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# Taking Ownership of Your Maths Curriculum *the role of research in moving us away from 'Stepford' teaching*

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Caught up in an overly prescriptive curriculum,



# Overly Prescriptive Curriculum

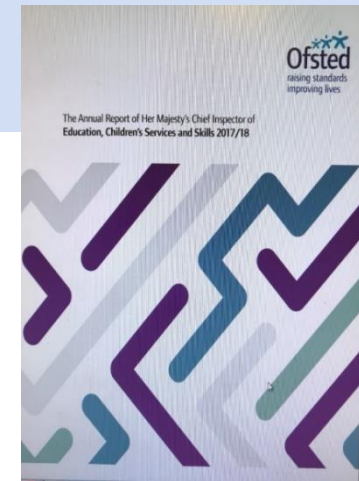
our talented teachers can sometimes lose sight of what they are doing, and why. Teachers need to be able to talk with confidence about their mathematics policy and guidelines and to shape the design of their curriculum by engaging in their own pedagogical research and that of others. Going forward, we need to invest in our teachers to give them the time and the ability to do this. Professor Jenny Field has spent many years engaged in research driven curriculum design and development. In this session, she will share some of these findings and best practice on the way forward.



# Delivery

- Focus on Deep Understanding and Mastery
- Research Driven
- Focus on conceptual understanding, leading to automaticity
- Advocates progression and consistency across the school
- Supports schools in taking control of their own curriculum

New Ofsted Inspection Framework (2019):  
more focus on research based curriculum design



*'Nine-year-olds should recite times tables by heart ...  
with an emphasis on memorising'*

Schools Minister Nick Gibb



National curriculum assessments

**Key stage 2**

Multiplication tables check  
assessment framework



Oh no ...  
not more  
'individually timed'  
maths tests

...more anxiety  
and an increase in  
negative attitudes?

Schools might  
focus on rote  
learning without  
understanding



*'Nine-year-olds should recite times tables by heart ... with an emphasis on memorising' (2014)*

Schools Minister Nick Gibb



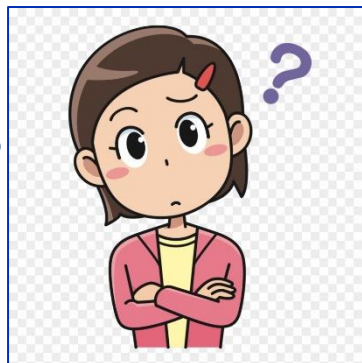
1. Not more *'timed'* maths tests...even worse... *'individually timed'* questions!

