

Averages

Pie Ch

Sharing in a
Ratio

Using
Formulae

Compo
Area

Teaching for Mastery in FE: the CfEM legacy

NANAMIC Conference, 27th June, 2023

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Aims

- Define what ‘teaching for mastery’ means with respect to FE
- Present research evidence in support of teaching for mastery in FE
- Showcase teaching and learning resources produced by CfEM colleges

01

**What is Teaching for
Mastery in FE?**

What is *Teaching for Mastery*?

Type short responses in chat

“Mastering maths means pupils acquiring a deep, long-term, secure and adaptable understanding of the subject”

National Centre for Excellence in the Teaching of Mathematics (NCETM)

What are the challenges to adopting a mastery approach in FE?

Challenges in adopting mastery for the FE sector

Re-sit learners:

- Arrive in colleges with **significant gaps in their knowledge**, they often lack fluency and understanding
- Have little more than **30 weeks to study for a qualification**
- Have often **experienced repeated failure in maths over a number of years**, and have deep-seated negative attitudes towards the subject.

Five key principles for FE

Values and builds on students' **prior learning**

Prioritises **curriculum coherence** and connections

Develops an understanding of **mathematical structure** of key concepts

Teaching for Mastery

Develops a **collaborative culture** in which everyone believes everyone can succeed

Develops both **fluency** and **understanding** of key ideas

Key mathematical concepts for GCSE resits

Key mathematical concepts which appear to differentiate between GCSE grade 3 and 4 learners:

- working with and understanding number
- multiplicative reasoning
- fractions, decimals and percentages
- basic algebra
- measure (area and volume)

From *Principles and Practice: Maths Mastery in Further Education*

https://www.et-foundation.co.uk/wp-content/uploads/2020/03/CfEM_Mastery_Handbook.pdf

02

Evidence in support of Teaching for Mastery in FE

University of Nottingham Randomised Control Trial (RCT)

Involved teachers from 118 FE 'settings' during 2021-22 academic year.

Teachers were randomly allocated to one of three groups:

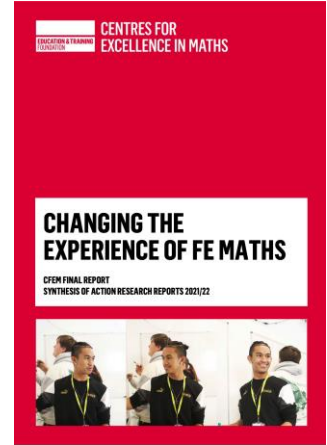
- **'partial' intervention:** teachers delivering five lessons to their learners that exemplified the [five key principles](#).
- **'full' intervention:** in addition, teachers took part in **lesson study**; 'cluster groups' of teachers observing the lessons from perspective of learners, and then discussing what they'd seen.
- **control group:** business as usual.

Findings

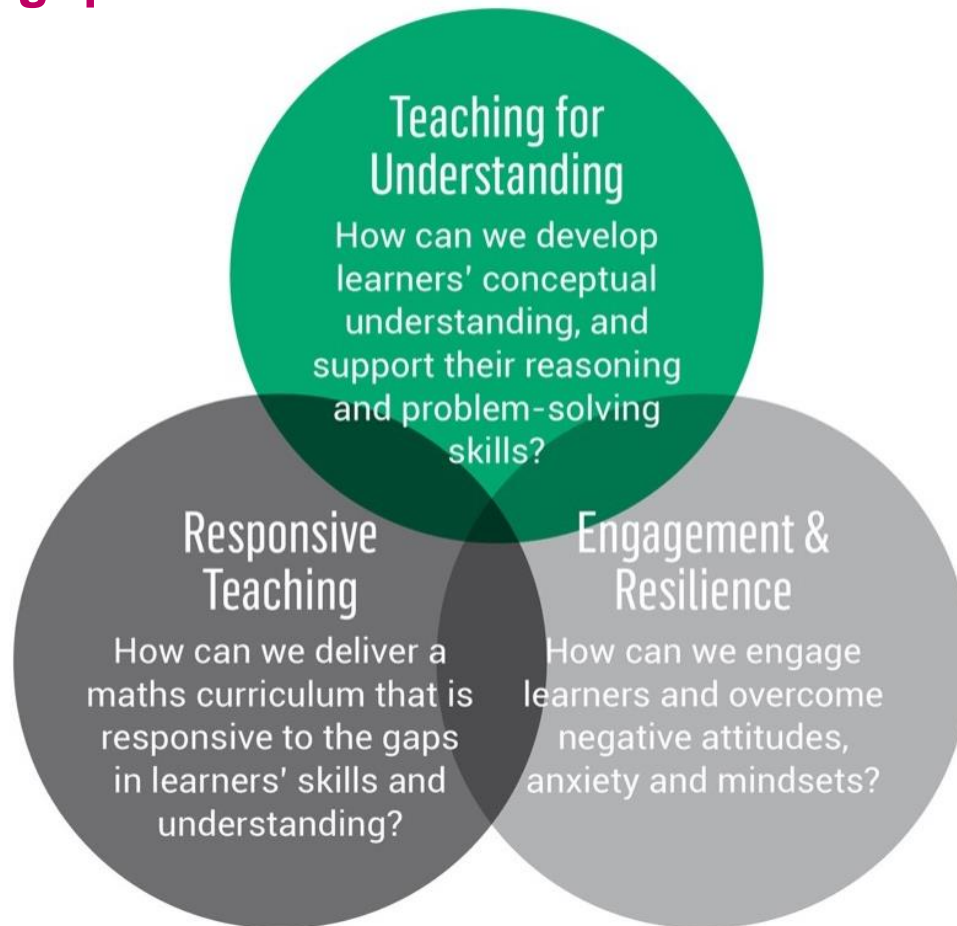
- Analysis of GCSE exam scores revealed average **1 month gain in learning** for students of teachers involved in **full intervention**
- Greatest impact for the **most deprived students** – average of **2 months gain in learning.**
- Greatest impact in assessment **related to the maths covered in the trial sample lessons.**
- Strong evidence that the intervention leads to changes in teachers' **usual teaching approach**
- Findings are supported by action research and other interventions based on the key principles

