Embedding Teaching for Mastery: A HoD's perspective

NEHS Conference 09.07.2021

Today’s session

- A little bit about me
- Finding your starting point
- Action planning
- Taking your team with you
- Changes to make
- Next steps

A bit about me

- My motivations
- My experience
- My lack of experience!

AO3	**Solve problems within mathematics and in other contexts.** Students should be able to: • translate problems in mathematical or non-mathematical contexts into a process or a series of mathematical processes • make and use connections between different parts of mathematics • interpret results in the context of the given problem • evaluate methods used and results obtained • evaluate solutions to identify how they may have been affected by assumptions made Where problems require candidates to 'use and apply standard techniques' or to 'reason, interpret and communicate mathematically' a proportion of those marks should be attributed to the corresponding assessment objective.	25%	30%	This assessment objective is similar to the current AO3, which makes up 20% of the current GCSE. Questions usually require students to develop and apply a strategy to solve a problem. Some questions carrying this AO3 tariff may not challenge students of a higher ability, but are considered to be at the appropriate level of demand for their position within the paper.

Finding your starting point

- Establish the skills need for your subject (e.g. does the new spec make new demands?)
- Identify the skills gaps (don't overlook what about the current practice is working well)
- Make the case to your team (gently)

"Sometimes you have to stop doing something good in order to do something better"

Action planning

- Beware ‘fad fatigue’
- How will you get started? (Quick wins)
- Collaboration is essential
- What do you need to provide: training, resources, etc?
- What is your time-frame?

MINDSET changes PRACTICE

MINDSET changes PRACTICE

The students are
at rearranging
let's give them
that they do

The students aren't very good at rearranging formulae BECAUSE we give them this tool and they don't have to practice.

Go to **www.menti.com** and use the code **9747 2408**

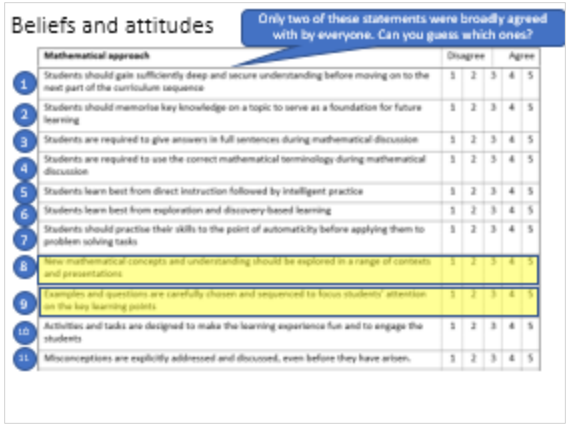
Mindset

"Higher ability students need to progress faster because they master the topics more easily"

What percentage of your team would agree with this statement?

Taking the team with you

- Find out the current beliefs and attitudes



Beliefs and attitudes

Only two of these statements were broadly agreed with by everyone. Can you guess which ones?

	Mathematical approach	Disagree				Agree
1	Students should gain sufficiently deep and secure understanding before moving on to the next part of the curriculum sequence	1	2	3	4	5
2	Students should memorise key knowledge on a topic to serve as a foundation for future learning	1	2	3	4	5
3	Students are required to give answers in full sentences during mathematical discussion	1	2	3	4	5
4	Students are required to use the correct mathematical terminology during mathematical discussion	1	2	3	4	5
5	Students learn best from direct instruction followed by intelligent practice	1	2	3	4	5
6	Students learn best from exploration and discovery-based learning	1	2	3	4	5
7	Students should practise their skills to the point of automaticity before applying them to problem solving tasks	1	2	3	4	5
8	New mathematical concepts and understanding should be explored in a range of contexts and presentations	1	2	3	4	5
9	Examples and questions are carefully chosen and sequenced to focus students' attention on the key learning points	1	2	3	4	5
10	Activities and tasks are designed to make the learning experience fun and to engage the students	1	2	3	4	5
11	Misconceptions are explicitly addressed and discussed, even before they have arisen.	1	2	3	4	5

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Policies and procedures	Disagree				Agree
Good feedback should always contain details of how a student could improve	1	2	3	4	5
Written feedback should create an ongoing dialogue with students to support them to improve over time	1	2	3	4	5
Teachers should only spend time on practices that are directly related to improving student outcomes	1	2	3	4	5

Only two people strongly agreed with this statement!

