Appendices for ICCAMS Evaluation Report

Contents

Further appendices

Appendix 1: Approach to Literature review

Our review focused on PD primarily and then a broader targeted search was performed to expand to Formative Assessment (FA) and/or multiplicative reasoning and algebra. The intention was to map the broader research landscape on mathematics (and STEM initiatives) and we did not impose any restrictions on selected studies in relation to the reported outcomes (we do, however, split in Appendix 1 depending on the focus of the study).For FA, for example, we drew heavily on a recent report[1]of a literature review some of our team had been involved with, but also a new search of relevant existing reviews plus snowballing from reference lists of key resources in Scopus (1988 – 2019) using the following search terms in title and abstract: "professional development" AND ("teaching" OR "teacher") AND (math OR maths OR mathematics) AND (school OR schools). This revealed 1106 matches which were first screened for relevance and the resulting 486 relevant (including only 7 relevant papers pre-2000) were further studied. The process of review involved identifying the key themes that were identified in the review papers, other papers' abstracts, and some full readings of papers that were deemed directly relevant to ICCAMS (see **www.teleprism.com/iccams-evaluation/LR.pdf** for more details).

Table 1A. The efficacy of the Formative Assessment (FA) as implemented in the design of the PD

Theme	Issues	Key references
Review of the literature	The effectiveness of FA varies considerably depending on the way in which FA is employed in the classroom	Wiliam (2007b)
Evaluation of commercial PD programme	Limited evidence of an increase in teachers' mathematical knowledge but no effect at all on their teaching practices or student outcomes.	Jacob et al. (2017)
Effective feedback	Task specific, metacognitive in purpose	EEF Toolkit and Wiliam (2007b)
	Teachers' own mathematical knowledge leading to difficulties in responding to students' problems	Watson (2006), Hodgen, (2007)
Measuring professional development	Teachers kept logs at specified intervals of FA used in a days' teaching accompanied by weekly written reflections	Wylie and Lyon (2015)
	Random assignment of teachers in two groups: PD in FA training for a year followed by a year using the networked classroom technology or using both methods simultaneously over 2 years.	Yin et al. (2015)
Negative impact of using grades or levels in assessing pupil progress (APP)	Occurs because students are interested in the grade and are therefore inclined to ignore the comments.	Wiliam (2007b)
	Performance culture in England has led to formative assessment practices being developed into the form of APP.	Ardron & Monahan (2010), Slade (2009)
	High stakes external examinations limit teachers' freedom to support students through FA	Hume & Coll (2009), Li et al. (2006).
Giving the answer	The teacher providing dialogic "elaborated explanations" are far more useful	Ding and Harskamp (2011), Davis et al. (2007)
Peer tutoring by students	Students in the peer tutoring situation remembered more than those in the collaborative context.	Ding and Harskamp (2011)
	Peer assessment does not indicate what the students learned but rather it helped them to appreciate what they still needed to know.	Davis et al. (2007)
Utilising software programs	Using everyday software, they provided a visual representation of positive/negative feedback which helped increased the frequency of positive feedback.	Sweigart et al. (2015)
	Classroom assessment drives a continuous process of feedback, as students test, retest, and practice, in real time.	Confrey et al. (2019)
	embedded formative assessment to better support personalized learning	Fancsali et al. (2018), Zheng et al. (2019)
Increasing students' metacognitive self-questioning	There was only a weak correlation between the time students spent on the programme and any increase in self-regulated learning or metacognition	Ader (2019)
	The self-questioning approach was the most successful with teachers in that it increased mathematics pedagogical content knowledge, and strengthened the metacognitive knowledge of mathematics teachers.	Kramarski (2009), Kramarski and Revach (2009)
Connectionist teaching	FA is one important part of 'connectionist' teaching, which is indeed the antithesis of 'transmissionist', teacher centred, 'delivery' pedagogy.	Askew et al. (1997a), Askew et al. (1997b), Swan (2006), Williams et al. (2008)

[1]https://royalsociety.org/~/media/education/policy/vision/reports/ev-2-vision-research-report-20140624.pdf

Appendix 2: Pilot Analysis of Measures

1. Introduction to Pilot Data

Pilot data collection took place from the end of June 2016 until the end of the academic year with schools and teachers from the development and pilot ICCAMS schools. Student data came from two pilot schools as summarised in Table 2A.

Table 2A: Student sample description for pilot study

Year Group (per school)	Male	Female	No information	Total
Year 7	**144**	**157**	**5**	**306**
School A	58	62		120
School B	86	95	3	184
No information			2	2
Year 8	**78**	**84**	**3**	**165**
School A	58	60	2	120
School B	20	24	1	45
Total	**222**	**241**	**6**	**471**

In regards to teacher surveys, we got 25 teacher responses, reporting on 50 teaching practice cases.

For the interpretation of Rasch Modelling findings presented below the reader should consult details in other Appendices (e.g. Appendix 11).

2. Students: Attitudes towards maths

Following previous work, we assume two dimensions for maths attitudes: disposition and self-identification.

[Please circle the appropriate number in each line]		**Scale**
1.	Mathematics is important to me	Disposition
2.	Most people can learn to be good at maths	Self-identification
3.	My parents/carers like maths	Self-identification
4.	Learning maths is enjoyable for me	Disposition
5.	I have a mathematical mind	Self-identification
6.	I can get good results in maths	Self-identification
7.	I am interested in learning new things in maths	Disposition
8.	I can learn maths even if it is hard	Self-identification
9.	I like using maths I am familiar with rather than new maths topics	Self-identification
10.	I often need help with maths	Self-identification
11.	Compared to my classmates, I am good at maths	Self-identification
12.	There are people in my close family who like maths	Self-identification
13.	I never want to take another mathematics course	Disposition
14.	I prefer my future studies to include a lot of maths	Disposition
15.	I look forward to studying more mathematics after school	Disposition
16.	I would like to be a mathematician	Disposition
17.	Maths is one of the most interesting school subjects	Disposition
18.	Maths is important for my future (after school)	Disposition

Response options: Strongly Disagree (1), Disagree (2), Unsure (3), Agree (4), Strongly Agree (5)

Analysis was performed with the combined data from Year 7 and Year 8 (resulting in 471 students, before missing data are accounted for).

2.1 MATHEMATICS DISPOSITION

Items: 1, 4, 7, 13, 14, 15, 16, 17, 18 (Reversely coded: item 13)

The Rasch Rating Scale model was used with 470 students (persons) and 9 items (statements)

Item fit analysis: similar findings with Teleprism in regards to misfiting item 18

ITEM STATISTICS: ENTRY ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
1	1991	468	-1.70	.07	.85	-2.2	.83	-2.0	.67	.66	63.1	58.2	statement1
2	1582	467	.02	.06	.81	-3.1	.82	-2.9	.75	.71	54.1	48.4	statement4
3	1826	463	-1.00	.07	.81	-2.9	.80	-2.9	.73	.69	61.8	53.0	statement7
4	1704	464	-.48	.06	1.22	3.1	1.25	3.4	.67	.70	50.3	50.5	statement13
5	1458	463	.42	.06	.80	-3.4	.80	-3.2	.75	.72	57.9	46.5	statement14
6	1289	467	1.04	.06	.85	-2.5	.84	-2.6	.76	.72	55.6	46.3	statement15
7	919	465	2.38	.06	1.19	2.6	1.16	1.8	.62	.68	55.7	53.0	statement16
8	1377	466	.73	.06	1.03	.5	.98	-.2	.73	.72	48.8	46.4	statement17
9	1937	468	-1.43	.07	1.56	6.9	1.50	5.2	.58	.67	48.4	56.2	statement18
MEAN	1564.8	465.7	.00	.06	1.01	-.1	1.00	-.4			55.1	50.9	
S.D.	324.5	1.9	1.23	.01	.25	3.4	.24	2.9			5.0	4.2	

Category Statistics: Healthy

SUMMARY OF CATEGORY STRUCTURE. Model="R"

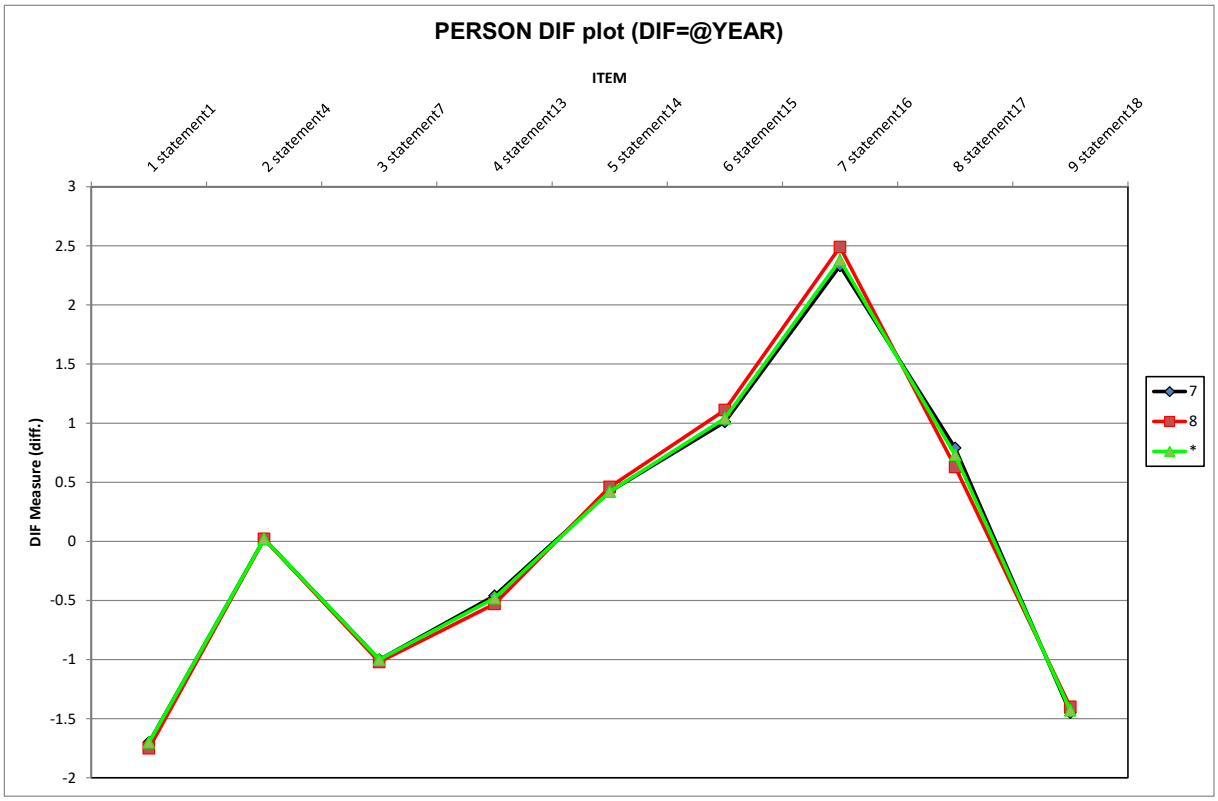
CATEGORY LABEL	OBSERVED SCORE	OBSERVED COUNT	OBSERVED %	OBSVD SAMPLE AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	464	11	-2.11	-2.13	1.13	1.13	NONE	(-3.14)	1
2	2	607	14	-.97	-.91	.88	.87	-1.82	-1.47	2
3	3	996	24	.16	.16	.92	1.02	-.87	-.12	3
4	4	1203	29	1.29	1.26	.88	.86	.51	1.44	4
5	5	921	22	2.56	2.58	1.17	1.13	2.18	(3.40)	5
MISSING		39	1	.58						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

