year journey (or even 7-year).
- Sept 2016 will see the first Y7 intake assessed against new NC – perhaps one factor in the limited action at KS3?
- Schools using the 3-year GCSE assume that the specification will provide coverage of the KS3 NC.
- Little CPD on the NC provided for staff. More have attended training on the new GCSE.

Priorities for improvement

Priorities will vary according to individual teachers'/schools' starting points.

- Knowing what is working well and what needs to be better is a critical first step.

Priorities common to the primary and secondary phases:

- a better awareness of the NC aims and expectations
- the development of mathematical reasoning across the mathematics curriculum
- deepening learning of pupils who grasp ideas quickly.

Reasoning is integral to the development of conceptual understanding and problem-solving skills.

Survey findings:

- Of the three NC aims, it is the least well developed.
- Not all classrooms have a positive ethos that encourages learning from mistakes.
- Teachers do not exploit opportunities to model thinking.
- Tasks are not used well enough to develop reasoning.
- Talk often focuses on the 'how' rather than the 'why', 'why not', and 'what if' in:
 - teachers' explanations and questions
 - pupils' responses.

Some more priorities – primary

- Making problem solving integral to all topics, not just where it crops up in the list of content
- Teaching mixed-age classes.
- Recognising weaknesses in teachers' subject knowledge and improving it.

Another priority – secondary

- Overcoming variability in teaching quality:
 - The best teaching builds concepts from first principles, develops reasoning (through discussion, questioning, and careful choice of tasks/exercises), and provides challenge through depth and complexity.
 - The weaker teaching continues to teach methods like recipes, and lacks attention to reasoning and problem solving.

Back to the question ...

... in your school/your class(es), what challenges do you face and/or worries do you have?

Discuss!



Challenges/worries



- Subject expertise:
 - 'new' mathematics content; new teaching approaches
 - the NC aims: how to teach reasoning, problem solving for all/the 'rapid graspers'; the meaning of fluency
- Expectations and progression:
 - gaps between where pupils are now and the GCSE spec or programme of study they are learning/due to learn
 - higher demand, especially for lower attainers and SEN
 - differentiation; challenge for the 'rapid graspers'
- Worries about demonstrating pupils' progress:
 - in lessons
 - for performance management/inspection

More challenges/worries

- Assessment without NC levels
- New national assessments
- Transition between: schools, key stages, one year to the next, one lesson to the next, one mathematical idea to the next, ...
- Staffing and CPD:
 - recruitment and retention of teachers and subject leaders
 - availability of local/in-school expert help ... the role of the Maths Hubs.

Ofsted and Mastery

A question for you ...

... what do you think inspectors expect to see in relation to mathematics teaching?

... would it be different where schools are teaching for mastery?

Discuss!



Ofsted expects ...



... teachers to use their subject and pedagogical expertise to provide high quality teaching and curricular experiences in order to secure the best possible learning and outcomes for their pupils.

- The points on the next slide are taken from the NCETM's paper on Mastery
www.ncetm.org.uk/public/files/19990433/Developing_mastery_in_mathematics_october_2014.pdf

The NC: a mastery curriculum



- An expectation that all pupils can and will achieve.
- The large majority of pupils progress through the curriculum content at the same pace. Differentiation emphasises deep knowledge and individual support/intervention.
- Teaching is underpinned by methodical curriculum design, with units of work that focus in depth on key topics. Lessons and resources are crafted carefully to foster deep conceptual and procedural knowledge.
- Practice and consolidation play a central role. Well-designed variation builds fluency and understanding of underlying mathematical concepts in tandem.
- Teachers use precise questioning to check conceptual and procedural knowledge. They assess in lessons to identify who requires intervention so that all pupils keep up.

The NC: a mastery curriculum



- A mastery curriculum often involves whole-class teaching, with all pupils being taught the same concepts at the same time. Small-group work typically involves challenge through greater depth for the 'rapid graspers' and support with grasping concepts and methods for pupils who have more difficulty.
- 'Intelligent practice' through tasks and exercises usually concentrates on the same topic/method/concept but varies in how the questions are presented, often in ways that expose the underlying concept or mathematical structure, and makes pupils think deeply for themselves.

Challenge through depth

3. What is the value of $\frac{12\ 345}{1 + 2 + 3 + 4 + 5}$?

A 1

B 8

C 678

D 823

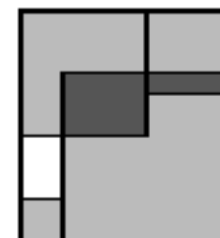
E 12 359

5. The difference between $\frac{1}{3}$ of a certain number and $\frac{1}{4}$ of the same number is 3. What is that number?

23. The diagram shows four shaded glass squares, with areas 1 cm^2 , 4 cm^2 ,

9 cm^2 and 16 cm^2 , placed in the corners of a rectangle. The largest square overlaps two others. The area of the region inside the rectangle but not covered by any square (shown unshaded) is 1.5 cm^2 .

What is the area of the region where squares overlap (shown dark grey)?



Changes to the inspection of teaching



- From September 2015, inspectors have judged teaching, learning and assessment together for the whole school, thereby linking the impact of teaching and assessment with pupils' learning.

What Ofsted says on inspecting maths



- Look at the extract on inspecting the impact of the teaching of mathematics, taken from the School Inspection Handbook.
- With a partner, consider which points might align with high quality teaching and learning in mathematics at your school. Are any points in conflict with the characteristics of mastery?
- The grade descriptor for good quality teaching, learning and assessment in schools is provided for reference.

Myth-busting ...



- Ofsted does not have a preference for particular teaching styles, assessment systems, or ways of planning the curriculum.
- Guidance on these and other aspects can be found at:
<https://www.gov.uk/government/publications/school-inspection-handbook-from-september-2015/ofsted-inspections-mythbusting>

Twitter chat – 18 June #ofstedmaths



Some questions/topics we were asked about:

- training of inspectors
- next-steps marking
- setting, or not
- differentiation within mastery; differentiation at 3 levels?
- pupils' progress when problem solving
- recording oral interactions
- work in/not in pupils' books

Twitter chat – 18 June #ofstedmaths



Bruno Reddy's summary:

Ofsted doesn't have a preferred lesson style, marking approach, differentiation approach, pupil grouping arrangement, textbook, lesson activity, assessment system or curriculum. So long as you can evidence how your school's choices on all of these impacts your students' learning, there is no need to "do it for Ofsted".

<http://mrreddy.com/blog/2015/06/ofstedmaths-roundup/>

Good practice in teachers' marking



- Concentrates on important mathematical aspects, such as misconceptions and recurring errors. Prompts/comments help pupils to see where they have gone wrong, point the way forward, enable pupils to think again and self-correct.
- Includes use of 'what if ...?' and/or 'try this ...' as ways to challenge pupils and/or check they understand.
- Is manageable as well as useful. Careful selection of work set in lessons and for homework can support teachers' better assessment of what pupils understand and can do.
- Might contribute to whole-school literacy through emphasis on mathematical reasoning, correct mathematical presentation and accurate use of mathematical language/symbols.

A Pi day Sudoku puzzle for you

<https://www.pinterest.com/k8ekakes/pi-day/>

3			1	5	4			1		9	5
	1			3					1	3	6
		4			3		8			2	
5			1			9	2	5			1
	9			5			5				
5	8	1			9		3			6	
	5		8			2			5	5	3
				5			6			1	
2			5	1	5			5			9
	6			4		1			3		
1	5	1					5			5	
5	5		4			3	1	6			8

- Each row, column and block of 12 cells contains the first 12 digits of pi, rather than the usual 1-9.

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