CPD and Collaborative work					ree
I regularly read articles or books about maths teaching to keep up with deve maths pedagogy					5
I regularly attend training courses to improve my practice					
I take part in departmental CPD opportunities and find them useful					
I take part in whole school CPD opportunities and find them useful					
I welcome opportunities to work collaboratively with my colleagues to prepare lessons or resources together	1	2	3	4	5
I think it is important to regularly observe (and be observed by) my colleagu can learn from each other					
I think it is important that there is consistency in teaching approach across the c					
I am interested in new initiatives or approaches in maths education	1	2	3	4	5
I am willing to try new ideas in my teaching only if there is sound evidenc for doi					
I share resources with colleagues or online					
I prefer CPD activities to be subject specific					

… but lots of people weren't doing this.

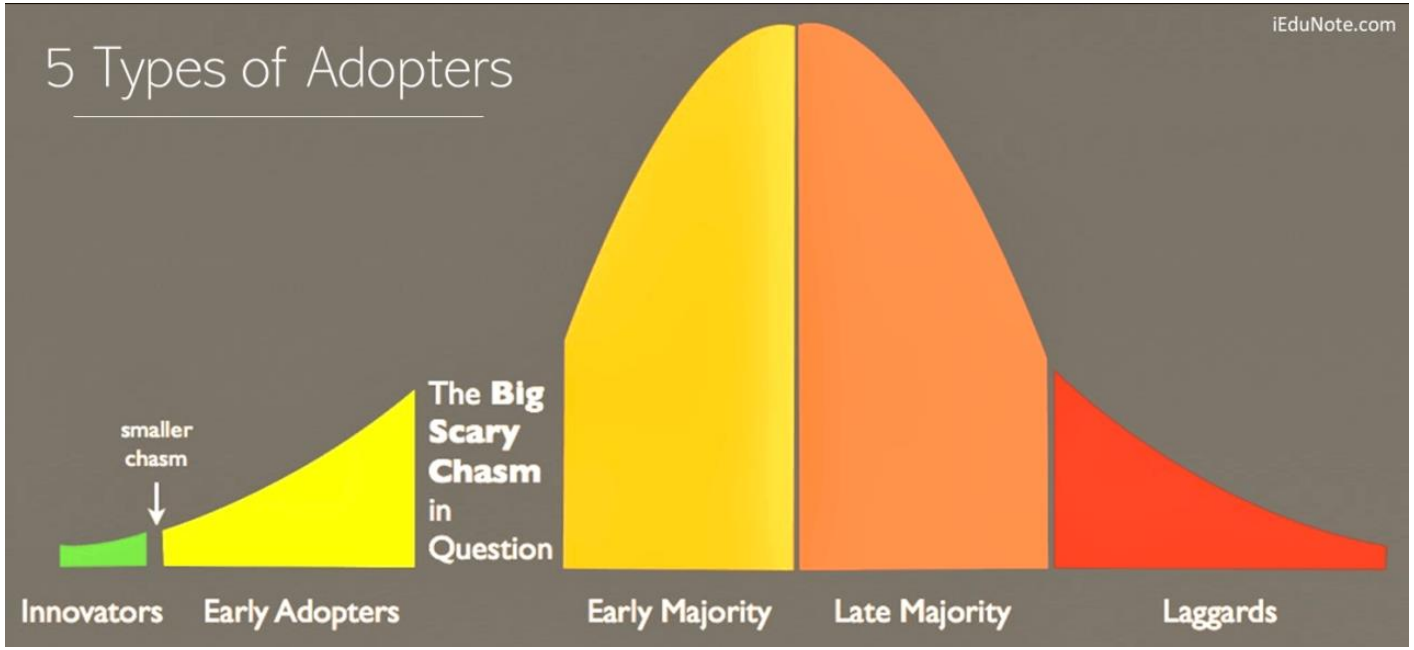
Everyone agreed with this, which was great news!

