HEP Maths Subject Network session

24.05.2022

Agenda

- ► Welcome and introductions

- ► Supporting SEN children

- ► Developing other teachers' subject knowledge around mastery approaches

- ► Ofsted updates: questions from a deep dive

- ► Subject resources

- ► Next meeting focus and evaluation

SEN

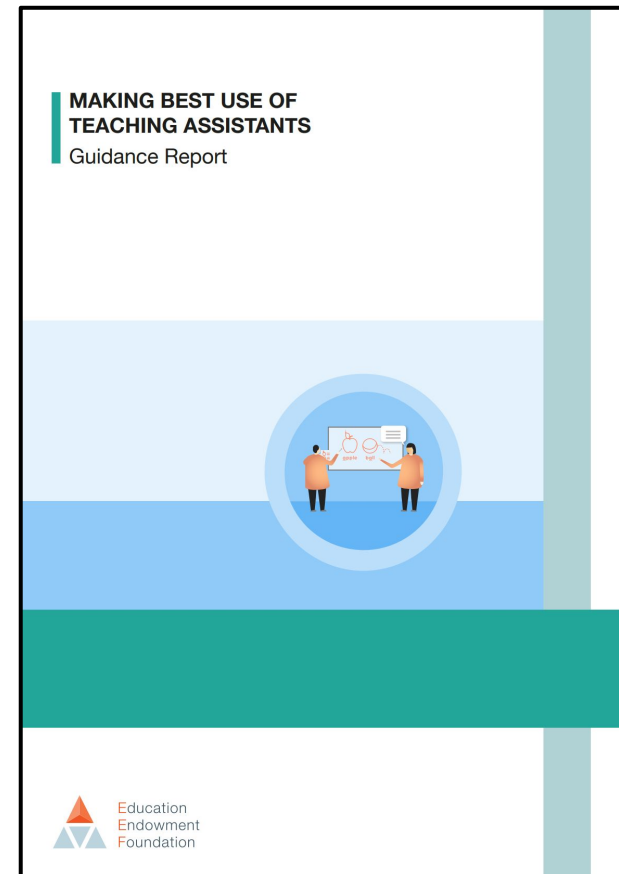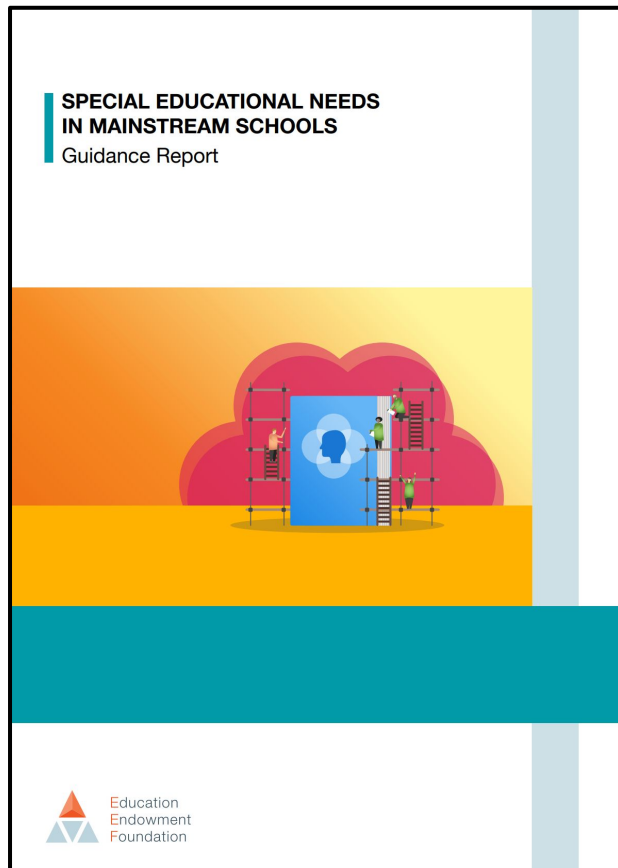- What is working well for your children with SEN?

Primary Mathematics Guidance

How to support children with SEN

Lessons should be planned to address potential areas of difficulty and to remove barriers to pupil achievement. In many cases, such planning will mean that pupils with SEN and disabilities will be able to study the full national curriculum. The guidance in this document will support planning for all SEND pupils by highlighting the most important concepts within the national curriculum so that teaching and targeted support can be weighted towards these.

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Using the Non-Statutory Guidance to support tiered provision in maths
Helpful materials to use:

SPECIAL EDUCATIONAL NEEDS IN MAINSTREAM SCHOOLS
Guidance Report
Education Endowment Foundation

MAKING BEST USE OF TEACHING ASSISTANTS
Guidance Report
Education Endowment Foundation

A tiered approach to Maths provision

Tier 3: Individualised provision. A small minority of pupils. Use the Ready to Progress criteria from earlier year groups. This will be determined by assessments.

Tier 2: Targeted small group support. Some children. Year group Ready to Progress criteria

Tier 1: Inclusive quality first teaching Most children or some children. Year group Ready To Progress criteria

Tier 3

Tier 2

Tier 1

Source: Buffum et al., 2012.

FIGURE I.1: Traditional RTI pyramid.