National curriculum assessments

Key stage 2

Multiplication tables check assessment framework

My Initial Thoughts



3. Schools might focus on rote learning without understanding

2. Could I get 25/25 with 6 seconds per questions??

5. SCHOOLS NEED MORE SUPPORT

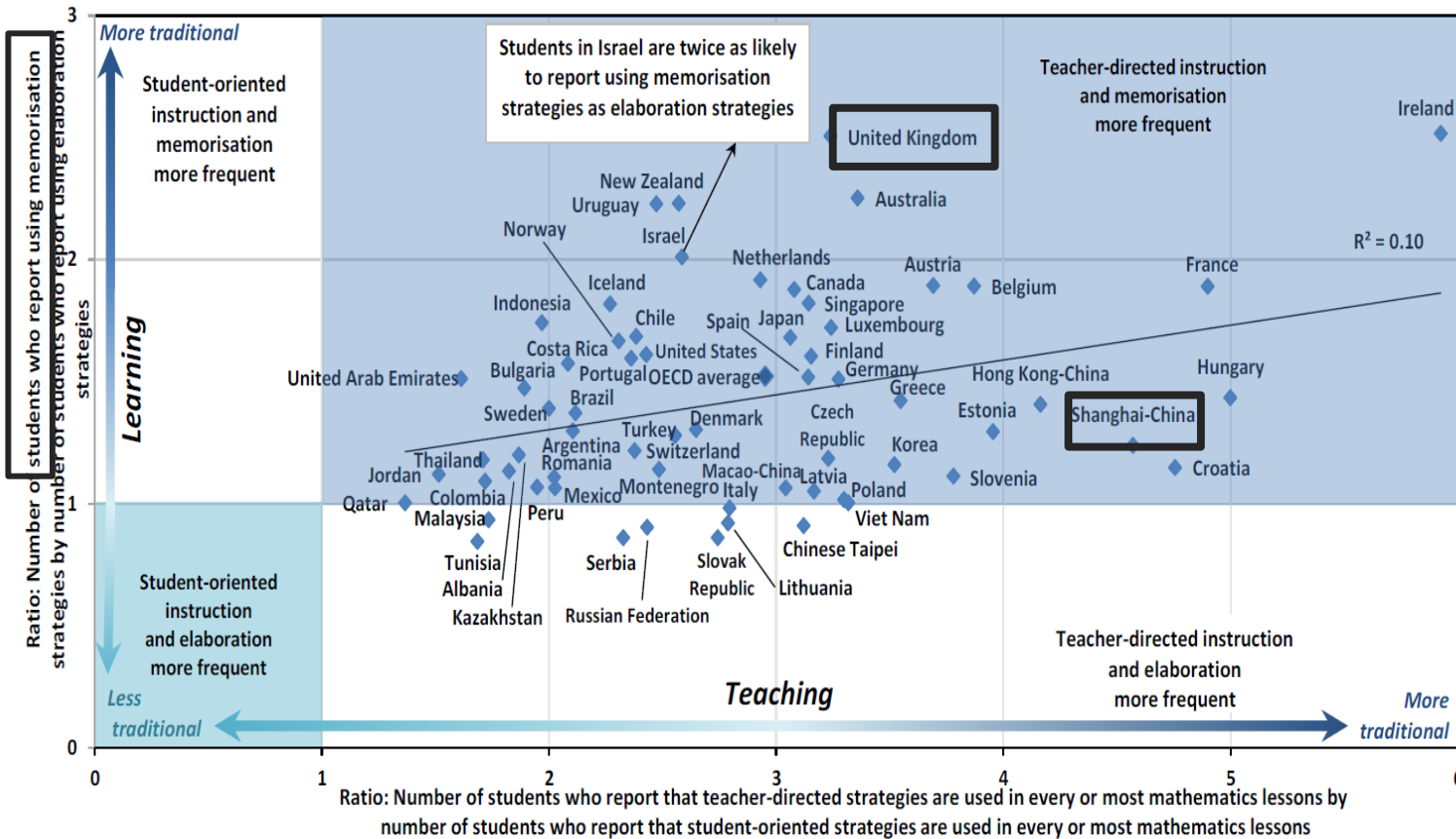
4. This will cause more anxiety an increase negative attitudes?



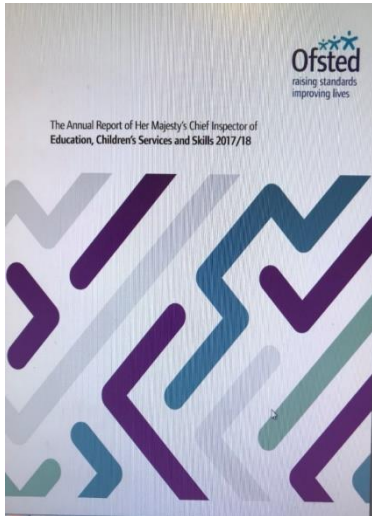
# Recent PISA research for mathematics highlighted that, of all the OECD countries (2019):



Figure 1.2. Traditional and modern mathematics teaching and learning



# New Ofsted Inspection Framework (2019): more focus on research based curriculum design



## *Curriculum knowledge and expertise (2017 Ofsted Annual Report)*

*'A striking conclusion that we have drawn from the findings is that, despite the fact that the curriculum is what is taught, there **is little debate or reflection about it** business of curriculum'*

## Taking ownership of our curriculum

I saw this project as an opportunity to give Maths Leads an opportunity to discuss and decide...  
shaping their own TTs Curriculum with its own clear rationales





That said, I believe Times Tables are an important tool, knowing *and understanding* them could ease cognitive overload, allow children to manipulate numbers and also get on to more interesting maths.