Everyone agreed with this…

Taking the team with you

Know your team:

- Identify department champions or experts
- Who will be harder to convert?



Taking the team with you

Consider the external barriers:

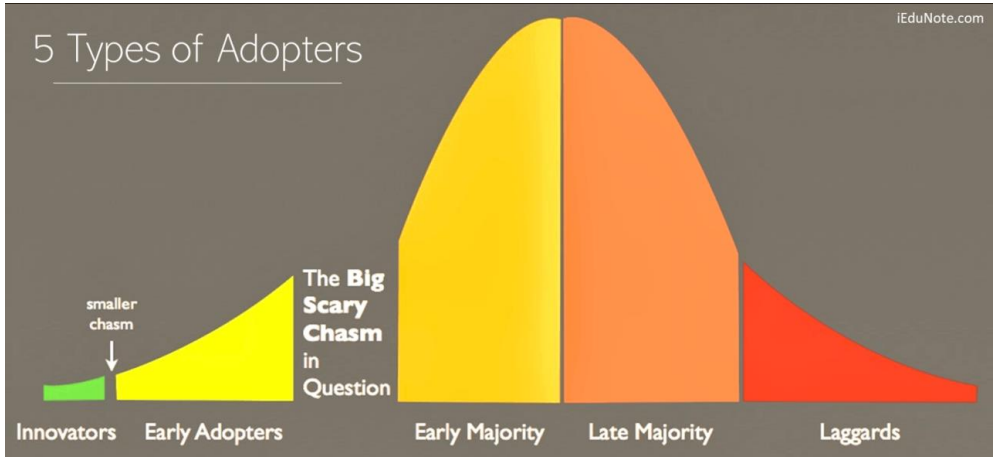
i.e. Structural barriers that genuinely make it more difficult for people to embrace change. For instance: working part-time; having a heavy workload outside the department; having a focused timetable.

Taking the team with you

Celebrate success (and keep going!)

Time to reflect

- Thinking about your team, can you place each person (including yourself) along the Adopters graph?
- How will you win people over?
- What are the barriers and how might you overcome them?



Changes to make

- Consider how your structures, documents and environments could support what you are trying to achieve
  - Classroom displays
  - Schemes of work
  - Assessments
  - Shared resources

- Don’t try to change everything at once.
- Don’t present yourself as an ‘expert’. Make the journey together.

My journey

- Share the 5 big ideas early so you can refer to them with shared language.
- ‘Weigh’ each idea and choose your starting point.
  - Mathematical Thinking
  - Variation
  - Fluency and Coherence
  - Representations

		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Half Term	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13
SUMMER	Year 7	Lines and Angles					Sets and Venn Diagrams		Probability				Groupwork & Projects		ACTIVITIES WEEK
	LPA	Units and Notation		Angles in shapes		Angles and lines	Sets and Venn Diagrams		Probability				Groupwork & Projects		
							Assessment						Assessment		

Year 8

		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Half Term	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15
AUTUMN	Year 8	Multiplying and dividing with fractions				Ratio/Multiplicative reasoning		Proportion			Use of a calculator	Percentages					Index Laws
	LPA	Multiplying and dividing with fractions				Ratio/Multiplicative reasoning		Proportion			Use of a calculator	Percentages					
									Assessment							Assessment	

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SPRING	Year 8	Algebraic Techniques					Inequalities		Area and Perimeter, including circles and Pythagoras					
	LPA	Algebraic techniques					Inequalities		Area and Perimeter, including introduction to circles.					
							Assessment							Assessment