Click below for the Ready to Progress criteria

Ready to Progress criteria

Quality first teaching

SEN Code of Practice

'High quality teaching, differentiated for individual pupils, is the starting point in responding to pupils who have or may have SEN.

Additional intervention and SEN support **cannot compensate for a lack of good quality teaching**.'

Quality first teaching

Good teaching is the most important lever schools have to improve outcomes for disadvantaged pupils. Using the Pupil Premium to improve teaching quality benefits all students and has a particularly positive effect on children eligible for the Pupil Premium.

The EEF Guide to Pupil Premium

Quality first teaching : access strategies

What access strategies does the non-statutory guidance provide guidance on?

- Coherence

- Manipulatives and representations

- Language structures

The benefits of these are not restricted to children at risk of falling behind peers. They also allow other children to understand the maths more deeply than they may otherwise have done.

Quality first teaching: cohesion

Making Connections

'Making connections' features discuss important connections between ready-to-progress criteria within a year group. The example below describes how division with remainders is connected to multiplication and fractions criteria.

Making connections

Pupils must have automatic recall of multiplication facts and related division facts, and be able to recognise multiples (**4NF–1**) before they can solve division problems with remainders. For example, to calculate $55 \div 7$, pupils need to be able to identify the largest multiple of 7 that is less than 55 (in this case 49). They must then recall how many sevens there are in 49, and calculate the remainder.

Converting improper fractions to mixed numbers (**4F–2**) relies on solving division problems with remainders. For example, converting $\frac{19}{6}$ to a mixed number depends on the calculation $19 \div 6 = 3 \text{ r } 1$.

Quality first teaching: Manipulatives and representations

Representations of the mathematics

A core set of representations have been selected to expose important mathematical structures and ideas, and make them accessible to pupils. Consistent use of the same representations across year groups help to connect prior learning to new learning. The example below demonstrates the use of tens frames and counters extended from year 1, where each counter represents 1 and a filled frame represents 10, to year 4 where each counter represents 100 a filled frame represents 1,000.
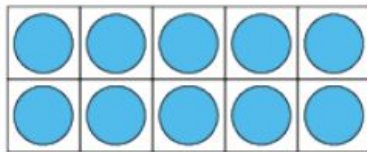
Figure 1: using a tens frame and counters

Figure 2: using a tens frame and counters

Quality first teaching: language structures

Language structures

The development and use of precise and accurate language in mathematics is important, so the guidance includes 'Language focus' features. These provide suggested sentence structures for pupils to use to capture, connect and apply important mathematical ideas. Once pupils have learnt to use a core sentence structure, they should be able to adapt and reason with it to apply their understanding in new contexts.

Language focus

"8 plus 6 is equal to 14, so 8 hundreds plus 6 hundreds is equal to 14 hundreds."
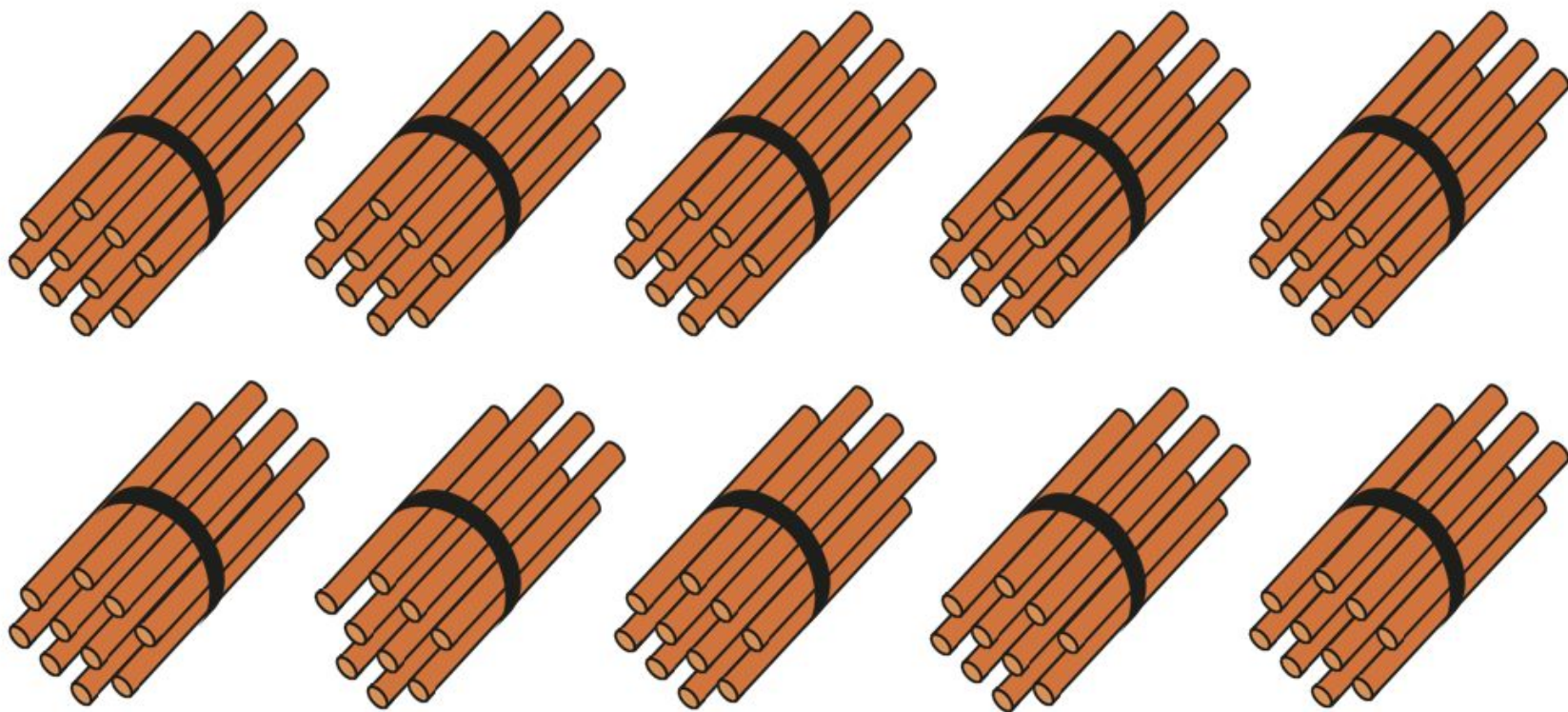
"14 hundreds is equal to 1,400."