Do schools currently have a structured approach?

*'Frequently children arrive in upper KS2 with very poor knowledge of multiplication facts.'*

*Part of this may be due to ... the reticence of some teachers to dedicate time for the teaching and learning of these facts within school time.*

*Times tables are often viewed as the equivalent of spelling in Literacy – it is a homework task, to be supported by parents.'*

Richards, A. MA Primary Mathematics Journal 2015



<http://saimagesutaswa.blogspot.com/2015/10/free-images-elephant-in-room.html>

All that said ...

I do believe Times Tables (multiplication bonds) are an important tool. Knowing and *understanding* them (*fairly* quickly) could ease cognitive load, allow children to manipulate numbers and get on to more interesting maths.

Do schools have a structured approach?  
Have schools considered how they teach tables?

*'Frequently children arrive in upper KS2 with very poor knowledge of multiplication facts.'*

*Part of this may be due to ... the reticence of some teachers to dedicate time for the teaching and learning of these facts within school time.*

*Times tables are often viewed as the equivalent of spelling in Literacy – it is a homework task, to be supported by parents'*

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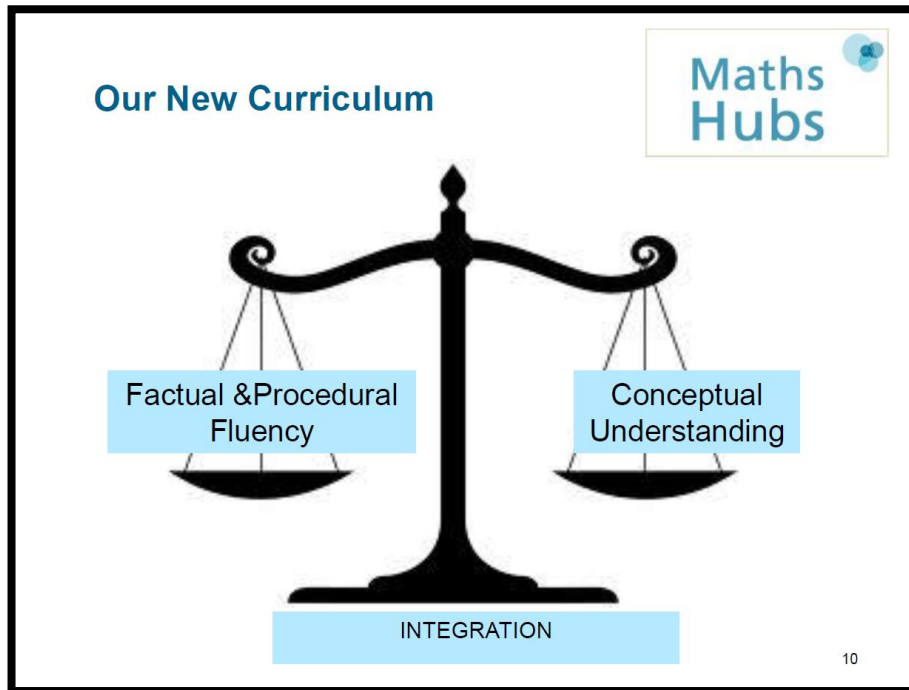
Yet over the years I have heard many teachers say in despair ... *'if only they knew their times tables!'*

# Aims of the NC for maths

1. Fluency
2. Reasoning
3. Problem Solving



Jane Jones HMI, Ofsted National Lead for Maths until 2018



Describes fluency as a *'blend of conceptual understanding and procedural flexibility'*