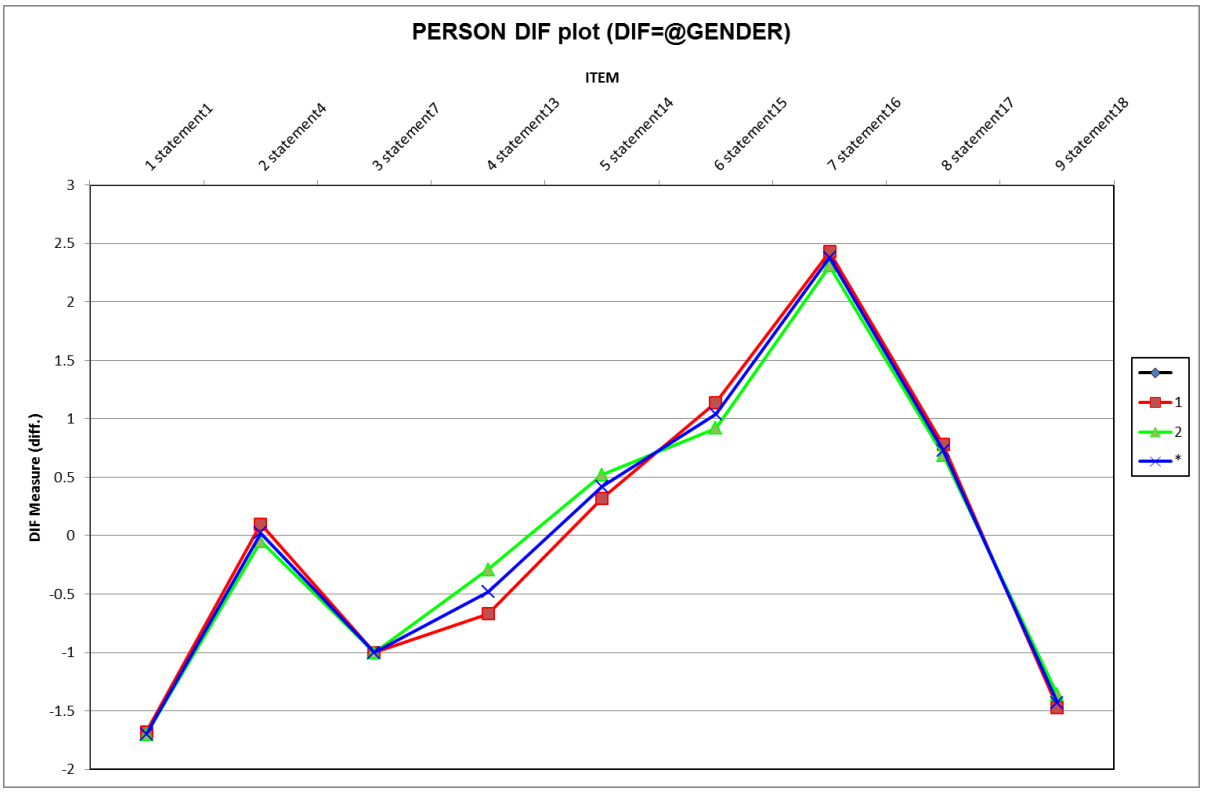
CATEGORY LABEL	STRUCTURE MEASURE	STRUCTURE S.E.	SCORE-TO-MEASURE AT CAT.	SCORE-TO-MEASURE ----ZONE----	50% CUM. PROBABLTY	COHERENCE M->C	COHERENCE C->M	COHERENCE RMSR	ESTIM DISCR	
1	NONE		(-3.14)	-INF -2.37		79%	42%	1.0091		1
2	-1.82	.07	-1.47	-2.37 -.78	-2.10	47%	54%	.7620	.96	2
3	-.87	.05	-.12	-.78 .61	-.81	49%	55%	.6688	1.06	3
4	.51	.04	1.44	.61 2.53	.56	52%	65%	.5830	1.04	4
5	2.18	.05	(3.40)	2.53 +INF	2.33	76%	49%	.8095	.96	5

M->C = Does Measure imply Category?
C->M = Does Category imply Measure?

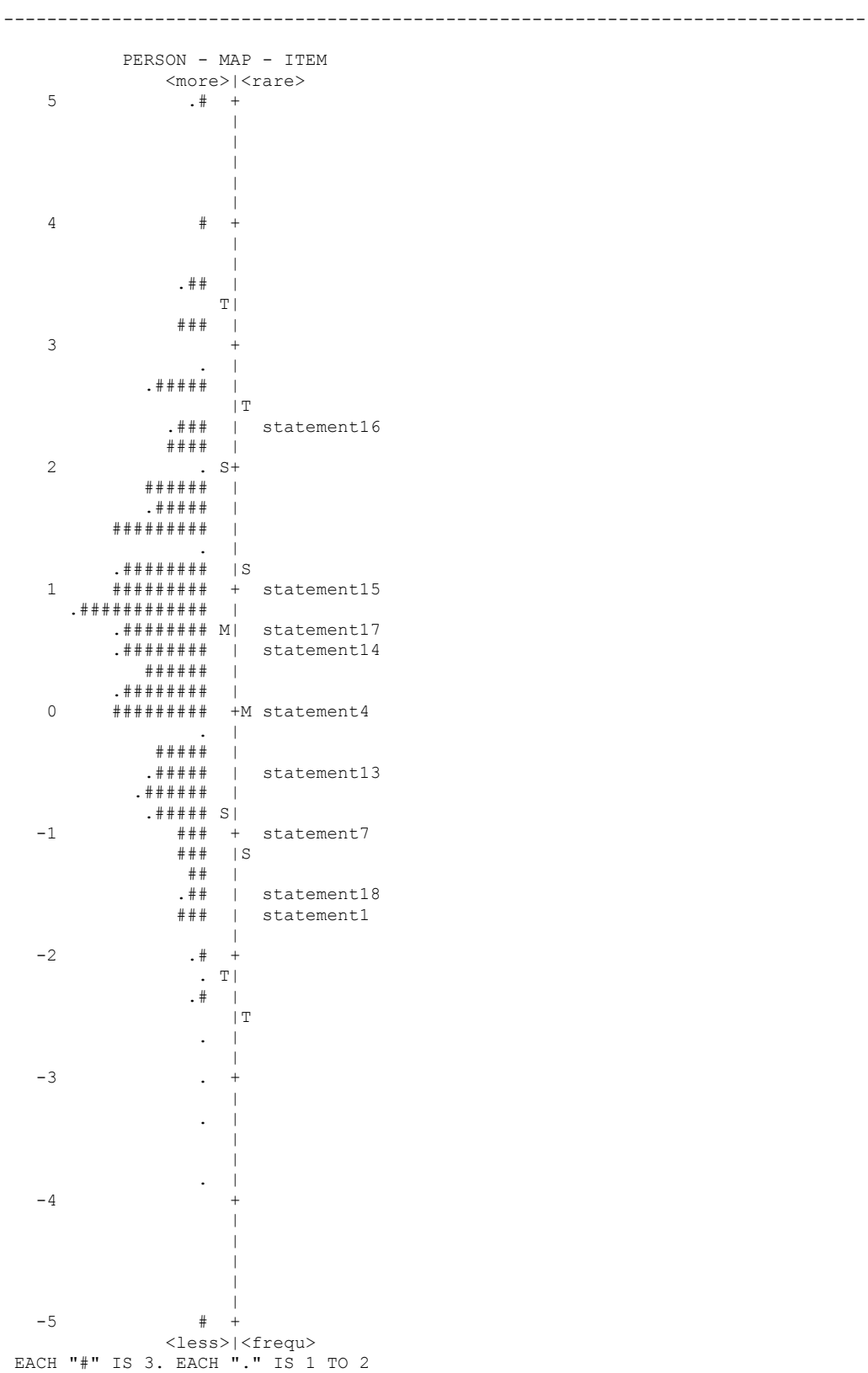
DIF by Year Group: Healthy



DIF by gender: marginally statistically significantly different for statement 13



Item-Person Map:



2.2 Maths Self-identification

Items: 2, 3, 5, 6, 8, 9, 10, 11 and 12 (Reversely coded: items 9 and 10)

Item fit analysis

Given the misfit in initial analysis, the scale has been sequentially been revised as detailed below:
➔ Items: 2, 3, 5, 6, 8, 9, 10, 11 (Reversely coded: 10)

In order to limit the length of the questionnaire this measure (and its items) was not included in the final questionnaire.

2.3. Perception of 'transmissionist' teaching by students

Items used: Part B of student Questionnaire following short versions from previously validated Transmaths and Teleprism instruments.