Targeted small group support

Teacher/TA led intervention

- 2-3 times per week.

- 20 minutes

- Pre teaching ideal

- Tied to what is being learnt in class

- Using same models, images and language as whole class teaching

- The powerpoints provide a backbone. Use corresponding concrete manipulatives with them.

https://www.ncetm.org.uk/classroom-resources/exemplification-of-ready-to-progress-criteria/

1NPV-1 Count forwards and backwards within 100

- Can you count in ones between 1 and 100, both forwards and backwards?

- Can you start your count from different numbers?

- Can you say the number of straws each time a bundle is tied up? Louder!

- Are you saying the 'teen numbers' clearly?

- Can you say the count in two ways?

- Begin by using real straws to count and bundle together in groups of 10.

Seven, eight, nine, ten, eleven, twelve… twenty, twenty-one, twenty-two…
Seven, eight, nine, ten, one-ten, one-ten-one, one-ten-two… two-tens, two-tens-one, two-tens-two…

Individualised provision

- For pupils who, even with inclusive quality first teaching and targeted small group support, are not able to access the year group curriculum

- Driven by fine grained assessment, starting the 'assess, plan, do, review' cycle

- Focused entirely on securing the RtP criteria from the child's starting point

- Planned and reviewed by teacher, LSA led

- The RtP criterion being taught is the child's ITP/LP target
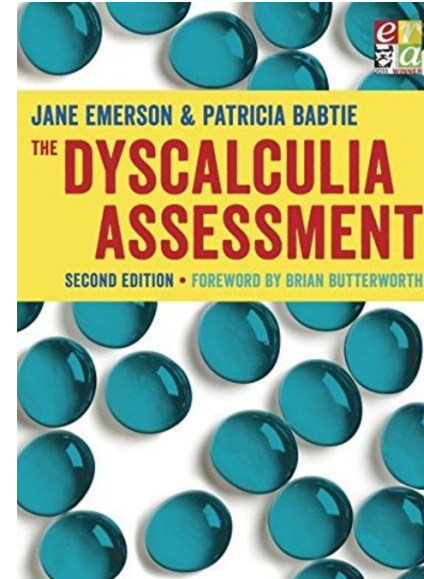
Individualised assessment:

3NF–3 Example assessment questions

1. A garden table costs £80 and 2 garden chairs each cost £60. How much do the 2 chairs and the table cost altogether?

2. 130 people are expected at a concert. So far 70 people have arrived. How many more people are due to arrive?

3. A family ticket for a safari park is £40. 3 families go together. How much do the 3 family tickets cost altogether?

4. Fill in the missing numbers.

   $30 + \boxed{} = 110$ $7 \times 60 = \boxed{}$

JANE EMERSON & PATRICIA BABTIE

THE **DYSCALCULIA ASSESSMENT**

SECOND EDITION • FOREWORD BY BRIAN BUTTERWORTH

Guidance provides example questions suitable for assessing most children

Supports fine grained assessment for children following individualised curriculum

Individualised provision

1NPV1 Count within 100, forwards and backwards, starting with any number.

4 can do fluently   3 can do correctly with some effort   2 can do correctly with lots of effort   1 can't always do correctly yet   0 not starting

	Wk1	Wk2	Wk3	Wk4	Wk5	Wk6	Wk7
a) Count forwards in ones to 25	3	4					
b) Count forwards in ones to 100	2	3 Noticeably less effort to bridge 10s					
c) Say one more than any number (except a number with 9 ones)	0	1 Can do if start with what is one more than 7? What is one more than 37?					
d) Say ten more than a multiple of 10 (you say 70, pupil says 80) (1NF2 link)	1 Quite often needs bundles of straws for support – laid out 5s wise pattern	3					
e) Say one more than a number with 9 ones (you say 79, they say 80)	1	3					
f) Count backwards in ones from 25	1	2					
g) Count backwards in ones from 100	0 Kept reverting to forwards, 48, 47, 46, 47, 48, 49	1 Didn't go forward, could bridge some tens					
h) Say one less than any number (except a multiple of 10)	0	1 Can do if start with what is one less than 7? What is one less than 37?					
i) Say ten less than a multiple of 10 (you say 70, pupil says 60) (1NF2 link)	1 Quite often needs bundles of straws for support – laid out 5s wise pattern	2					
j) Say one less than a multiple of 10 (you say 70, they say 69)	0	1 Sometimes says the same 10, 60, 69 not 60, 59 but starting to s.c.					