NCETM blog November 2014

## Year-Long Action Research Project

### Whole School Approaches to Teaching, Learning and Understanding Times Tables

Focus on a Consistent Approach across School

**Maths Leads** attend 4 half days over the year

**Gap Tasks:** Practical things to do in school between training

**Professional Log** completed before each session

**Moodle Direct:** A repository for all the materials and a support forum

Qualitative and Quantitative Data Gathered across the Year  
Certificate of Attendance

**So far 3 Cohorts**

**120 Maths Leads Across 5 Local Authorities and Large Academy Trusts**



# 8 WHOLE SCHOOL STEPS

## Step 1

Decide the order in which your school will teach times tables, which tables and why.

The National Curriculum

This is not well considered in this respect

MULTIPLICATION & DIVISION FACTS					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<i>count in multiples of twos, fives and tens</i> (copied from Number and Place Value)	<i>count in steps of 2, 3, and 5 from 0, and in tens from any number, forward or backward</i> (copied from Number and Place Value)	<i>count from 0 in multiples of 4, 8, 50 and 100</i> (copied from Number and Place Value)	<i>count in multiples of 6, 7, 9, 25 and 1000</i> (copied from Number and Place Value)	<i>count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000</i> (copied from Number and Place Value)	
	recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers	recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables	recall multiplication and division facts for multiplication tables up to $12 \times 12$		



## How I might plan it ...discuss

Focus on **ONE times table each half term** – with opportunities built in to also practise those learnt previously

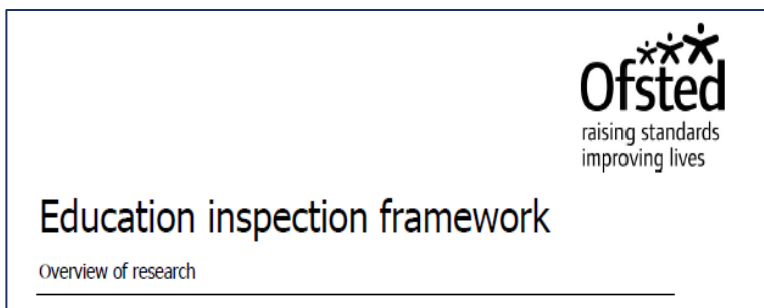
YEAR	First half term	Second half term	Third half term	Fourth half term	Fifth half term	Sixth half term
Year 1	Experience of counting in 1s, 2s, 5s, 10s					
Year 2	1x	(1x) 2x	5x	(5x) 10x	0x and revision	revision
Year 3	(2x) 4 x	(4x) 8 x	3x	(3x) 6x	(6x) 12x	revision
Year 4	9x	7x	11x	Squares	revision	Test: June

**Why a focus one TT per half term?** Plasticity of the brain

Neuroscientists tell us it takes approximately **8 weeks of repetition to make a new neural pathway with a myelin sheath** - making this 'go to' automated thinking!  
Then continued practice makes the sheath thicker

Inspection Framework (2019) has more focus on research-based curriculum design

As a school this TT Project gives you an opportunity to discuss and decide...  
shaping your own TTs maths curriculum with your own clear rationales



*'unintended consequences of school inspection ... narrowing the curriculum on test objectives and with discouraging teachers from experimenting with teaching strategies (Ehren et al, 2015; Jones et al, 2017)... which include lack of a shared language to discuss curriculum and poor implementation of school policies in classroom practice.'*