Response options:

Almost Never [1]	Some of the time [2]	Most of the time [3]	Almost Always [4]

In this section, we want to find out how you are taught maths in general. Please tell us how often does each of the following happen in your normal weekly maths lessons? *[Please circle the appropriate number for each line]*		**Coding**	
1.	We (students) use only the methods the teacher taught us.		
2.	We choose which questions to tackle.	R	
3.	We compare different methods for doing questions.	R	
4.	The teacher draws links between different topics.	R	
5.	We work collaboratively in small groups.	R	
6.	We discuss our own ideas.	R	
7.	We work collaboratively in pairs.	R	
8.	We invent our own methods.	R	
9.	The teacher tells us which questions to tackle.		
10.	The teacher asks questions to check what we understood.	R	
11.	The teacher teaches each topic separately.		
12.	What we learn is related to everyday real life situations.	R	
13.	We use resources from the internet.	R	
14.	We explain our work to the whole class.	R	
15.	The teacher questions our methods.	R	

Fit Statistics

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-------------------------------------------------------------------------------
PERSON: REAL SEP.: 1.21  REL.: .59 ... ITEM: REAL SEP.: 10.64  REL.: .99

         ITEM STATISTICS:  ENTRY ORDER

-----------------------------------------------------------------------------------------------
|ENTRY   TOTAL  TOTAL           MODEL|   INFIT   |  OUTFIT  |PT-MEASURE |EXACT MATCH|           |
|NUMBER  SCORE  COUNT  MEASURE  S.E. |MNSQ  ZSTD|MNSQ  ZSTD|CORR.  EXP.| OBS%  EXP%| ITEM      |
|------------------------------------+----------+----------+-----------+-----------+-----------|
|     1   1318    466    -.32     .06| .97   -.5|1.05    .9| -.02   .41| 52.6  45.5| teaching1 |
|     2   1202    463     .04     .06| .88  -2.2| .90  -1.9|  .45   .42| 49.5  43.5| teaching2 |
|     3   1034    458     .53     .06| .85  -2.9| .85  -2.8|  .50   .42| 44.5  41.5| teaching3 |
|     4   1189    461     .06     .06| .84  -2.9| .84  -2.9|  .46   .42| 48.6  43.1| teaching4 |
|     5   1348    457    -.51     .06| .90  -1.8| .91  -1.4|  .52   .40| 46.6  46.2| teaching5 |
|     6   1034    464     .57     .06| .92  -1.4| .92  -1.5|  .54   .42| 44.4  41.5| teaching6 |
|     7   1071    458     .41     .06| .83  -3.1| .83  -3.2|  .49   .42| 46.9  41.7| teaching7 |
|     8   1560    461   -1.35     .07|1.02    .3| .97   -.5|  .46   .36| 56.7  51.8| teaching8 |
|     9   1191    460     .04     .06|1.11   2.0|1.16   2.7|  .27   .41| 39.6  43.4| teaching9 |
|    10    784    462    1.44     .06|1.07   1.1|1.01    .2|  .47   .38| 49.4  47.5| teaching10|
|    11   1452    457    -.91     .06|1.51   6.9|1.73   9.2|  .00   .37| 38.1  47.9| teaching11|
|    12   1153    456     .13     .06| .88  -2.2| .88  -2.2|  .45   .42| 47.6  43.1| teaching12|
|    13   1393    457    -.67     .06|1.31   4.6|1.31   4.5|  .37   .39| 37.6  47.0| teaching13|
|    14   1178    459     .08     .06|1.07   1.3|1.07   1.2|  .52   .42| 41.2  43.1| teaching14|
|    15   1068    461     .44     .06| .96   -.7| .96   -.8|  .50   .42| 43.4  41.8| teaching15|
|------------------------------------+----------+----------+-----------+-----------+-----------|
| MEAN  1198.3  460.0     .00     .06|1.01   -.1|1.03    .1|           | 45.8  44.6|           |
| S.D.   188.2    2.8     .66     .00| .18   2.8| .23   3.2|           |  5.2   2.9|           |
```

Fit Statistics: After removing item 13

```
INPUT: 471 PERSON  14 ITEM  REPORTED: 469 PERSON  14 ITEM  4 CATS WINSTEPS 3.72.3
-------------------------------------------------------------------------------
PERSON: REAL SEP.: 1.19  REL.: .59 ... ITEM: REAL SEP.: 10.82  REL.: .99

         ITEM STATISTICS:  ENTRY ORDER

-----------------------------------------------------------------------------------------------
|ENTRY   TOTAL  TOTAL           MODEL|   INFIT   |  OUTFIT  |PT-MEASURE |EXACT MATCH|           |
|NUMBER  SCORE  COUNT  MEASURE  S.E. |MNSQ  ZSTD|MNSQ  ZSTD|CORR.  EXP.| OBS%  EXP%| ITEM      |
|------------------------------------+----------+----------+-----------+-----------+-----------|
|     1   1318    466    -.38     .06| .98   -.3|1.06   1.0|  .00   .41| 49.8  46.3| teaching1 |
|     2   1202    463    -.01     .06| .90  -1.9| .91  -1.6|  .46   .43| 49.5  44.4| teaching2 |
|     3   1034    458     .49     .06| .86  -2.6| .86  -2.5|  .51   .43| 44.1  42.0| teaching3 |
|     4   1189    461     .02     .06| .85  -2.7| .85  -2.7|  .47   .43| 49.0  44.3| teaching4 |
|     5   1348    457    -.57     .06| .93  -1.1| .95   -.8|  .51   .40| 46.8  47.6| teaching5 |
|     6   1034    464     .54     .06| .95  -1.0| .94  -1.1|  .54   .43| 43.8  42.0| teaching6 |
|     7   1071    458     .38     .06| .85  -2.8| .85  -2.8|  .50   .43| 48.3  42.4| teaching7 |
|     8   1560    461   -1.43     .07|1.05    .7| .99   -.1|  .46   .37| 59.3  53.3| teaching8 |
|     9   1191    460     .00     .06|1.14   2.3|1.17   2.8|  .29   .42| 39.3  44.3| teaching9 |
|    10    784    462    1.43     .07|1.09   1.4|1.02    .3|  .47   .39| 51.1  47.9| teaching10|
|    11   1452    457    -.99     .07|1.54   7.2|1.75   9.3|  .02   .38| 38.5  49.3| teaching11|
|    12   1153    456     .09     .06| .90  -1.8| .90  -1.8|  .46   .43| 46.5  43.7| teaching12|
|    13   1178    459     .03     .06|1.10   1.7|1.10   1.6|  .52   .43| 40.7  43.8| teaching14|
|    14   1068    461     .40     .06| .98   -.4| .98   -.4|  .51   .43| 42.1  42.4| teaching15|
|------------------------------------+----------+----------+-----------+-----------+-----------|
| MEAN  1184.4  460.2     .00     .06|1.01   -.1|1.02    .1|           | 46.3  45.3|           |
| S.D.   187.2    2.8     .68     .00| .17   2.6| .22   3.0|           |  5.3   3.1|           |
-------------------------------------------------------------------------------
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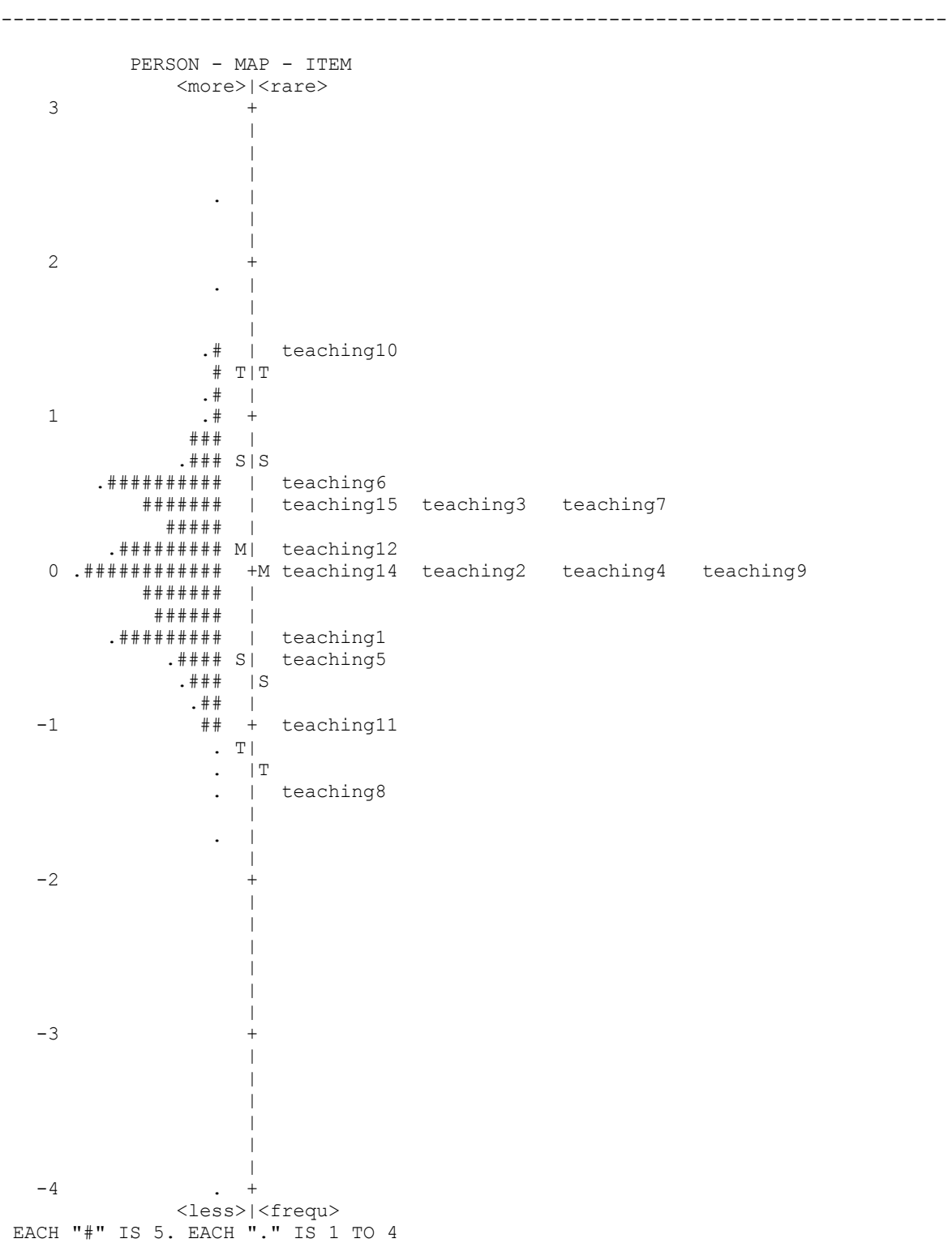
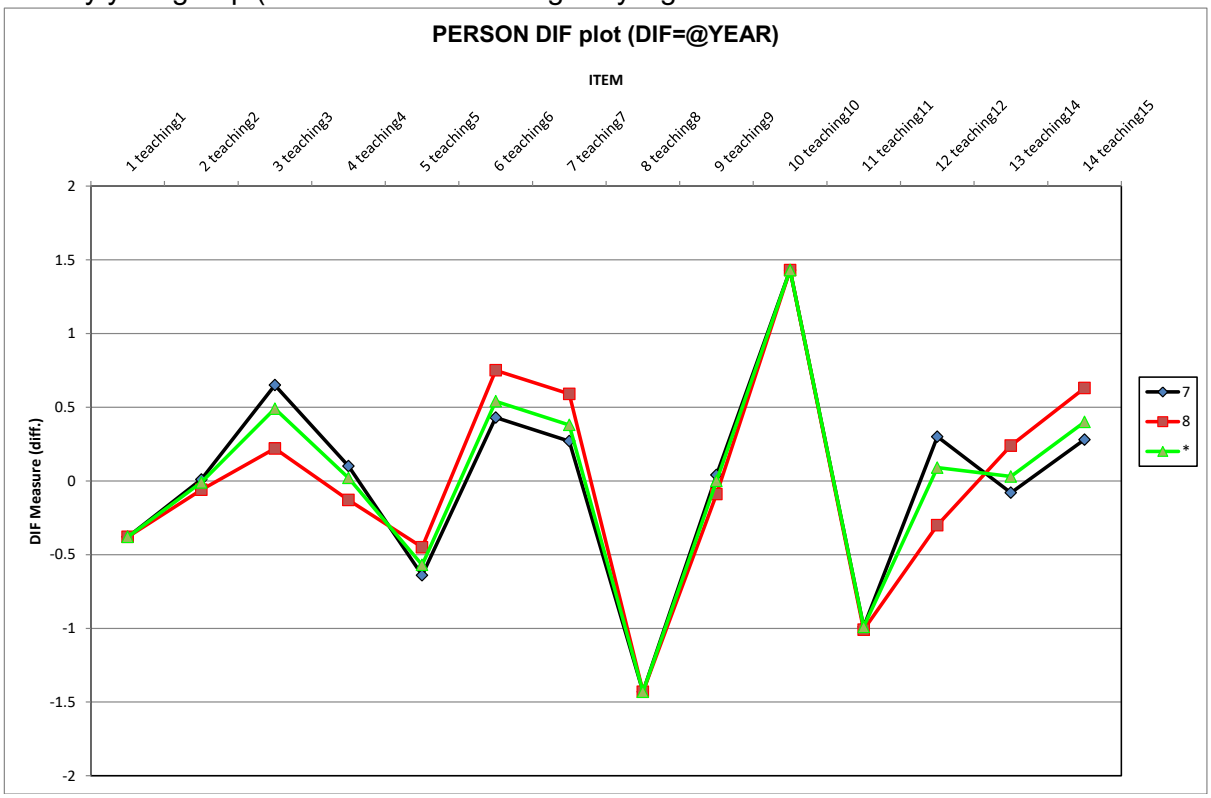
Removing item 11 even though misfitting might distort the measurement scale (one of the easiest to report frequency)