		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Half Term	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13
SUMMER	Year 8	Algebraic Graphs							Unit conversion inc. time		Data and Statistics				ACTIVITIES WEEK
	LPA	Powers, roots & primes. Index laws.			Coordinate geometry				Unit conversions, including time				Averages		
							Assessment							Assessment	

Year 9

KS3

		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Half Term	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15
AUTUMN	Year 9	H Unit 9: Quadratics, Inequalities and Simultaneous Equations							H Unit 2c: Sequences		H Unit 2c: Sequences	H Unit 7a,b: Perimeter, Area and Volume					
	Foundation	F Unit 5a,b & 16a: Equations, inequalities, quadratics							F Unit 5c: Sequences		F Unit 5c: Sequences	F Unit 8: Perimeter, Area and Volume					
									Assessment								Assessment

KS3 KS4

		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Half Term	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
SPRING	Year 9	H Unit 5b: Pythagoras and Trigonometry							H Unit 7c: Accuracy and bounds		H Unit 1d (surds) + Combinations		Index Laws	H Unit 1a Standard

HIGHER: FURTHER QUADRATICS

Possible learning sequence	Notes
REVISION: Recognise the key features of a quadratic graph; identify approximate solutions to a quadratic from the graph *(Revision from Algebraic Graphs unit, Year 10 Autumn 1)* REVISION: Basic techniques in working with quadratics: factorising, completing the square, using the formula. *(Revision from Quadratics, Inequalities and Simultaneous Equations, Year 9 Autumn 1)* 1a. Identify if a quadratic has any real roots from the graph. 1b. Sketch a graph of a quadratic function by factorising or by using the formula to find the roots. 1c. Identify the turning point by completing the square. REVISION: Solve linear equations in two variables graphically. *(Revision from Quadratics, Inequalities and Simultaneous Equations, Year 9 Autumn 1)* 2a. Understand that the solutions to simultaneous equations are the intersection points. E.g. where a quadratic and a line intersect, where a circle and a line intersect. 2b. Understand the graphical interpretation of one, two or zero solutions to the simultaneous equations. 2c. Solve two simultaneous equations (one linear, one quadratic) algebraically and interpret the solution as the intersection of the two graphs. 3. Expand the product of more than two linear expressions. 4. Sketch the graphs of simple cubic functions given as three linear expressions. REVISION: Language and notation of inequalities, including representations on a number line. *(Revision from Quadratics, Inequalities and Simultaneous Equations, Year 9 Autumn 1)* 5a. Represent the solution set for inequalities using set notation, i.e. curly brackets (braces) and 'is an element of' notation. 5b. Include the case where the solution set is the intersection of two solution sets. 6. Solve quadratic inequalities in one variable, by factorising and sketching the graph to find critical values. 7. Show the solution set of several inequalities in two variables on a graph. (Regions) 8a. Introduction to the general iterative process. Notation and language of recursive formulae. 8b. Rearrange algebraic functions into recursive formulae. Be aware that functions can be rearranged in more than one way. 8c. Use iterative functions with simple converging sequences. Be aware that some iterative processes will diverge.	***GCSE unit references: Higher unit 15*** *The learning sequence is for guidance only as a suggestion of how to progress through the content. Note that this is NOT a lesson schedule – you will need to consult your timetable and the school calendar to establish how many lessons you will have for teaching this unit and plan your lessons accordingly.*

Prior Knowledge	Interleaving	Mathematical language
• Use set notation to list a set of integers • Solve quadratics and linear equations. • Use a formal method to solve a linear inequality • Show a range of values that solve an inequality on a number line	• Plotting and sketching graphs • Equation of a circle • Simultaneous equations	(Linear) inequality Variable Manipulate Solve

Training and support

Twilight sessions or existing department meetings?

Use of Advocates

Theory vs practical

Learning walks and observations

Impact

This is really important to plan for. You'll need to come up with a model that work for you and your team.