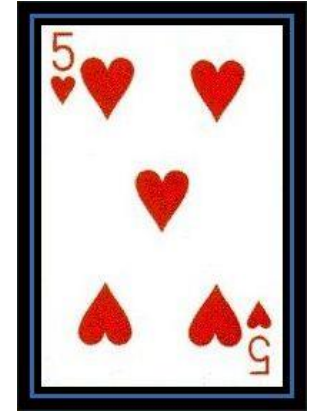
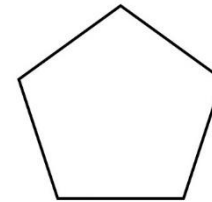
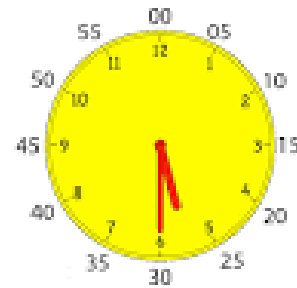
## **Curriculum Knowledge and Expertise** (2017 Ofsted Annual Report)

*'A striking conclusion that we have drawn from the findings is that, despite the fact that the curriculum is what is taught, there **is little debate or reflection about it**. School leaders and inspectors discussed the timetable in each school. The timetable is important. It is, however, not the curriculum.'*

*'There is limited evidence of a thoughtful approach to curriculum, which is often equated with the timetable and discussed in a generic fashion. Schools reported that few teachers are trained in curriculum development or theory.'*

# WHAT COMES IN 5s?

Make a class display for half a term of children's ideas, photos and resources



1. Conceptual understanding
2. Great source for word problems
3. Keep adding to it – focus on one table each month



## Step 5

### Highly important and happening alongside the other Steps

Regular retrieval practice to develop fluency (5-10 minutes 3-5 times a week)

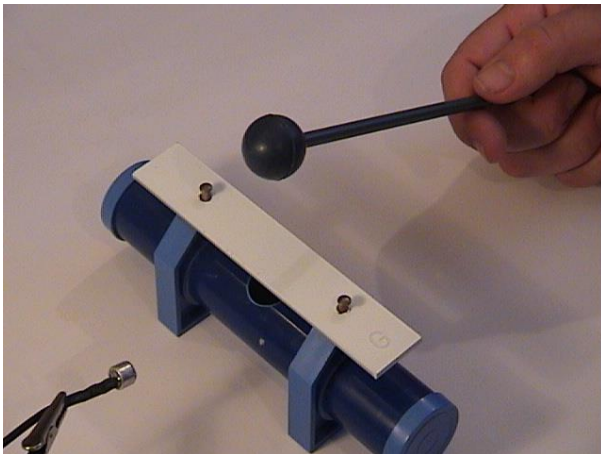
Provide teachers across school with a 'Bank of high quality activities for retrieval'

Include conceptual support (at least initially)

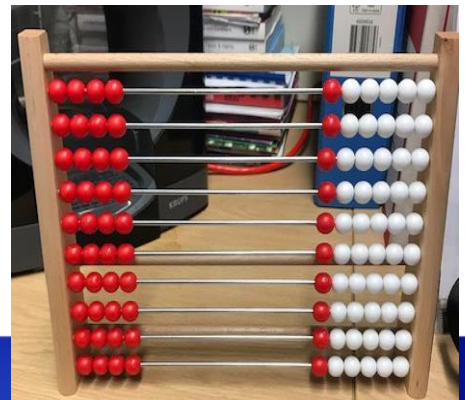
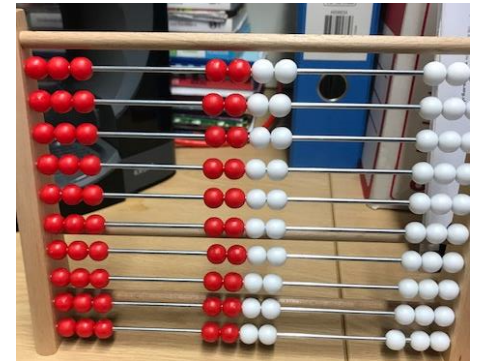
Include full verbal patterning (saying whole calculation) and also step counting

First in order then out of order

Build in tests but **NOT** as the main activity



What's the same?  
what's different?