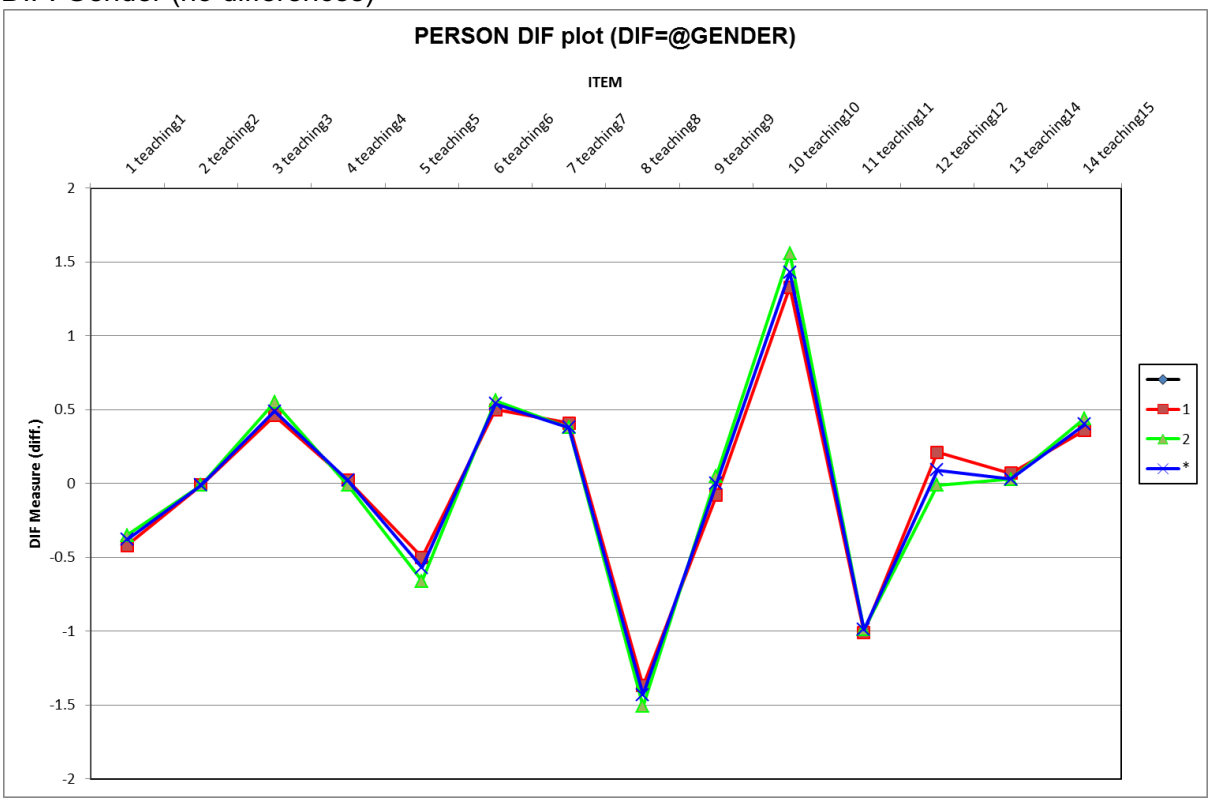
Item Person Map: **Perception of 'transmissionist' teaching by students**



DIF: By year group (some differences marginally significant – could be due to substantive differences)



DIF: Gender (no differences)



2.3 MALT test and Sub-scales

Overview of items piloted with initial subscaling.

index	mark poin	item name	alg	mult	MALT13	issing dat
1	m13qu1	Lightbulb		1	1	7
2	m13qu2	Rice Servings		1	2	8
3	m13qu3	Hall with 288 Seats		1	3	18
4	m13qu4	70 Train Journeys		1	4	27
5	m13qu5	Sound Speed 1			5	22
6	m13qu6	$d = 5t^2$	1	1	6	39
7	m13qu7	Hour Hand Angle			7	9
8	m13qu8	David's Juice		1	8	17
9	m13qu9	Javelin Throws			9	37
10	m13qu10	A4 Sheet Area			10	33
11	m13qu11	Storage Box			11	54
12	m13qu12	Magnetic Top			12	32
13	m12qu10	Jodie's Paint Percentage		1	13	22
	m13qu13	$x^3 + x = 20$	1		not used	
14	m13qu14	Jack's Football Practice			14	6
15a	m13qu15	6 to x + 3	1		15a	11
15b	m13qu16	3 to 7y	1		15b	14
16a	m13qu17	Baby Girls Names 1			16a	11
16b	m13qu18	Baby Girls Names 2			16b	15
	m13qu19	Page Thickness		1	not used	
17	m13qu20	Cube Net (Opposite D)			18	21
18	m13qu21	0.5 x 8		1	19	11
19	m13qu22	5 Cubes Surface Area			20	23
20	m13qu23	4 Times As Big As 80		1	21	15
21	m13qu24	y = 2x/x-3 Values 1	1		22	29
22	m13qu25	Ribbon Lengths			23	20
23	m13qu26	Monthly Rainfall			24	18
24a	m13qu27	Celsius to Fahrenheit 1			25a	27
24b	m13qu28	Celsius to Fahrenheit 2			25b	28
25	m13qu29	Coin Tosses			26	27
26	m13qu30	Number Sequence (10.24 div by 4s)		1	27	43
27a	m13qu31	Onomatopoeia 1			28a	44
27b	m13qu32	Onomatopoeia 2			28b	65
28	m13qu33	Conservation of Area			29	29
29	m13qu34	12.09 - 1.5			30	30
30	m13qu35	Prime Spinner			31	34
31	m13qu36	Triangle Pattern Coordinates			32	43
32	m13qu37	Equivalent Fraction (12/20)		1	33	31
33	m13qu38	0.64 / 8		1	34	43
34	m13qu39	Shade No Lines of Symmetry			35	38
35	m13qu40	2.7m Cloth		1	36	49
36	m13qu41	12 Bottles of Water		1	37	49
37	m13qu42	Largest Calculations		1	38	50
38a	m13qu43	Loaves (4:6) 1		1	39a	63
38b	m13qu44	Loaves (4:6) 2		1	39b	67
39	m13qu45	Bestselling Book		1	40	83
40	m12qu28	16 packets of paper		1		64
41	m14qu20	Brother And Sister Ages	1			68
42		Tom's quicz	1			77
43a	m14qu22	Toothpick Patterns 1	1			72
43b	m14qu23	Toothpick Patterns 2	1			73