Action research

- **106 CfEM action research projects** over 4 years
- Carried out **collaboratively by teams of practitioners** within and between colleges
- Involved literature reviews, planning, data collection and analysis, and reporting
- Projects developed across **several iterative cycles**
- Synthesis and library of [reports and video presentations](#) available online

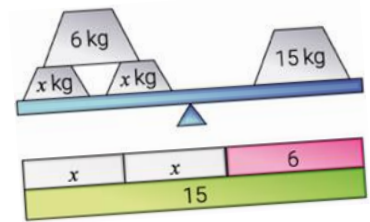
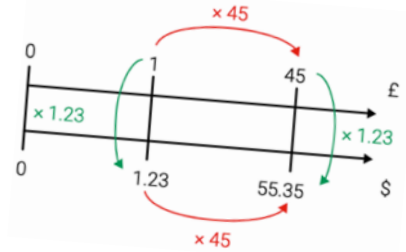
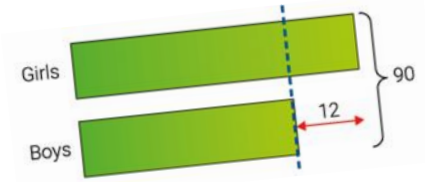


Three overarching questions



Consistent findings: Models and representations

- **Bar models, ratio tables and double-number lines work**, especially for:
 - Wordy problems
 - lower attaining learners
- **Manipulatives** ... learners will engage with them
- Carefully chosen **contexts** to engage and make maths relatable
- **BUT** ... **teachers need CPD and time to experiment**



eggs	1	2	3	30	33
cost	17	34	51	510	561

Consistent findings: Engagement and resilience

Affective barriers to maths can be addressed!

- Listen to learners and discuss experiences/anxieties
- Use **mindset strategies**
- **Embrace mistakes** as a source of learning
- Include **goal-free tasks** and fun activities
- Develop **peer support** ... where everyone believes in success for all

Outcomes: **increase in attendance, active participation, confidence and self-belief, willingness to attempt complex questions.**



03

**CfEM classroom
materials**

CfEM Mastery schemes of work: GCSE and Functional Skills L1 and L2

Rationale:

- Focus on a **limited number of key concepts**
- Sequence to help learners to see **links between mathematical concepts**
- Consistent use of **familiar representations across different topics**
- Consideration to **learner engagement and resilience**