Y1 RtP criterion broken down into small steps for Y4 pupil

All individualised teaching focused on this one criterion, which is her Learning Passport target

Easy to see progress and plan new teaching activities

Teaching followed by independent practice of steps in this target, and of previously mastered targets

Individualised provision

xx maths – Term 2 Week 2

	Day 1	Day 2	Day 3	Day 4
Counting	Continue daily prac of counting back from 100, with 100 square available for support as needed. Practise counting back from any number to 100 (just saying first 4 or 5 numbers to check xxx can start from numbers other than 100, e.g. you say 68, she says 67, 66, 65, 64. Then stop her and give another number to count back from. Great job on this one overall! (This is RtP **1NPV-1 Count within 100, forwards and backwards, starting with any number.**)			
Counting notes:				
Main teaching	Start **1NPV-2 Reason about the location of numbers to 20 within the linear number system, including comparing using < > and =.** Will quite quickly move onto **2NPV-1 Reason about the location of any two-digit number in the linear number system, including identifying the previous and next multiple of 10.** Assessment showed xxx was confident with marked but unlabelled 0 – 20 number lines. Use yellow laminated no line to continue practice on this. Now teaching her to use unmarked number lines to estimate numbers. Use two 10cm lengths of card to estimate length of items (as shown in guidance) then measure with a ruler to check. Write simple table in xxx's book for her to estimate (with unmarked 10 cm strips) then measure (with a ruler) length of small items with as ind work (just need a selection of these in a basket for next couple of weeks).			
Main teaching notes:				

Teacher reviews weekly against fine grained tracking sheet

Very simple teaching plan for following week then written

LSA fills in daily notes (handwritten)

LSA uses the guidance for that single RtP criterion to get 'big picture'

Fine grained tracking sheet (previous page) guides LSA in progression

Standard 1

The pupil can:

- demonstrate an understanding of the concept of transaction (e.g. by exchanging a coin for an item, or one item for another, during a role-play activity)
- distinguish between 'one' and 'lots', when shown an example of a single object and a group of objects
- demonstrate an understanding of the concept of 1:1 correspondence (e.g. giving one cup to each pupil).

Standard 2

The pupil can:

- identify the big or small object from a selection of two
- sort objects according to a stated characteristic (e.g. group all the small balls together, sort the shapes into triangles and circles)
- say the number names to 5 in the correct order (e.g. in a song or by joining in with the teacher)
- demonstrate an understanding of the concept of numbers up to 5 by putting together the right number of objects when asked
- copy and continue simple patterns using real-life materials (e.g. apple, orange, apple, orange, etc.).

Standard 3

The pupil can:

- identify how many objects there are in a group of up to 10 objects, recognising smaller groups on sight and counting the objects in larger groups up to 10
- demonstrate an understanding that the last number counted represents the total number of the count
- use real-life materials (e.g. apples or crayons) to add and subtract 1 from a group of objects and indicate how many are now present
- copy and continue more advanced patterns using real-life materials (e.g. apple, apple, orange, apple, apple, orange, etc.).

Standard 4

The pupil can:

- read and write numbers in numerals from 0 to 9
- demonstrate an understanding of the mathematical symbols of add, subtract and equal to
- solve number problems involving the addition and subtraction of single-digit numbers up to 10
- demonstrate an understanding of the composition of numbers to 5 and a developing ability to recall number bonds to and within 5 (e.g. 2 + 2 = 4 and 3 + 1 = 4)
- demonstrate an understanding of the commutative law (e.g. 3 + 2 = 5, therefore 2 + 3 = 5)
- demonstrate an understanding of inverse relationships involving addition and subtraction (e.g. if 3 + 2 = 5, then 5 − 2 = 3)
- demonstrate an understanding that the total number of objects changes when objects are added or taken away
- demonstrate an understanding that the number of objects remains the same when they are rearranged, providing nothing has been added or taken away
- count to 20, demonstrating that the next number in the count is one more and the previous number is one less
- recognise some common 2-D shapes.

► https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/903457/2021_Pre-key_stage_1_-_pupils_working_below_the_national_curriculum_assessment_standard_PDFA.pdf

Individualised provision: the vision

Fine grained tracking sheet for each criterion to support assess, plan, do, review cycle

Bank of independent consolidation worksheets

Bank of teaching activities and supporting resources

Linked online practice and consolidation (numbergym or other)

Tiered provision: Prompts for leaders

What are pupils missing by spending time away from the class?

How does a pupil's experience in an intervention relate to whole-class teaching?

Is this the right intervention for the pupil?

Can we provide the support required for our staff to deliver the intervention well?

Are we able to dedicate the time and resources required to implement the intervention well?