OVERALL MEASURE

Item analysis:

```
INPUT: 471 PERSON  49 ITEM  REPORTED: 165 PERSON  49 ITEM  98 CATS WINSTEPS 3.72.3
-------------------------------------------------------------------------------
PERSON: REAL SEP.: 3.40  REL.: .92 ... ITEM: REAL SEP.: 6.00  REL.: .97

         ITEM STATISTICS:  ENTRY ORDER

-------------------------------------------------------------------------------------------------
|ENTRY   TOTAL  TOTAL           MODEL|   INFIT  |  OUTFIT  |PT-MEASURE |EXACT MATCH|          |
|NUMBER  SCORE  COUNT  MEASURE  S.E. |MNSQ  ZSTD|MNSQ  ZSTD|CORR.  EXP.| OBS%  EXP%| ITEM  G  |
|-----------------------------------+----------+----------+-----------+-----------+----------|
|     1    114    165   -1.46     .21|1.42   3.3|1.74   2.8|  .40   .58| 70.8  80.5| q1    0  |
|     2    105    165   -1.08     .20|1.18   1.7|1.20   1.1|  .50   .58| 73.9  78.4| q2    0  |
|     3     42    165    1.29     .21|1.01    .1| .84  -.4|  .44   .44| 77.0  78.8| q3    0  |
|     4     51    165     .92     .20|1.03    .4|1.25   .9|  .44   .47| 79.5  76.4| q4    0  |
|     5     74    165     .08     .19| .98   -.2|1.00   .1|  .53   .53| 74.5  73.4| q5    0  |
|     6     62    165     .51     .19| .89  -1.4| .89  -.4|  .55   .50| 78.9  74.1| q6    0  |
|     7     74    165     .08     .19|1.01    .2|1.30  1.5|  .50   .53| 77.0  73.4| q7    0  |
|     8     60    165     .58     .19|1.04    .6| .95  -.1|  .48   .50| 74.5  74.4| q8    0  |
|     9     76    165     .00     .19|1.09   1.0|1.08   .5|  .50   .53| 73.3  73.4| q9    0  |
|    10     10    165    3.32     .35| .95   -.1| .43 -1.0|  .30   .24| 93.8  93.8| q10   0  |
|    11     38    165    1.46     .21| .81  -1.9| .71  -.9|  .50   .42| 85.1  80.1| q11   0  |
|    12     36    165    1.56     .22| .84  -1.5| .61 -1.2|  .49   .41| 82.6  80.9| q12   0  |
|    13     93    165    -.61     .19| .94   -.7| .88  -.6|  .59   .56| 77.6  75.8| q13   0  |
|    14    143    165   -3.17     .29|1.22   1.2|1.17   .5|  .48   .56| 88.8  90.4| q14   0  |
|    15     92    165    -.58     .19| .90  -1.1| .86  -.8|  .60   .56| 82.0  75.6| q15a  0  |
|    16     97    165    -.77     .20|1.05    .6| .93  -.3|  .56   .57| 72.0  76.7| q15b  0  |
|    17     62    165     .51     .19|1.60   6.3|2.21  4.0|  .19   .50| 57.8  74.1| q16a  0  |
|    18     49    165    1.00     .20|1.28   2.8|2.34  3.5|  .30   .46| 69.6  76.9| q16b  0  |
|    19    109    165   -1.25     .21|1.12   1.1|1.14   .7|  .53   .58| 78.9  79.3| q17   0  |
|    20    144    165   -3.25     .30| .93   -.3|1.70  1.2|  .58   .56| 89.4  90.9| q18   0  |
|    21     35    165    1.60     .22| .94   -.5| .96   .0|  .44   .41| 82.0  81.2| q19   0  |
|    22    119    165   -1.69     .22|1.03    .3|1.48  1.7|  .56   .58| 81.4  81.8| q20   0  |
|    23     89    165    -.47     .19| .88  -1.4| .88  -.7|  .61   .56| 80.7  74.9| q21   0  |
|    24    120    165   -1.74     .22| .99    .0| .92  -.2|  .59   .58| 82.0  82.0| q22   0  |
|    25     87    165    -.39     .19|1.17   1.9|1.18  1.0|  .48   .55| 67.1  74.6| q23   0  |
|    26    120    165   -1.74     .22| .74  -2.3| .80  -.7|  .68   .58| 88.2  82.0| q24a  0  |
|    27    113    165   -1.42     .21| .73  -2.6| .64 -1.8|  .69   .58| 87.6  80.3| q24b  0  |
|    28     93    165    -.61     .19|1.12   1.3|1.19  1.1|  .50   .56| 71.4  75.8| q25   0  |
|    29     66    165     .36     .19|1.00    .0| .93  -.3|  .52   .51| 71.4  73.6| q26   0  |
|    30     96    165    -.73     .20| .71  -3.4| .60 -2.6|  .69   .57| 85.7  76.4| q27a  0  |
|    31     49    165    1.00     .20|1.07    .8| .88  -.3|  .45   .46| 68.3  76.9| q27b  0  |
|    32     98    165    -.80     .20| .72  -3.2| .61 -2.5|  .69   .57| 85.1  76.9| q28   0  |
|    33    102    165    -.96     .20|1.18   1.7|1.27  1.4|  .50   .57| 72.0  77.7| q29   0  |
|    34     90    165    -.50     .19| .91  -1.0| .87  -.8|  .60   .56| 77.6  75.1| q30   0  |
|    35     55    165     .77     .19| .98   -.3| .78  -.8|  .51   .48| 75.8  75.5| q31   0  |
|    36    106    165   -1.12     .20| .83  -1.7| .74 -1.4|  .65   .58| 82.6  78.6| q32   0  |
|    37     89    165    -.47     .19|1.19   2.1|1.25  1.4|  .47   .56| 67.1  74.9| q33   0  |
|    38     67    165     .33     .19| .89  -1.3| .76 -1.2|  .57   .51| 77.6  73.5| q34   0  |
|    39    101    165    -.92     .20| .64  -4.1| .49 -3.4|  .73   .57| 87.6  77.5| q35   0  |
|    40     84    165    -.28     .19| .92   -.9| .90  -.5|  .58   .55| 77.0  74.1| q36   0  |
|    41     41    165    1.33     .21|1.19   1.8|1.46  1.4|  .33   .43| 76.4  79.1| q37   0  |
|    42     54    164     .80     .20| .81  -2.3| .68 -1.3|  .57   .48| 78.8  75.6| q38a  0  |
|    43     43    165    1.25     .21| .81  -2.0| .66 -1.2|  .53   .44| 83.9  78.5| q38b  0  |
|    44      3    165    4.66     .60| .87   -.1| .18 -1.4|  .22   .14| 98.1  98.1| q39   0  |
|    45     77    165    -.03     .19|1.10   1.2|1.11   .6|  .49   .54| 70.2  73.5| q40   0  |
|    46     59    165     .62     .19| .89  -1.4| .84  -.6|  .54   .49| 78.9  74.6| q41   0  |
|    47     62    165     .51     .19| .85  -1.9| .74 -1.1|  .57   .50| 77.6  74.1| q42   0  |
|    48     57    165     .69     .19|1.07    .8|1.17   .7|  .44   .49| 75.8  75.0| q43a  0  |
|    49     54    165     .81     .20|1.13   1.4|1.38  1.4|  .40   .48| 73.9  75.7| q43b  0  |
|-----------------------------------+----------+----------+-----------+-----------+----------|
| MEAN   76.7  165.0     .00     .21| .99   -.1|1.01   .0|           | 78.3  78.1|          |
| S.D.   31.2    .1    1.39     .06| .18   1.9| .40  1.4|           |  7.4   5.3|          |
-------------------------------------------------------------------------------------------------
```

Note: Q16a and 16b – problem with printing so different scoring than initial MALT

SUBSCALE: MULTIPLICATION (WITH PILOT VERSION)

INPUT: 471 PERSON 19 ITEM REPORTED: 165 PERSON 19 ITEM 2 CATS WINSTEPS 3.72.3
PERSON: REAL SEP.: 2.18 REL.: .83 ... ITEM: REAL SEP.: 6.51 REL.: .98

ITEM STATISTICS: ENTRY ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM	G
1	114	165	-1.57	.21	1.47	3.8	1.85	2.7	.39	.60	71.7	80.2	q1	0
2	105	165	-1.18	.20	1.13	1.3	1.15	.7	.54	.60	75.5	78.0	q2	0
3	42	165	1.32	.21	1.01	.2	.78	-.7	.49	.48	78.6	79.6	q3	0
4	51	165	.93	.20	1.08	.8	1.18	.8	.47	.51	77.4	78.0	q4	0
5	62	165	.49	.20	.91	-.9	.90	-.4	.58	.54	76.1	76.1	q6	0
6	60	165	.57	.20	1.06	.7	.99	.0	.52	.54	74.8	76.4	q8	0
7	93	165	-.69	.20	.99	-.1	.93	-.4	.60	.59	76.7	76.6	q13	0
8	144	165	-3.42	.31	.85	-.8	1.45	.9	.59	.55	92.5	91.2	q18	0
9	119	165	-1.81	.22	1.07	.6	1.22	.8	.56	.59	81.1	81.8	q20	0
10	66	165	.33	.20	.99	-.1	.96	-.2	.56	.55	74.2	75.6	q26	0
11	106	165	-1.22	.21	.83	-1.8	.68	-1.6	.67	.60	83.6	78.3	q32	0
12	89	165	-.54	.20	1.11	1.1	1.06	.4	.55	.59	73.0	76.0	q33	0
13	101	165	-1.01	.20	.68	-3.7	.51	-3.0	.73	.60	85.5	77.5	q35	0
14	84	165	-.35	.19	.91	-1.0	.85	-.8	.62	.58	76.7	75.6	q36	0
15	41	165	1.36	.21	1.20	1.8	1.35	1.1	.38	.48	76.7	79.8	q37	0
16	54	164	.80	.20	.78	-2.5	.70	-1.3	.62	.52	82.9	77.3	q38a	0
17	43	165	1.27	.21	.79	-2.1	.63	-1.3	.58	.49	84.3	79.4	q38b	0
18	3	165	4.80	.60	.91	.0	.23	-1.2	.22	.15	98.1	98.1	q39	0
19	77	165	-.08	.19	1.12	1.4	1.38	2.0	.51	.57	71.1	75.2	q40	0
MEAN	76.5	164.9	.00	.23	.99	-.1	.99	-.1			79.5	79.5		
S.D.	33.5	.2	1.67	.09	.18	1.7	.37	1.3			6.8	5.6		

SUBSCALE: ALGEBRA (WITH PILOT DATA)

PERSON: REAL SEP.: 1.29 REL.: .62 ... ITEM: REAL SEP.: 3.23 REL.: .91

ITEM STATISTICS: ENTRY ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
1	62	165	.41	.21	1.01	.1	1.01	.1	.64	.64	69.1	73.6	q6
2	92	165	-.91	.21	.98	-.2	1.07	.5	.66	.66	74.8	73.4	q15a
3	97	165	-1.14	.22	1.08	.8	1.10	.6	.63	.66	74.0	74.0	q15b
4	89	165	-.77	.21	1.01	.1	1.18	1.2	.65	.66	77.2	72.8	q21
5	59	165	.55	.22	.92	-.8	.92	-.5	.67	.64	78.0	74.1	q41
6	62	165	.41	.21	.72	-3.3	.69	-2.2	.73	.64	87.0	73.6	q42
7	57	165	.65	.22	1.10	1.0	1.27	1.6	.60	.64	70.7	74.7	q43a
8	54	165	.79	.22	1.08	.7	1.25	1.3	.60	.64	74.8	75.9	q43b
MEAN	71.5	165.0	.00	.22	.99	-.2	1.06	.3			75.7	74.0	
S.D.	16.7	.0	.74	.00	.12	1.3	.18	1.2			5.1	.9	

CONCLUDING THOUGHTS REGARDING OUTCOMES AND INSTRUMENTS TO USE

- MALT 13 as it stands gives a robust sub-measure of Multiplicative Reasoning
- The Measure of Algebra with only 4 items (with MALT 13) is weak and needs additional items➔ we could only add these items so as not to extend a lot the test
- Regarding Students' perceptions of teaching practice: potential resolution/alternative to teachers' perceptions. Also previous research indicated this was more influential.

2.4 Teachers: Teaching Practice (self-report) Scales

Average reported completion time: 12 (but included 3 year groups)

Preliminary analysis resulted in the following decisions for the final instruments (R indicates that the item will need to be reversely coded in analysis).