## Step 7

Explore the many patterns within each new times table; repeating digits, reversing digits, addition of digits, divisibility and how each table relates to several others.

Couple of examples	× 1	0,1,2,3,4,5,6,7,8,9,0
	× 9	0,9,8,7,6,5,4,3,2,1,0
	× 2	0,2,4,6,8,0
	× 8	0,8,6,4,2,0
	× 3	0,3,6,9,2,5,8,1,4,7,0
	× 7	0,7,4,1,8,5,2,9,6,3,0
	× 4	0,4,8,2,6,0
	× 6	0,6,2,8,4,0



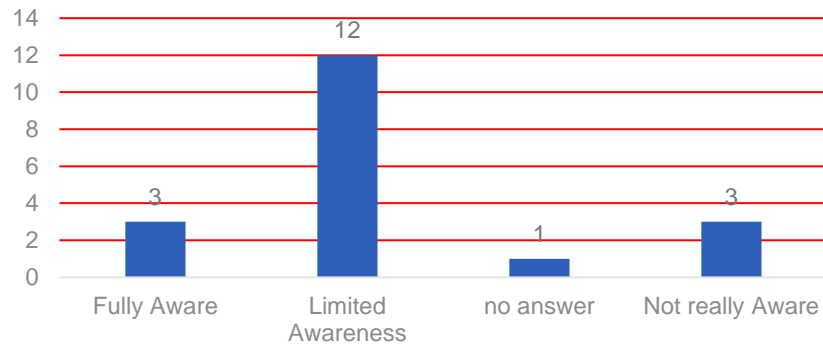
## Step 8

This relates to all Steps and runs concurrently, providing participants with opportunities to develop mastery through the use of variation (rather than variety) and through intelligent practice as they plan the content of component 1 and 2.

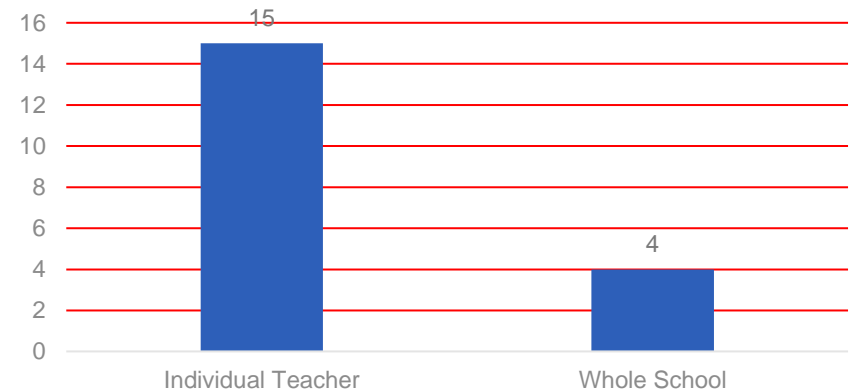


# Pre- Programme Questionnaires from Cohort 1

Graph 7 Participants Awareness of Routinely Used Models to teach Times Tables (n)



Graph 8 Local Approach to Teaching Times Tables (n)



86% of Maths Leads were **not really aware** of how TTs were taught in their School

Only 21% of Maths Leads had any whole school approaches to teaching TTs in their School

This was not a surprise to be as Maths Leads are overworked and have been stretched in many directions with too many priorities



# Data Shows 8 Key Impact Themes

*Importance of a great package of CPD for staff back at school*

*School are receptive: enjoying well structured ideas in small steps*

*Maths Leads are more confident in challenging ideas with staff*

*Opportunity to Deepen Subject Knowledge of ML and their school*

*Actually 'teaching' Times Tables now*

*Moving away from class by class random ways of teaching TT*

*Developing consistency across school*

*Children and Staff using specific vocabulary was a 'game changer'*

## Data from questionnaires demonstrates some early impact: 69 Maths Leads

**Pre-intervention** Maths Leads were asked about their awareness of the way times tables were taught across their school. Only 10% felt fully aware, with 71% of participants feeling they had limited awareness and a further 19% with no real awareness at all.