Source: Special Educational Needs in the Mainstream School, from Recommendation 4 (EEF)

Tiered provision: Prompts for leaders

5. Use TAs to deliver high quality one-to-one and small group support using structured interventions

6. Adopt evidence based interventions to support TAs in their small group and one-to-one instruction

7. Ensure explicit connections are made between learning from everyday classroom teaching and structured interventions.

Source: Making Best Use of Teaching Assistants (EEF)

MAKING BEST USE OF TEACHING ASSISTANTS
RECOMMENDATIONS SUMMARY

The effective use of TAs in delivering structured interventions out of class

Integrating learning from work led by teachers and TAs

5 Use TAs to deliver high quality one-to-one and small group support using structured interventions

Research on TAs delivering targeted interventions in one-to-one or small group settings shows a consistent impact on attainment of approximately three to four additional months' progress (effect size 0.2–0.3). Crucially, these positive effects are only observed when TAs work in structured settings with high quality support and training. When TAs are deployed in more informal, unsupported instructional roles, they can impact negatively on pupils' learning outcomes.

6 Adopt evidence-based interventions to support TAs in their small group and one-to-one instruction

Schools should use structured interventions with reliable evidence of effectiveness. There are presently only a handful of programmes in the UK for which there is a secure evidence base, so if schools are using programmes that are 'unproven', they should try and replicate some common elements of effective interventions:

- Sessions are often brief
- (20–50mins), occur regularly (3–5 times per week) and are maintained over a sustained period (8–20 weeks). Careful timetabling is in place to enable this consistent delivery
- TAs receive extensive training from experienced trainers and/or teachers (5–30 hours per intervention)
- The intervention has structured supporting resources and lesson plans, with clear objectives
- TAs closely follow the plan and structure of the intervention
- Assessments are used to identify appropriate pupils, guide areas for focus and track pupil progress. Effective interventions ensure the right support is being provided to the right child
- Connections are made between the out-of-class learning in the intervention and classroom teaching (see Rec 7).

7 Ensure explicit connections are made between learning from everyday classroom teaching structured interventions

Interventions are often quite separate from classroom activities. Lack of time for teachers and TAs to liaise allows relatively little connection between what pupils experience in, and away, from the classroom. The key is to ensure that learning in interventions is consistent with, and extends, work inside the classroom and that pupils understand the links between them. It should not be assumed that pupils can consistently identify and make sense of these links on their own.

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Suggested strategies for adding scaffolding to tasks

► These can be used as a starting point. They are not an exhaustive list.

| Strategy	Explanation
Partially completed examples	This could be the completion of a small number of examples to act as a model or reduce the demand of the task.
Adding representations that support conceptual understanding	For tasks which require pupils to connect concrete manipulatives with abstract numerals, pictorial representations can be a supportive intermediate step. By giving children a choice of pictorial representations, you narrow down the number of options and support pupils' conceptual understanding.
Reducing number of examples	It is important to ensure that pupils complete enough examples to have had adequate practice and consolidation; however, some pupils work at slower pace and will be overwhelmed if presented with too many questions.
Providing additional information that supports independent completion of tasks	For example, providing a brief glossary of key mathematical vocabulary or images linking concrete representations used by the teacher and the abstract or pictorial representations used on the task sheet.
Providing a scaffold frame for pupils to record	For example: a blank table/partially completed table/equation frame.

► What might help children to start problems?

► •Start with simple language

► •Start with small numbers so that it is the *words* not the *maths*

► •Use familiar situations that the children can identify with

► •Encourage them to explain to a friend what the problem is

What might help children to start problems?