Lesson	Block	Section	Lesson topic	Lesson objectives	Model or representation
1	1	Engagement and resilience	Attitudes to maths and getting unstuck	<ul style="list-style-type: none"> Get to know your learners Recognise previous experiences of maths learners Equip learners with strategies to progress in their maths Promote a safe, positive learning environment 	
2			Mindsets, resilience and number sense	<ul style="list-style-type: none"> Categorise attitudes into fixed or growth mindsets Recognise that progress is maximised when in the growth zone Use ratio tables to answer proportion questions State characteristics of mathematical resilience 	Ratio table
3	Proportional reasoning 1	Direct proportion	Direct proportion	<ul style="list-style-type: none"> Identify when two quantities vary in direct proportion to each other Understand the multiplicative relationship between two quantities (non-calculator) Solve simple proportional problems using efficient methods with ratio tables 	Ratio table
4			Best buys	<ul style="list-style-type: none"> Investigate pricing structures for items that come in different sizes to determine what is the best buy Solve simple best buy problems using efficient methods and ratio tables 	
5			Scales, maps and units	<ul style="list-style-type: none"> Convert metric units of measurement Use a scale to find lengths Represent a proportional situation in a ratio table 	
6			Speed	<ul style="list-style-type: none"> Convert between units of time (seconds, minutes and hours) Understand meaning of 'average speed' and the factors that can affect it in real context Solve problems that involve distance, time and speed 	
7		Parts and wholes	Basic fractions	<ul style="list-style-type: none"> Understand what a fraction is and be able to link this to proportion Find a fraction of an amount Find the whole amount from a fraction Find a half without finding the whole by drawing a bar model 	Bar model
8			Ratio and fractions	<ul style="list-style-type: none"> Write a ratio as a fraction, and vice versa Divide a given quantity into parts in a given part-part and part-whole ratio Solve multi-step problems using ratios and fractions Use representations to provide insight into solving problems 	
9		Ratio	Sharing in a ratio	<ul style="list-style-type: none"> Understand how ratios correspond with real-world situations Use ratio reasoning to solve whole to part and part to part simple problems Use bar model representations to provide insights into problem solving 	
10			Equivalent ratios	<ul style="list-style-type: none"> Use the difference between ratio parts to solve problems using bar models Write equivalent ratios including in the form $1 : n$ or $n : 1$ 	

Mastery lessons

- 30 GCSE lessons
- 34 Functional Skills lessons
- Written by teachers in CfEM colleges
- Based on the 6 lesson design principles used for the research trial

By the sector, for the sector!

DISCUSS Speed as a rate (3)

Example 2
A car travels 10 miles in 12 minutes.
Calculate the average speed of the car in miles per hour.

Distance (miles)	10	5	50	
Time (min)	12	6	60	

50 mph

EXPLORE Algebra tiles

How many cubes have a mass equal to the bag?

How can you use the algebra tiles to find the answer??

DISCUSS Finding half

Can you find a half without finding the whole first?

$\frac{3}{4}$ of a cake costs £18.
What is the value of half of the cake?

£18

What are the different ways you could calculate...

DISCUSS Pizza treat

12-inch pizza
£7.99!!!

Two 8-inch pizzas
£7.99!!!

Ruby and Florence can buy one 12-inch pizza or two 8-inch pizzas.

Ruby thinks that two 8-inch pizzas are better because they get 4 more inches of pizza for the same price.
Florence does not agree.

Lesson design principles

Highlight
mathematical
structure

Introduce and
develop
concepts
through context

Build on prior
learning

Foreground
common
misconceptions

Connect
different areas
of maths where
possible

Active and
collaborative
engagement

CfEM Resources and Evidence Hub

CfEM resources



Teaching for Mastery: Classroom resources

Including schemes of learning, mastery lessons, and guidance on using mastery approaches.

[Learn more >](#)



Evidence

From research carried out during the CfEM projects about 'what works in FE maths.'

[Learn more >](#)



Professional Development

Guidance on the use of action research and lesson study to promote collaboration between teachers.

[Learn more >](#)



The Whole College Approach

How to plan and implement organisational change that will lead to improved mathematical outcomes.

[Learn more >](#)

Visit the [CfEM Resources and Evidence Hub](#) for exemplar schemes of work, mastery lessons and much more.



CfEM lessons: task

1. Go to [GCSE maths re-sit: Classroom Resources](#) (link in chat) or Functional Skills if preferred.
2. Scroll down and choose a lesson that interests you
3. Browse through the slides, and refer to the lesson plan and handouts as required.
4. Consider:
 - **Which of the 6 design features can you see incorporated in the lesson?**
 - **How might you use or adapt the lesson for your teaching?**

04

Reflections

So what? Now what?

Take a minute to reflect on what you've seen and heard today:

- How can you incorporate teaching for mastery within your own teaching?
- How about wider in your organisation?
- What needs to happen?
- How can you help make it happen?

Thank you Any Questions?

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Funded by



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Working in partnership with the Education and Training Foundation to deliver this programme