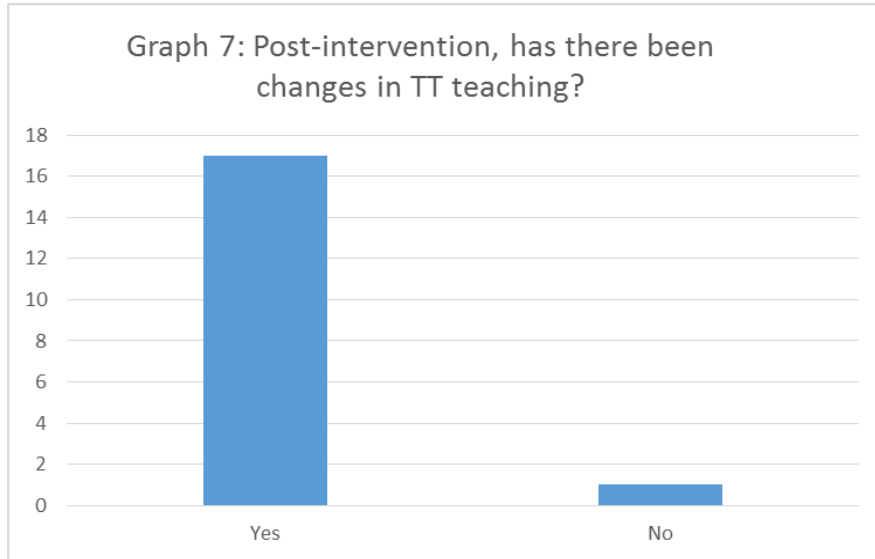
**Post intervention** only 4% were still unsure about how tt were taught in their school and the percentage who now felt **fully** aware had risen from 10% to 68%.

**Pre questionnaires** demonstrated that 80% of schools had an individual teacher approach to teaching times tables; 12% didn't answer or were not sure; leaving 8% with a whole school approach.

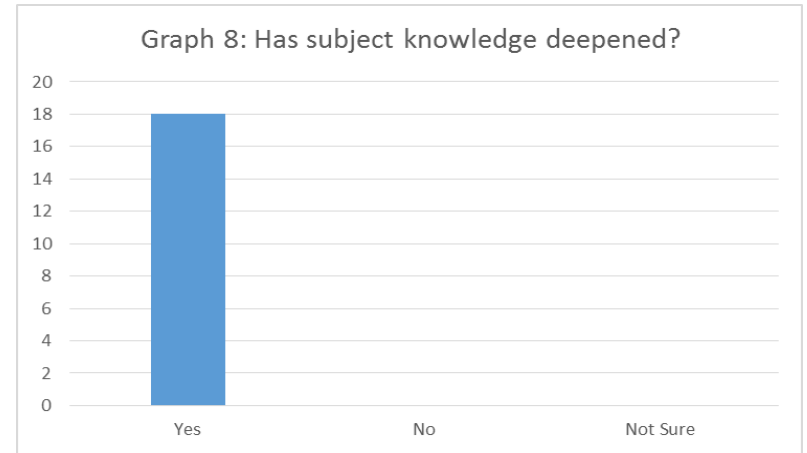
**Post questionnaires** demonstrated a real shift here, with 79% stating that they had a whole school approach, and the majority of others stating that this would be rolled out in the near future.