ID	Item	FA Practice	Transmissionist
1	I introduce a new topic by first determining what the students already know about it	✓	✓ R
2	I use activities in contexts that the students can engage with	✓	✓ R
3	I use activities which allow connections to be made between mathematical ideas	✓	✓ R
4	I allow students to work at their own pace		✓ R
5	Students use mathematical concepts to interpret and solve applied problems	Remove	
6	I teach the whole class at once	✓ R	✓
7	Students start with easy questions and work up to harder questions	Te16	✓
8	During lessons I ask a lot of short questions to check whether students understand the content matter	Te26	
9	I offer content matter in gradually increasing levels of complexity	Te2	
10	When a student asks a question, I give clues instead of the correct answer	✓	✓ R
11	I ask students to explain their reasoning when giving an answer		✓ R
12	I encourage students to discuss the mistakes they make		✓ R
13	Students use only the methods I taught them		✓
14	Students choose which questions to tackle		✓ R
15	Students compare different methods for doing questions		✓ R
16	Students work collaboratively in small groups.	✓	✓ R
17	Students discuss their ideas.		✓ R
18	Students work collaboratively in pairs.	✓	✓ R
19	Students invent their own methods.	✓	✓ R
20	I tell students which questions to tackle.	✓ R	✓
21	I teach each topic separately		✓
22	I provide feedback to students on their understanding of mathematical concepts	✓	
23	I check students' understanding for maths during lessons to assess specific intended learning outcomes	✓	
24	I assess students' maths conceptions and misconceptions in order to adapt my teaching	✓	
25	I provide feedback on what students have understood in relation to what they should do next	✓	
26	I encourage students to learn from each other	✓	

2.5 *Confidence in Teaching ICCAMS*

Q8. The next question is only for ICCAMS teachers (teachers who used the ICCAMS material); if you have not used them please skip this part

Considering the ICCAMS material and lessons you taught, please tell us how much you agree with the following statements.

(Please circle the appropriate number in each line)	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
I feel confident teaching the ICCAMS lessons.	1	2	3	4	5
Teaching ICCAMS lessons is no more demanding for me than the other lessons I am teaching.	1	2	3	4	5
The materials for ICCAMS have helped me feel confident.	1	2	3	4	5
Other support for ICCAMS has helped me feel confident.	1	2	3	4	5
I feel I need some further training to teach these lessons with confidence.	1	2	3	4	5
The training I received was useful	1	2	3	4	5
Teaching ICCAMS lessons matches my teaching skills and experience well.	1	2	3	4	5
I would feel confident to teach these lessons again next year if I am asked to do.	1	2	3	4	5
I would prefer to teach the ICCAMS lessons instead of other maths courses/units, if I had a choice.	1	2	3	4	5

```
INPUT: 75 PERSON  9 ITEM  REPORTED: 17 PERSON  9 ITEM  5 CATS    WINSTEPS 3.72.3
-------------------------------------------------------------------------------
PERSON: REAL SEP.: 2.23  REL.: .83 ... ITEM: REAL SEP.: 2.51  REL.: .86

         ITEM STATISTICS:  ENTRY ORDER

-----------------------------------------------------------------------------------------------
|ENTRY   TOTAL  TOTAL           MODEL|   INFIT   |  OUTFIT   |PT-MEASURE |EXACT MATCH|        |
|NUMBER  SCORE  COUNT  MEASURE  S.E. |MNSQ  ZSTD|MNSQ  ZSTD|CORR.  EXP.| OBS%  EXP%| ITEM   |
|---------------------------------+----------+----------+-----------+-----------+--------|
|     1     65     17    -.23     .39|1.02    .2| .97    .1|  .70   .71| 58.8  61.2| iccams1|
|     2     56     17     .91     .34|1.27    .9|1.36   1.1|  .67   .72| 47.1  49.9| iccams2|
|     3     61     17     .32     .36| .63  -1.1| .69   -.8|  .83   .71| 64.7  57.3| iccams3|
|     4     63     17     .06     .37| .67   -.9| .81   -.4|  .83   .71| 52.9  58.5| iccams4|
|     5     47     17    1.90     .33|1.99   2.4|2.64   3.3|  .32   .72| 35.3  51.6| iccams5|
|     6     74     17   -1.92     .47| .55  -1.3| .51  -1.3|  .82   .67| 76.5  66.1| iccams6|
|     7     65     17    -.23     .39| .81   -.4| .69   -.8|  .79   .71| 70.6  61.2| iccams7|
|     8     73     17   -1.71     .46|1.79   1.8|1.41   1.0|  .56   .68| 70.6  67.9| iccams8|
|     9     56     17     .91     .34| .71   -.9|1.00    .1|  .84   .72| 52.9  49.9| iccams9|
|---------------------------------+----------+----------+-----------+-----------+--------|
| MEAN    62.2   17.0     .00     .38|1.05    .1|1.12    .2|           | 58.8  58.2|        |
| S.D.     8.0     .0    1.16     .05| .50   1.3| .61   1.3|           | 12.4   6.3|        |
-----------------------------------------------------------------------------------------------
```

Despite being misfitting it was decided to keep item 5 in the measure as it appears to be the hardest and its removal could distort the measure.

Item fit analysis with item 5 removed

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-------------------------------------------------------------------------------
PERSON: REAL SEP.: 2.58  REL.: .87 ... ITEM: REAL SEP.: 2.35  REL.: .85

         ITEM STATISTICS:  ENTRY ORDER

-------------------------------------------------------------------------------------------------
|ENTRY   TOTAL  TOTAL           MODEL|   INFIT  |  OUTFIT  |PT-MEASURE |EXACT MATCH|        |
|NUMBER  SCORE  COUNT  MEASURE  S.E. |MNSQ  ZSTD|MNSQ  ZSTD|CORR.  EXP.| OBS%  EXP%| ITEM   |
|------------------------------------+----------+----------+-----------+-----------+--------|
|     1     65     17     .02     .43| .90   -.1| .83   -.3|  .76   .76| 70.6  65.6| iccams1|
|     2     56     17    1.39     .36|1.54   1.5|1.81   2.0|  .67   .77| 47.1  53.0| iccams2|
|     3     61     17     .68     .39| .63  -1.1| .67   -.8|  .85   .76| 76.5  61.2| iccams3|
|     4     63     17     .37     .41| .81   -.4| .93    .0|  .82   .76| 58.8  62.4| iccams4|
|     5     74     17   -2.07     .51| .71   -.7| .64   -.5|  .77   .71| 76.5  70.1| iccams6|
|     6     65     17     .02     .43|1.06    .3| .81   -.3|  .78   .76| 70.6  65.6| iccams7|
|     7     73     17   -1.80     .51|2.08   2.2|1.45    .9|  .61   .73| 64.7  73.2| iccams8|
|     8     56     17    1.39     .36| .84   -.4|1.25    .8|  .80   .77| 64.7  53.0| iccams9|
|------------------------------------+----------+----------+-----------+-----------+--------|
| MEAN    64.1   17.0     .00     .43|1.07    .1|1.05    .2|           | 66.2  63.0|        |
| S.D.     6.3     .0    1.22     .06| .46   1.0| .39    .9|           |  9.2   6.8|        |
-------------------------------------------------------------------------------------------------

Analysis 3 - continue

INPUT: 75 PERSON  8 ITEM  REPORTED: 17 PERSON  8 ITEM  5 CATS    WINSTEPS 3.72.3
-------------------------------------------------------------------------------