KEY LEARNING POINT:

KEY DIFFICULTY POINT:

PROBLEM TO FRAME THE LEARNING:

A worded problem to spark mathematical debate (baseline) / demonstrate application for the learning / demonstrate challenge.

SECTION 1: STANDARD VARIATION

Standard questions but vary the numbers in a specific way to expose the structure of the method.

Key questions to try and ask: What do you notice? Can you explain why? Convince me

Challenge questions:

Can you think of any more examples that show…

Why is this one harder?

Section 2: NON-STANDARD VARIATION

Questions with non-standard diagrams or notation.

Use fractions, decimals and negatives where possible.

Information given in different terminology or requiring some re-arranging first.

Generalise method to algebra.

- Always, sometimes, never
- Multiple choice – more than one correct answer
- Do you agree?
- How is it different?
- *Discuss with your partner then convince me that you are right.*

Section 3: NEGATIVE VARIATION

Highlight common errors or misconceptions to expose what the method is NOT.

Include examples with zeroes as this often reveals interesting limitations.

- Why does this method not work?
- Multiple choice – all answers incorrect
- True or false:
- Spot the mistake
- *Can you see what the correct answer should be?*
- *Can you describe…*

Section 4: PROCEDURAL VARIATION

Vary the information that is missing. E.g. provide the answer, work backwards to the question.

Also some examples where the standard method needs to be adapted, or where the answer does not require the full algorithm.

Can you think of any other ways to work this out?

How many ways can you think of to calculate this?

How many different questions can you think of that have the answer…

Planning departmental activities:

- Who will lead the sessions?
- What time of day will they be and long will they last for?
- How will these sessions be structured?
  - Explore the theory
  - Share the research / impact
  - Create resources / activities to take into the classroom

Resources

- Changing your SoL – one year at a time or all at once?
- Collaborative planning or ‘off the shelf’ resources?
- Where will you start? How will you structure it?

Time to reflect

- What does your department look like 1/2/5 years into Teaching for Mastery?
- What are the key features of each lesson?
- What’s different about the teaching? What’s the same?
- What’s different about the learning? What’s the same?

Next steps

- Embedding the changes
- Training for new staff
- Spreading the word beyond your department

Things I've learned

- I can't focus on TfM as much as a HoD as I did as Key Stage leader. I need to use my Advocates more.
- If I were to do this a third time, I would do it differently again!
- Some aspects of TfM become automatic very quickly.
- Checklists and structure help.
- But I still struggle with representations!

Planning for change

Starting points:

- What skills are required?
- Where are the gaps?
- What do you want to keep?

Action planning:

- What changes do you want to make?
- What evidence do you have that they'll work?
- What training/resources will you need?
- Time-frame?

Taking the team with you:

- Does your team share your beliefs and attitudes?
- Who will be your champions and experts?
- Who will be your reluctant converters?
- How will your part-timers cope?

Changes to make:

- Classroom environment
- SoL
- Assessments
- Resources
- What's your timeframe and what are your priorities?

Leading change

1 *Establish the need*

2 *Collaborate on the remedy*

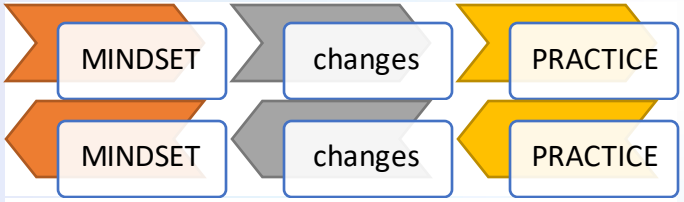
3 *Start small: quick wins*

4 *Slow and steady ➡ lasting change*

5 *Training and resources*

6 *Structures to change*

7 *Look beyond the department*



How will you measure success?

One thing at a time.

Take the team with you.

- Consider their needs
- Use their strengths

"Sometimes you have to stop doing something good in order to do something better"