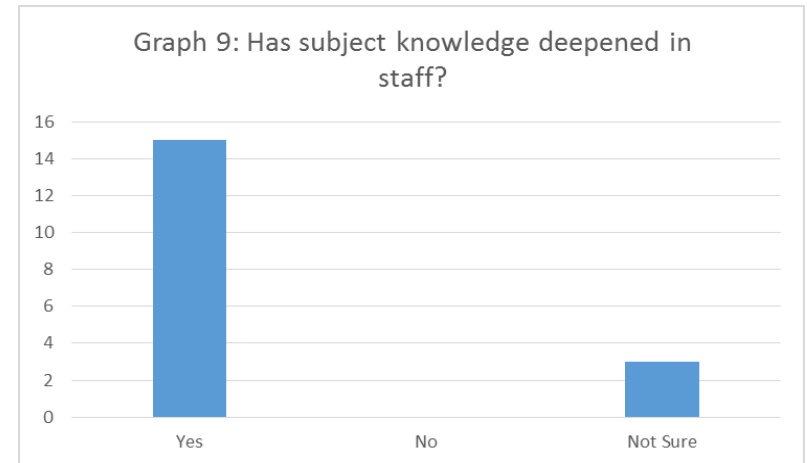
# Early Impact



'no' response: free text *'intend to start next academic year'*



## Maths Lead Subject Knowledge



## Staff Subject Knowledge



# The Journey So Far

## **Cohort 1 (2017/18):**

- 19 teachers completed
- eTimesTables Group for Cohort 1 Alumni
- Case study - 15% of Cohort 1 into year 2 in their own setting
- Attendees now providing sessions for other Maths Leads

## **Cohort 2 (2018/19):**

- 50 teachers almost completed – including two whole Academies
- Pioneer Academy Times Tables Steering Group
- Presentation at Conferences

## **Cohort 3 (2019/20):**

- New cohort of 40+ schools
- Roll out to other Maths Hubs – ‘Training the Trainers’ Model
- In talks with United Learning (Cumbria to Kent 40,000 children)

MA Article for the Autumn Term

Article in Research in Mathematics Education 2020

Presenting at Conference e.g. MA/ATM 2020

## **Post intervention:**

95% stated that there had been changes in the teaching of times tables

100% felt that their subject knowledge had deepened

84% said that subject knowledge of their staff had grown

**In addition Maths Leads from Cohort 2 undertook a times tables check test with their year 3 children pre & post intervention (circa 1500 children)**

100% of children increased their scores over 5 months, and 75% saw their score increase between 11-30%.





# A selection of key impact themes:

- Long term high quality CPD made Maths Leads more confident when working with staff, creating opportunities for deepening subject knowledge and improving pedagogy
- Staff across schools are more receptive when things are well structured, are in small steps and do-able
- Schools involved are now actually teaching times tables with a whole school approach which has improved consistency across the school (or are working towards this)



## A few quotes

*'This Project has been a perfect balance of rationale, pedagogy, subject knowledge development, examples and ideas to take back to school, the importance of teaching times tables well, and deepening understanding – now it's our turn to implement it and make sure it has lasting impact'*

*'In the 16 years I have been a teacher, this has been by far the most interesting, practical and useful course I have ever attended. It has clearly suggested and reasoned why this model is good practice and will have a definite impact on my own teaching and my whole school staff. Thank you!'*

*'The course has been inspiring. It has enabled me to pass on a joy of teaching times tables to my children and colleagues and enabled a deeper understanding of mastering tables and mathematical concepts.'*

*'I just wanted to let you know that Holly introduced the teaching of times tables to staff yesterday. The agreed practice is exceptionally clear and usable, her subject knowledge and enthusiasm shone through and I would like to thank you. Your times tables project has been highly impactful at \*\*\*\*'*



# Key Limitations

- Time needed to demonstrate impact. Careful planning necessary, and acceptance that whole school change and impact take time to introduce, deliver and embed.  
*‘School Staff are willing to take on small changes, one bit at a time’*
- Maths Lead and staff time limited - other priorities and staff changes  
*‘Only limitation is time, haven't done as much as would have liked’*
- Staff subject knowledge – several teachers spoke of this issue  
*‘Exposes limited knowledge in teachers / staff. Children picked up terms and their meanings quickly.’*

