An overview of current students' understandings and attitudes

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How fast do students learn?

Number

	Mean	% of Total (73)	Std. Dev.
Year 7	36.3	50%	16.8
Year 8	39.0	53%	17.3
Year 9	41.1	56%	17.7

How fast do students learn?

Number

	Score Gain	% Gain	Effect size	Attainment gap: 5th - 95th %ile
Y7 --> Y8	2.6	3.6%	0.15	53/55
Y8 --> Y9	2.1	2.9%	0.12	55/56

How fast do students learn?

Algebra

	Mean	% of Total (59)	Std. Dev.
Year 7	18.2	31%	10.9
Year 8	22.2	38%	11.7
Year 9	24.6	42%	12.5

How fast do students learn?

Algebra

	Score Gain	% Gain	Effect size	Attainment gap: 5th - 95th %ile
Y7 --> Y8	4.0	7%	0.35	35/38
Y8 --> Y9	2.4	4%	0.20	38/41

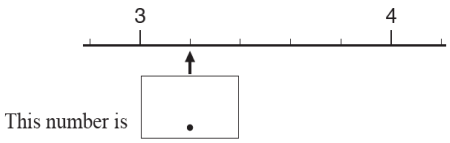
A widening gap in attainment?

Algebra

	Percentiles						
	5th	10th	25th	50th	75th	90th	95th
Y7 --> Y8	0.09	0.18	0.35	0.44	0.35	0.53	0.35
Y8 --> Y9	0.00	0.08	0.17	0.25	0.25	0.25	0.25

Effect sizes estimates (Cohen's *d)* of annual growth in learning in algebra across the attainment range

Strengths: some aspects of number



Y9: 50% → 75%

Weakness: multiplication

Ring the (calculation) you would need to do to find the answer:

M1

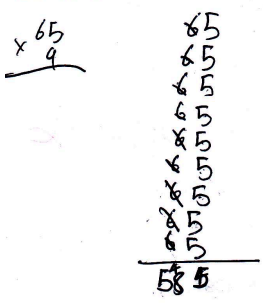
My car can go 41.8 miles on each gallon of petrol on a motorway. How many miles can I expect to travel on 8.37 gallons?

41.8 + 8.37	8.37 ÷ 41.8
41.8 ÷ 8.37	8.37 − 41.8
41.8 − 8.37	8.37 × 41.8

Y9: 54% → 33%

Weakness: repeated addition

65 × 9



Weakness: non-routine problems

Six tenths as a decimal is **0.6**

How would you write as decimals:

eleven tenths . . . . . .

Y9: 36% → 16%

Weakness: algebra

If $e + f = 8$

$e + f + g = \ldots$

Response	Percentage
8+*g*	37%
12	18%
9	7%
8*g*	6%

Self-concept: Do you think you are good at maths?

	Year 7	Year 8	Year 9
Boys	80%	79%	78%
Girls	66%	63%	59%

% of all students responding positively to "*Do you think you are good at maths?*"

Self-concept amongst highest attainers

	Year 7	Year 8	Year 9
Boys	98%	96%	93%
Girls	89%	84%	75%

% of highest attaining quintile (Ratio) students responding positively to "*Do you think you are good at maths?*"

Intentions to study maths post-16

	Boys		Girls	
	Year 7	Year 9	Year 7	Year 9
Yes	39%	34%	29%	25%
No	15%	24%	17%	29%
Don't know	46%	42%	53%	46%

All students' responses to "*Do you think you will continue to study maths after GCSE?*"

Intentions to study maths amongst the highest attaining group

	Year 9	
	Boys	Girls
Yes	44%	34%
No	17%	26%
Don't know	39%	47%

% of highest attaining quintile (Ratio) students' responses to "*Do you think you will continue to study maths after GCSE?*"

Implications

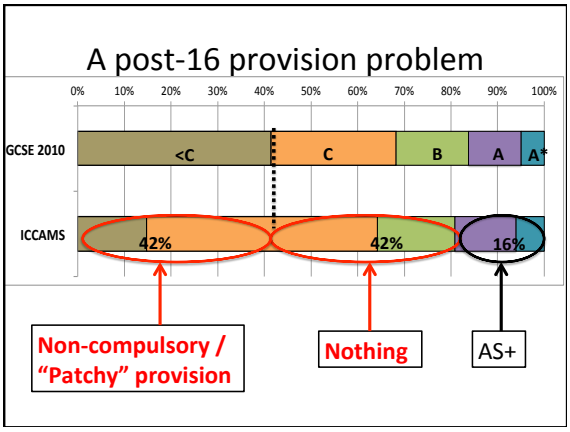
- Mathematics attainment is a serious problem
  - More serious than "standards" over time
  - **ALL** need multiplicative reasoning
  - Algebra needed for progression into STEM
- Slow rate of growth in understanding
  - Learning mathematics takes time
  - Tackling the attainment gap is a very significant challenge

Improving attainment

- Assessment matters
  - Most teachers 'surprised' by students' errors & by the consistency of errors
- Support and guidance to teachers matters
  - Current textbooks are worse than the textbooks of 1970s (and internationally)
- Ban early entry to GCSE
  - Most students have not attained 'mastery'

Improving participation

- Improving self-concept seems unlikely to increase participation significantly
  - "*I'm good at maths – it is maths that is not good*"
  - But a problem around girls' self concept
- Address participation directly
  - Increase attainment
  - Information about extrinsic benefits
  - Require it
  - Make school mathematics more meaningful (not more formal)
- Increase post-16 options


A post-16 provision problem
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
GCSE 2010
<C
C
B
A
A*
ICCAMS
42%
42%
16%
Non-compulsory / "Patchy" provision
Nothing
AS+