- Visualise the problem
- Draw
- Make
- Act it out
- Suggesting organisation strategies –tables, colours, lay out, making notes.
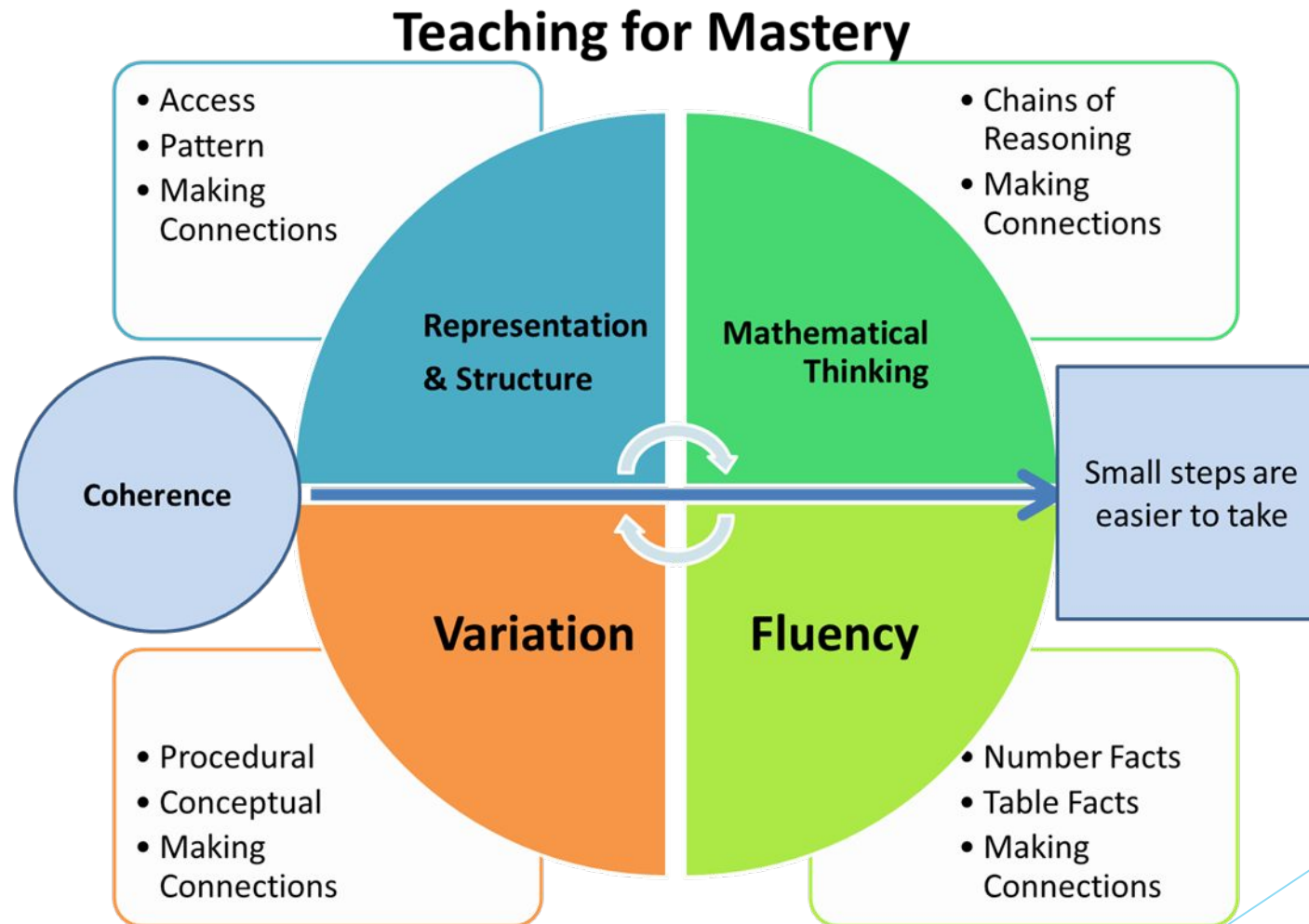- Modelling if necessary, but give children a chance to start it themselves first.

THE 'LOTS OF' MODEL

3 x 4 is the same as 4 + 4 + 4
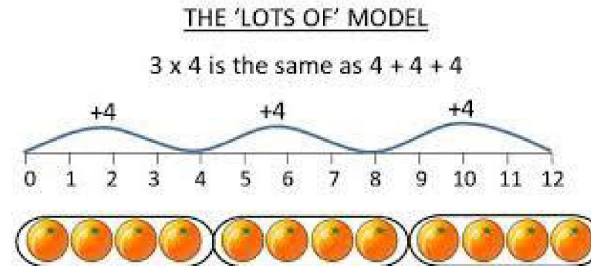
There are 83 girls and 76 boys in the third grade. How many total students are in the third grade?

83

girls

76

boys

} ?

83
+76
159

or

?

83   76
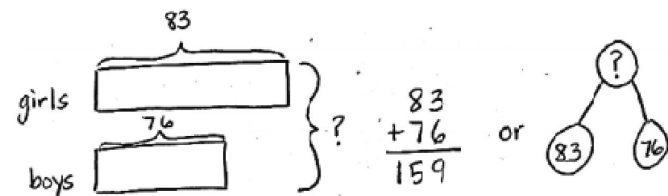
There are 159 students in third grade.

Developing subject knowledge of teachers

► What has worked well in your setting?

Teaching for Mastery

- Access
- Pattern
- Making Connections

- Chains of Reasoning
- Making Connections

Representation & Structure

Mathematical Thinking

Coherence

Small steps are easier to take

Variation

Fluency

- Procedural
- Conceptual
- Making Connections

- Number Facts
- Table Facts
- Making Connections

Representation and structure

Key Messages
1. The representation needs to clearly show the concept being taught, and in particular the key difficulty point. **It exposes the structure.**
2. In the end, the **students need to be able to do the maths without the representation.**
3. A stem sentence describes the representation and helps the students move to working in the abstract ("ten tenths is equivalent to one whole") and could be seen as a representation in itself.
4. There will be some key representations which the students will meet time and again.
5. **Pattern and structure are related but different**: students may have seen a pattern without understanding the structure which causes that pattern.

Big Idea: Coherence

Key Messages

1. Small steps are easier to take.
2. **Focusing on one key point each lesson** allows for deep and sustainable learning.
3. Certain images, techniques and concepts are **important pre-cursors** to later ideas. Getting the sequencing of these right is an important skill in planning and teaching for mastery.
4. When introducing new ideas, it is important to make connections with earlier ones that have already been understood.
5. When something has been deeply understood and mastered, it can and should be **used in the next steps of learning.**

Meaningful learning

When a new concept is encountered, in order for learning to take place, one of two things must happen:

Either

- The new idea is connected to and incorporated into the learner's existing framework of knowledge (assimilation)

Or

- Existing knowledge structures must be extended/reorganised (accommodation).