     PERSON - MAP - ITEM
         <more>|<rare>
    6          +
               |
             XX|
               |
               |
    5          +
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               |
               |
               |
             X |
    4          S+
             X |
               |
               |
               |
             X |
    3          +
               |
               |
               |T
             XX|
    2          +
          XXXX M|
               |
               |  iccams2  iccams9
             X |S
    1          +
               |
             X |  iccams3
            XX |  iccams4
               |
    0          +M iccams1  iccams7
              S|
               |
             X |
               |
   -1          +
               |S
               |
               |
               |  iccams8
   -2          +  iccams6
               |
              T|T
               |
               |
   -3          X  +
         <less>|<frequ>
```

Appendix 3: School Participation Agreement

Increasing Competence and Confidence in Algebra and Multiplicative Structures (ICCAMS 2) Research Project and Independent Evaluation

Durham University, University of Nottingham, and the University of Manchester (collectively "the Universities") are undertaking a research project entitled "Increasing Competence and Confidence in Algebra and Multiplicative Structures (ICCAMS 2)" (the "Project").

Through this document we wish to clarify the background of the Project along with the rights and obligations of the Universities and your School in the event you choose to participate.

Details of the Project including the expected involvement of a participating school can be found in Schedule 1 attached hereto.

ROLES AND OBLIGATIONS:

In the event your School chooses to participate in the Project, the following roles and obligations are hereby agreed by the Universities and your School:

Your School agrees to:

At sign up	
1.	Identify a lead contact in the school to liaise with Durham University and ensure that all responsibilities have been fulfilled and all necessary arrangements are in place.
2.	Provide Durham University with required information about the school.
3.	Identify and provide Durham University with the names of two nominated lead teachers for ICCAMS (to attend the training if school is allocated to receive the ICCAMS Maths intervention) one of whom should be senior in the Maths department.
September 2016	
4.	Send out opt-out consent letters to parents/caregivers of all Year 7 students and inform Durham University of the names of any students that wish to opt out.
5.	Securely provide Durham University with student information for all students in Year 7 except those who have opted out.
6.	Ask all Year 7 students to complete Attitudes to Maths questionnaires and return to University of Manchester.
7.	Ask all maths teachers who teach Key Stage 3 Maths to complete teacher surveys and return to University of Manchester.
July 2017, September 2017 and July 2018	
8.	Provide Durham University with updates to student information and information on which teachers are teaching which Year 7/8 classes (if any new students have joined the school or changed classes).

(continued overleaf)

June/July 2018	
9.	Ask all maths teachers who teach Key Stage 3 Maths to facilitate the completion of the MaLT maths assessment and Attitudes to Maths questionnaires and return to University of Manchester. Schools to arrange a suitable date with University of Manchester to complete the MaLT maths assessment and Attitudes to Maths questionnaires with all Year 8 students under exam conditions supported by a member of staff from University of Manchester.
Throughout the Project	
10.	Liaise with University of Manchester to allow researchers to visit the school to observe maths lesson practice and to talk with staff and pupils about maths teaching in the school if requested. This will include circulating information and consent forms for pupils and students provided by University of Manchester.

If allocated to the ICCAMS Intervention Group, your school also agrees to:

11.	Allow the two nominated lead teachers to attend 6 full days of ICCAMS PD spread across the 2016/17 school year and 3 full PD days across the 2017/18 school year (cover and travel costs not provided).
12.	Deliver 20 ICCAMS lessons to all Year 7 pupils during 2016/17 and 20 ICCAMS lessons to all Year 8 pupils during 2017/18 along with associated assessment tasks.
13.	Provide monthly, hour-long ICCAMS PD workshop sessions throughout each year for the KS3 Maths team led by the two Lead teachers using provided materials.
14.	Support visits from the local PD Lead (and occasionally other members of the research team) to the school to observe two ICCAMS lessons each year.

Durham University agrees to:

1.	Obtain consent from schools and parents for participation in the research, and for data matching so that National Pupil Database (NPD) data can be collated with project data to examine longer-term impacts of the programme.
2.	Store all data safely and securely.
3.	Inform schools of the results of the random allocation.
4.	Collate school and pupil level data provided by schools.
5.	Provide ICCAMS Intervention Group schools with teacher handbooks and resources to enable delivery of the ICCAMS Maths programme.
6.	Provide 9 sessions of PD to ICCAMS Intervention Group Lead Teachers and provide ongoing support to schools through local PD Leads in each area.
7.	Support and train PD Leads in each area.
8.	Securely share data provided by the school and necessary to complete the research, with University of Manchester and University of Nottingham.

University of Nottingham agrees to:

1.	Pay Comparison Group Schools £500 for completion of responsibilities detailed above up to end of September 2016 and pay Comparison Group Schools £1000 for completion of responsibilities detailed above to the end of the project.
2.	Store all data safely and securely.

University of Manchester agrees to:

1.	Store all data safely and securely.
2.	Conduct the random allocation of schools to ICCAMS Intervention Group or Comparison Group.
3.	Provide schools with MaLT Maths Assessments, student and staff questionnaires at appropriate points in the project.
4.	Work with the school lead contact to schedule the testing under exam conditions and support school with delivering this.
5.	Provide schools with the results from the MaLT Maths Assessment.
6.	Conduct the process evaluation including observation visits to schools, and interviews with staff and pupils and obtaining consent from participants for this aspect.
7.	Analyse data from the project in order to produce impact estimates.
8.	Produce an end of project evaluation report and share this with all participating schools.
9.	Share data provided by the school as necessary to complete the research with Durham University and University of Nottingham.
10.	Collate data collected as part of the project with data obtained from the National Pupil Database (NPD) and transfer school and pupil level data to the Education Endowment Foundation's (EEF) long term data archive for future research purposes.

DATA PROTECTION

a. For the purposes of this agreement Data, Personal Data and Process/Processing shall mean Data, Personal Data and Process/Processing as defined in Section 1 of the Data Protection Act 1998 ("the Act").

b. The Universities undertake to hold the all Personal Data shared by the School (the "Shared Data") securely and not to use such Data for any purpose other than in the course of the Project.

c. The Universities will hold the Shared Data in confidence and trust, and will not disclose any of the Shared Data, directly or indirectly, to any third party except as expressly permitted by this Agreement, without the express written consent of the School. The Universities may disclose the Shared Data within their organisation, but only to those having a need to know for the purpose of the Project.

d. The Universities shall ensure that all employees with access to the Shared Data have undergone training in data protection and in the care and handling of Personal Data.

e. The Universities shall be permitted to disclose Shared Data pursuant to a legal requirement or to the order of a court or administrative body of competent jurisdiction.

AGREEMENT TO PARTICIPATE AND WITHDRAWAL OF PARTICIPATION

Participation in the Project by your School is voluntary.

By completing, signing and returning the attached Consent Form you confirm your understanding of the Project and agree to all aspects of taking part in it. Please make sure to ask any questions you have about the Project before signing.

If your school or an individual from your school would like to withdraw from the Project they can do so at any point until the final data is collected (July 2018) by contacting the project administrator in the first instance (details below):

Project Administrator

Clare Collyer:

Email: **ICCAMS@cem.dur.ac.uk**

Tel: 0191 334 4682.

In the event your School chooses to participate in the Project, the Universities agree to perform the Project in keeping with their obligations as set out in this Participation Agreement.

This Participation Agreement may be executed in any number of counterparts, each of which shall be deemed to be an original, and all of which together shall constitute one and the same agreement. Each party acknowledges that an original signature or a copy thereof transmitted by facsimile or by PDF shall constitute an original signature for purposes of this Participation Agreement.

Accepted on behalf of Durham University	Accepted on behalf of University of Nottingham
Signature:	Signature:
Name/position:	Name/position:
Date:	Date:

Accepted on behalf of University of Manchester

Signature:

Name/position:

Date:

FORM OF CONSENT

Please complete and sign two copies of this Form of Consent, retaining one and returning the second copy to Clare Collyer at CEM, Rowan House, Mountjoy Research Centre, Durham University, Stockton Road, Durham DH1 3UZ.

- I confirm that I have read and understood the Participation Agreement for the ICCAMS 2 Project and have had the opportunity to ask questions about the Project and receive answers.

- I understand that by agreeing to take part in the Project the school will be randomly assigned in July 2016 to either the ICCAMS intervention group or the Comparison group:
    - Schools in the ICCAMS intervention group will begin the ICCAMS programme in 2016 and be expected to continue for two years.
    - Schools in the comparison group will receive £1500 (in two payments) for completing the required aspects of the project as set out in the Participation Agreement.

  I understand what is involved for schools in both groups and agree to the School taking part in the Project whichever group the school is assigned to.

- I agree to the responsibilities set out for the schools in this Participation Agreement and agree to deliver these.

- I consent to the school taking part in the above study.

Headteacher name: _____ Date: _____

Headteacher signature: _____

Email address: _____

School name and address: _____

_____

Schedule 1

THE PROJECT

Project Background

The ICCAMS 2 research project will work with schools over the next two years to support maths staff in developing Year 7 and Year 8 students' maths understanding, ability and confidence in order to investigate the impact of the ICCAMS Maths programme. The programme supports teachers in tackling students' common misconceptions around algebra and multiplicative reasoning and provides teachers with training, lesson plans and resources to help embed formative assessment in the Key Stage 3 maths classroom.
The programme is comprised of 40 evidence-informed lessons with additional assessment tasks and extensive teacher professional development (PD) to be delivered across two years. Lessons should be used with students at all levels and are designed to improve students' knowledge and use of algebra and multiplicative reasoning. Previous research using the ICCAMS programme with students in Year 8 suggested that ICCAMS doubled the rate of learning compared to a comparison group.

Research Aims

This project aims to study the impact that ICCAMS Maths has on students' maths attainment and attitudes towards maths. It will also investigate changes in teachers' practice and knowledge as a result of taking part in the programme. This will be done by comparing students and teachers in schools that use ICCAMS Maths over a two year period, with schools that do not use ICCAMS.

Research Design

Within each of our 5 areas participating schools will be randomly allocated to either:

1. **ICCAMS Intervention Group** – to receive the ICCAMS Maths programme between September 2016 and July 2018.
2. **Comparison Group** – to continue business as usual with KS3 Maths teaching and receive financial incentive of £1500 on completion of research aspects of the project.

Random allocation is essential to the evaluation as it is the best way of establishing what effect ICCAMS has on students' attainment. It is important that schools understand and agree to this process. Schools that are allocated to the comparison group still need to remain part of the project and complete relevant activities e.g. providing data, completing student assessment and teacher questionnaires.

What would the ICCAMS Maths Programme require of a Participating school?

Schools that are assigned to ICCAMS Intervention Group will use the programme with all Year 7 students starting in September 2016 and to continue to use the programme with the same students when they are in Year 8. This comprises of 20 lessons in Year 7 and 20 lessons in Year 8 with associated formative assessment tasks.

A full PD programme (full day sessions: 6 in first year and 3 in the second year) will be provided to two nominated Lead Teachers from each school in a location central to schools in your region. These PD sessions will be led by an external experienced PD Lead trained by the ICCAMS research team. These school's Lead Teachers will explore ICCAMS Maths in-depth during these sessions and will provide monthly shorter PD workshop sessions to other KS3 maths teachers in their school to enable them to use the lessons with Year 7 (later Year 8) students. Resources will be provided for internal staff PD including a handbook containing the programme theory and lesson plans for all teachers as well as PD plans and resources. At least one of the Lead teachers should be senior in the maths department while the other can be any member of staff willing to attend and to disseminate the training back in school. Both teachers need to attend all 9 PD sessions.

The local PD Lead (and possibly other members of research staff) will visit each ICCAMS Intervention Group school to observe two ICCAMS Maths lessons per year. One lesson should be taught by an ICCAMS Lead teacher and one by another Year 7 maths teacher. These observations are done to provide support to the school and teachers involved and to provide research data on how ICCAMS lessons are delivered in practice.

All schools involved in the project (ICCAMS Intervention Group and Comparison Group)

All schools signed up to the project will need to provide the research teams with information about their school, students and teachers at different stages during the project. Schools will need to deliver maths assessments at the end of the project and also questionnaires at the start and end of the project.

Information required from schools

On signing up to the project schools will be asked to provide the following information about the school via email or post:

- School contact details and name of main contact for the project
- Name of Head Teacher and Head of Maths
- Expected size of year 7 intake 2016/17 and number of Year 7 Maths classes
- Number of maths teaching staff for year 7
- Names of two nominated lead teachers for ICCAMS (to attend full PD if school is allocated to receive the programme)
- Name of school main contact for project

In September 2016 schools will be asked to:

- Distribute opt-out consent forms to parents and caregivers of all Year 7 students. These letters will ask for consent for the child's data to be used by the three Universities and our funders for the research project. Should a parent wish for their child not to be involved they should inform the school or the research team directly. Schools will need to pass on names of any children who have opted-out in September and throughout the project as received. Opting out of the research does not affect whether a student is involved in the ICCAMS teaching in the school.