What this means for coherence

There are implications for curriculum design (macro) and lesson design (micro).

It is the teacher's role to plan and structure learning experiences and to help the student in conceptual organisation and reorganisation.

It is the student who must do the conceptualising!

Big Idea: Mathematical Thinking

Key Messages

1. Mathematical thinking is central to deep and sustainable learning of mathematics.

2. Taught ideas that are understood deeply are **not just 'received' passively but worked on by the student**. They need to be thought about, reasoned with and discussed.

3. Mathematical thinking involves
    a. looking for **pattern** in order to discern **structure**
    b. looking for **relationships** and **connecting ideas**
    c. **reasoning logically**, **explaining**, **conjecturing** and **proving**.

Big Idea: Fluency

► **Key Messages**

1. **Fluency demands more of students than memorisation** of a single procedure or collection of facts. It encompasses **a mixture of efficiency, accuracy and flexibility**.

2. Quick and efficient recall of facts and procedures is important in order for students to keep track of sub-problems, think strategically and solve problems.

3. Fluency also demands the **flexibility to move between different contexts and representations of mathematics**, to recognise relationships and make connections, and to make appropriate choices from a whole toolkit of methods, strategies and approaches

What do we mean by "*efficiency, accuracy and flexibility*"?

- ► Efficiency – using an appropriate strategy or algorithm (with speed)

- ► Accuracy – finding correct solutions

- ► Flexibility – adapting strategy and transferring across contexts

- ► (Adapted from Bay-William and Stokes-Levine, 2017)

Variation

Key Messages

1. The central idea of teaching with variation is to **highlight the essential features of a concept or idea** through varying the non-essential features.

2. **Variation is not the same as variety** – careful attention needs to be paid to what aspects are being varied (and what is not being varied) and for what purpose.

3. When giving examples of a mathematical concept, it is useful to add variation to emphasise

   a) **What it is (both standard and non-standard examples**)

   b) **What it is not**.

4. When constructing a set of activities or questions it is important to consider what connects the examples; what mathematical structures are being highlighted? Students are encouraged to avoid mechanical practice and, instead, **to practise the thinking process (intelligent practice).**

Variation

- "Variation helps us to better focus student attention. Awareness, has a structure to it. By this we mean that the amount of sensory data that we are subject to cannot all be dealt with at once; some things have to be to the foreground of our awareness, others will not. We must try and help learners focus their awareness on critical features."

- Askew (2011)

Variation

✔ Strategically varies one thing at a time so that the underlying structure of the concept is exposed

✔ Prompt students to attend to the variation by asking 'What is the same and what is different?'

✔ May appear easy

✔ Not variety (Exercise A is variety)

Variation

This could be used as a starter for staff training.

Variation Theory in Practice

Set A	Set B
120 – 90	120 – 90
235 – 180	122 – 92
502 – 367	119 – 89
122 – 92	235 – 180
119 – 89	237 – 182
237 – 182	502 – 367

Compare the two sets of calculations below. What is the same, what is different?

Variation

Frequent practice like in Set B helps patterns to become ingrained. Students will be able to see that question B2 is very similar to B1 and hence reduce the need to calculate formally.

Students are explicitly taught to investigate questions like 34 + 78 + 66 to see that by changing the question it becomes 34+66+78 = 100 + 78 = 178.

These flexible mental strategies are practised and become second nature to students.

What area is your focus going forward?

PD materials

► https://www.ncetm.org.uk/teaching-for-mastery/mastery-materials/primary-mastery-professional-development/
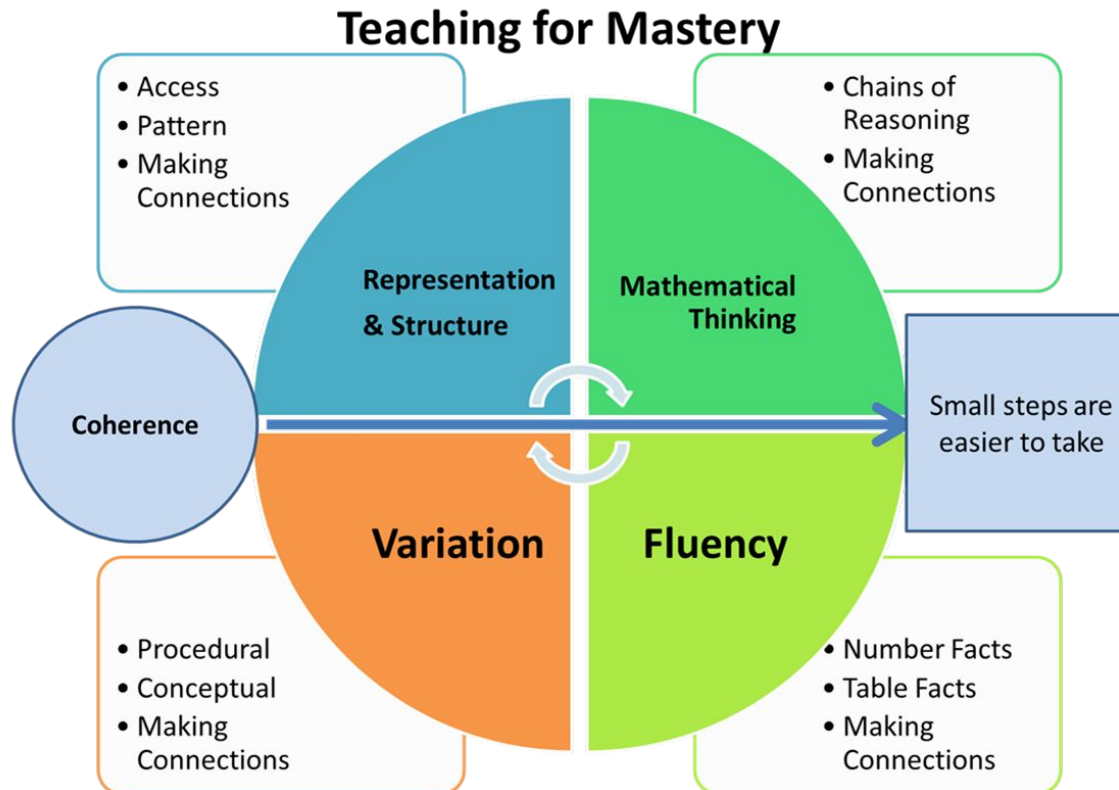
We've split the curriculum up into a small number of areas – we call these 'spines' –

Spine 1: Number, Addition and Subtraction,

Spine 2: Multiplication and Division and

Spine 3: Fractions.

Ofsted

- **Ofsted blog – What to expect on a deep dive**

- https://educationinspection.blog.gov.uk/2022/02/02/what-to-expect-on-a-primary-deep-dive-some-guidance-for-subject-leaders/

- Has anyone had Ofsted recently and would like to share?

Deep dive in Mathematics Subject leader questions

- How long have you been maths lead?

- What training have you had to support you in leading a subject? (asked to all subject leaders)

- What CPD have you received and how has that impacted staff and pupils?

- What scheme of learning do you use and why have you chosen it?

- How do you adapt your scheme to meet the needs of your pupils?

- Thinking of one particular area of maths, what are the end points for each year group and how do you ensure they have met them before moving on?

- How do you assess children's prior learning and what do you do to support children who have gaps in their learning?

- How are SEND children supported in Mathematics?

- How do you exploit mathematics across the whole curriculum?

- What further opportunities for enrichment do you have?

- What has your CPD focus been and how will I see its impact?

- What priorities have you identified for future development and why?

- How do you ensure that early career teachers are supported?

Lesson observations

► The inspector wanted to observe classes from across the age range. We observed EYFS, Year 2, 4 and 6. We remained in each lesson for around 15 minutes. During the lesson he particularly focused on looking for evidence to support what I had told him.

► He was particularly challenging about where the children were in relation to the end points discussed, and on how SEND children were supported within the lesson. He also looked for evidence that proved that the teachers were checking prior learning and that the children were using appropriate mathematical vocabulary as that was an area of CPD that I have recently given.

Books scrutiny

- Books were looked at from the classes we had observed. The inspector focussed mainly on the books from SEND or lower ability children, comparing the with books of children working at age related.

- He also looked for gaps in the dates on the work, asking me why there were gaps (COVID related) and what we had done to ensure that the child was able to catch up on missed learning. He wanted to see the evidence that we had done this.

Pupil Interviews

The inspector spoke to four children from each of the classes observed with the exception of EYFS.

The subject leader was asked to leave

Children told me he had asked him what new mathematical vocabulary they had learnt today, and what 0.3333333333333 is as a fraction (Year 6).

He also asked the Year 2 children some doubles questions as they had been working on 2x table.

Staff interviews

The deep dive concluded with the inspector talking to the teachers of the classes observed, again without me present.

He spoke to them about how they felt their lesson went, where the learning fitted in with prior and future learning and what the end goal for their year group is.

He asked why they taught what they taught and how they know whether children achieved the lesson objective.

He then went on to discuss staff well-being and safe guarding etc.

Subject resources

What is working well?

- https://jamboard.google.com/d/11kB_nfX277-fMUdVSZldn0AHWq3ImOGbxeDL_Lvr-ac/viewer?f=0

Subject resources

► <u>Variation</u>

Craig Barton <u>https://variationtheory.com/</u>

► <u>Questions to support variation</u>

- Can you find other ways to get the same answer?
- What's the same?
- What's different?
- What changes?
- What stays the same if I change ....?
- If I change, ... how does .... change?
- What is/What is not ....?
- Put your calculation in another context?
- If I know ...., what else do I know?
- Can you vary the words of the problem but it the calculation stays the same?
- What does this word mean/not mean? Can you draw/write examples and non-examples of this word? (Frayer Model)
- Can you use another resource to show ....?
- Can you give me an example of ...? And another?

Conceptual variation

Number Sense Maths

Assessment

► What is working well in your setting?

► Pre-requisite tests before teaching each unit.

► Use the RtP criteria to identify what children know.

► Maths meetings

- pre-teaching, focus on areas that children are needing further support with.

Introducing multiplicative thinking

- https://www.ncetm.org.uk/features/introducing-multiplicative-thinking/

Evaluation

- https://www.hounsloweducationpartnership.co.uk/survey/primary-subject-network-evaluation-3/

- Thank-you for your contributions.