- Provide a list of all students in Year 7 (except those who have opted out of the research), including names, gender, date of birth, free school meals status, unique pupil number (UPN), Key Stage 2 results, Maths class.
- Provide a list of which teachers will be teaching which Maths classes.

At the end of Year 7 and the beginning and end of Year 8, schools will be asked to provide an update to student, class and teacher information.

Student assessment

Schools will be supported in facilitating the delivery of maths assessments to all students in Year 8 in June/July 2018 by the University of Manchester. The assessment will be the Maths Assessment for Learning and Teaching (MaLT), a standardised paper maths assessment which covers the full maths curriculum. This assessment will take around 45 minutes. Results from the assessment will also be returned to the school for their own use. The assessment will need to be delivered under exam conditions.

Student questionnaires

Students will be asked to complete questionnaires exploring attitudes towards maths in September 2016 and again in June/July 2018 (delivered at the same time as the assessment). These should take no more than 10 minutes.

Teacher questionnaires

Teachers involved in teaching Key Stage 3 Maths will be asked to complete questionnaires in September 2016 and again in June/July 2018. These questionnaires will explore teacher attitudes and practice particularly in regards to formative assessment and should take no longer than 10 minutes to complete.

Process evaluation

During the project, members of the evaluation team from the University of Manchester will visit ten schools to observe ICCAMS lessons (and other maths lessons within the comparison schools) and to talk to students and teachers about their experiences of maths and the ICCAMS Maths programme. Participation from students and staff in these visits will be voluntary. Consent for participation in the process evaluation will be sought from parents and staff by the University of Manchester.

How will the data collected from schools be used in this project?

Data collected as part of this project will be used only for research purposes and will be collected to evaluate the ICCAMS programme, its impact on staff and students and how the programme is implemented. No school, teacher or student would be identifiable from any report arising from the research.

Student data provided as part of this project will be linked with further information about students from the National Pupil Database (held by the Department for Education) and other official records, and shared with: the Department for Education, our funder (Education Endowment Foundation, EEF), and the EEF's data contractor FFT Education so they can investigate the longer term impact of different educational interventions. Data will also be transferred in a non-identifiable form to the UK Data Archive with restricted access for research purposes only.

About the teams

Durham University (Trial Lead – Vic Menzies) will be the main contact through the trial and they will work with and support schools who wish to sign up to the project. They will also work closely with the PD Leads and will be looking at how the programme is implemented in different schools.

University of Nottingham (Project Lead – Jeremy Hodgen) are developing the ICCAMS programme and the professional development training and have overall responsibility for the project.

University of Manchester (Evaluation Lead – Maria Pampaka) will be the independent evaluator looking at the impact the programme has on school outcomes, as well as being responsible for the random ballot, the assessment and other outcome measures and the process evaluation.

Appendix 4: Initial Letters to Parents, student and teacher consent forms (September 2016)

Appendix 4A: Revised Parental Information Sheet to Control Schools

ICCAMS Maths

Clare Collyer (Project Administrator)
Durham University, Rowan House, Mountjoy Centre,
Stockton Road, Durham, DH1 3UZ.
Telephone: 0191 334 4682
Email: ICCAMS@cem.dur.ac.uk
www.iccams-maths.org

(date)

Dear Parent/Carer

ICCAMS Maths Independent Evaluation Research Study

I am writing to let you know about a national research study which will be taking place in your child's school over the next two years (2016/2017 and 2017/18).

As part of the study, your child will be asked to complete a questionnaire about their attitudes to maths and their maths teaching during their normal classroom lessons at two time points. They will also be asked to complete a maths assessment at the end of Year 8. They will be free to choose not to participate in the study. Completing these aspects will take around 10 minutes (in 2016/17) and 50 minutes (in 2017/18). Data about your child will also be passed from the school to the research team to help us complete the research. The information provided will be used to look at whether the ICCAMS Maths programme improves maths attainment. We expect the findings to benefit teaching and learning in the future.

If you agree to your child taking part in the study, then you do not need to do anything. If you would prefer your child was not part of the study or have any questions, you should contact Clare Collyer, Project Administrator, Durham University, in the first instance on 0191 334 4682, or email ICCAMS@cem.dur.ac.uk or inform you child's school.

We provide more information about the project below. Please read this information before deciding whether your child should take part.

What is the ICCAMS Research Study and why are we doing it?

Along with 108 other schools across England, «School» is taking part in a research project to study whether the ICCAMS Maths programme affects students' maths attainment and attitudes to maths. Some schools will be implementing a different way of teaching maths (called ICCAMS Maths) for Year 7 lessons this year, and Year 8 lessons next year. We would like to compare the learning and pupils' attitudes in those schools to schools like «School», where normal maths teaching is taking place. By doing this we can find out if this new initiative makes a difference to pupil learning and attitudes.

Who is doing the research?

Durham University are working with the University of Nottingham and University of Manchester to do this project. This study is funded by the Educational Endowment Foundation (EEF) and involves Year 7 pupils in 109 schools around England. The project is led by Vic Menzies at Durham University, Maria Pampaka at the University of Manchester and Jeremy Hodgen at the University of Nottingham.

What exactly does the research involve for my child?

The head teacher of the school has given permission for the school to take part, and the study will involve pupils in Year 7. The University of Manchester team will be asking pupils to complete a questionnaire about their attitudes to maths at the beginning of the project in September 2016 and again at the end of the project in summer 2018. They will also be asking pupils to complete a maths assessment at the end of the study in summer 2018. The research project team will analyse the assessment data, and will also pass the results to the school to inform teaching.

Results from the group of schools delivering the ICCAMS lessons will be compared to results from schools like your child's where maths teaching is being done as normal to see whether ICCAMS helps pupils. The funder, the EEF, will

Durham University | The University of Nottingham | MANCHESTER 1824 The University of Manchester

also look at the longer term impact of ICCAMS and will continue to look at pupil academic outcomes (e.g. GCSE and A-Level results) beyond the end of the ICCAMS programme in July 2018.

How will my child's data be used?

To help us with this research the school will pass on some background information about pupils (name, date of birth, Key Stage 2 results, Free School Meals Status, gender, and Unique Pupil Number) to Durham University who will share this with the other university teams. This information will enable the research team to match up the information from the maths assessment and questionnaires with past attainment as well as other contextual information (such as Free School Meal status) from the National Pupil Database (NPD). All data collected will be treated with the strictest confidence and will only be used for research purposes. The data for your child's school will be analysed together with data from other schools, and no individual pupils or schools will be named or identified in any report.

For the purpose of the research, data collected as part of this project will be shared between the three universities involved (Durham University, University of Manchester and University of Nottingham). The University of Manchester will also share pupil data (name, date of birth, school, year group, UPN) with the Department for Education in order to link to the NPD. The project data will be shared with the EEF and the EEF's data managers (FFT) to allow the longer-term impact of the ICCAMS programme to be investigated. In addition, pupil data will be shared anonymously with the UK Data Archive for future research purposes.

Does my child need to take part in the research?

Taking part in the research is optional. If you are happy for your child to take part and for your child's data to be used as described you do not need to do anything. **If you would prefer we did not use your child's data in this research study you can opt-out by contacting** the school office who will pass details onto the schools project lead.. You can also opt-out by contacting the research team directly using the project administrator contact details below. You can opt out at any point during the project until September 2018.

Does the research have ethical approval?

The research study has received ethical approval from the Ethics Committees at Durham University (date: 14/12/15), the University of Manchester (DATE) and the University of Nottingham (08/10/15).

Who should I contact about questions or concerns?

If you have any questions, requests or concerns about the study please contact Clare Collyer, Project Administrator, Durham University, in the first instance on 0191 334 4682, or email clare.collyer@cem.dur.ac.uk. These will then be passed onto the best person to answer them.

Any formal concerns about this study should be addressed to the School of Education Ethics Sub-Committee, Durham University via email to ed.ethics@durham.ac.uk and/or to the Research Governance and Integrity Manager, University of Manchester via email to research.complaints@manchester.ac.uk or phone 0161 275 2674.

Yours faithfully,

Victoria Menzies, Research Trial Lead, Durham University

MARIA SIGNATURE

Maria Pampaka, Evaluation Lead, University of Manchester

JEREMY SIGNATURE

Jeremy Hodgen, ICCAMS Developer Lead, University of Nottingham

Project Information Sheet Version 2 – 14th September 2016

Appendix 4B: Revised Parent Information Sheet to Intervention Schools

Clare Collyer (Project Administrator)
Durham University, Rowan House, Mountjoy Centre,
Stockton Road, Durham, DH1 3UZ.
Telephone: 0191 334 4682
Email: ICCAMS@cem.dur.ac.uk
www.iccams-maths.org

Dear Parent/Carer

ICCAMS Maths Research Study -

Increasing Competence and Confidence in Algebra and Multiplicative Reasoning

I am writing to let you know about a national maths research study which your child's school will be participating in over the next two years (2016/2017 and 2017/18).

As part of the study, your child will be asked to complete a questionnaire about their attitudes to maths and their maths teaching during their normal classroom lessons at two time points. They will also be asked to complete a maths assessment at the end of Year 8. They will be free to choose not to participate in the study. Completing these aspects will take around 10 minutes (in 2016/17) and 50 minutes (in 2017/18). Data about your child will also be passed from the school to the research team to help us complete the research. The information provided will be used to look at whether the ICCAMS Maths programme (being used by the school for the next two years) improves maths attainment. We expect the findings to benefit teaching and learning in the future.

If you agree to your child taking part then you do not need to do anything. If you would prefer your child was not part of the study or have any questions you should contact Collyer, Project Administrator, Durham University, in the first instance on 0191 334 4682, or email ICCAMS@cem.dur.ac.uk or inform you child's school.

We provide more information about what the project involves below. Please read this information before deciding whether your child should take part.

What is the ICCAMS Programme?

«School» has signed up to be involved with the ICCAMS programme along with more than 100 other schools across England. This will involve teachers in the school delivering the ICCAMS programme in some maths lessons to all Year 7 pupils in 2016/17 and Year 8 pupils in 2017/18. The ICCAMS programme supports teachers in teaching algebra and multiplicative reasoning and fits within the National Curriculum.

Who is doing the research?

Durham University is working with University of Nottingham and University of Manchester, to study the impact that the ICCAMS programme has on students' maths attainment and attitudes to maths. This study is funded by the Educational Endowment Foundation (EEF) and involves Year 7 pupils in schools around England.

The project is led by Vic Menzies at Durham University, Maria Pampaka at the University of Manchester and Jeremy Hodgen at the University of Nottingham.

What does the research involve for my child?

The head teacher of the school has given permission for the school to take part, and all Year 7 pupils will be taught using the ICCAMS approach for some lessons in Year 7 and in Year 8. The University of Manchester team will be asking pupils to complete a questionnaire about their attitudes to maths at the beginning of the project in September 2016 and again at the end of the project in summer 2018. Pupils will also be asked to complete a maths assessment at the end of the study in summer 2018. The research project team will pass the results of the assessment to the school to inform teaching.

Results from all schools delivering the ICCAMS lessons will be compared to results from a comparison group whose pupils have not been taught using ICCAMS to see how much ICCAMS helps pupils. The funder, the EEF, will also look at

the longer term impact of ICCAMS and will continue to look at pupil academic outcomes (e.g. GCSE and A-Level results) beyond the end of the ICCAMS programme in July 2018.

How will my child's data be used?

To help us with this research the school will pass on some background information about pupils (name, date of birth, gender, Key Stage 2 results, free school meal status and Unique Pupil Number) to Durham University who will share this with the other university teams. This information will enable the research team at Manchester to match up the information from the maths assessment and questionnaires with past attainment as well as other contextual information (such as Free School Meal status) from the National Pupil Database (NPD). All data collected will be treated with the strictest confidence and will only be used for research purposes –specifically to evaluate the ICCAMS Maths Programme. The data for your child's school will be analysed, together with data from other schools, and no individual pupils or schools will be named or identified in any report.

For the purpose of the research, data collected as part of this project will be shared between the three universities involved (Durham University, University of Manchester and University of Nottingham). The University of Manchester will also share pupil data (name, date of birth, school, year group, UPN) with the Department for Education in order to link to the NPD. The project data will be shared with the EEF and the EEF's data managers (Fisher Family Trust) to allow the longer-term impact of the ICCAMS programme to be investigated. In addition, pupil data will be shared anonymously with the UK Data Archive for future research purposes.

Does my child need to take part in the research?

The ICCAMS programme will be taking place over the next two years in your child's school. However, taking part in the research project is optional. If you are happy for your child to take part and your child's data to be used for the purposes described you do not need to do anything. **If you would prefer we did not use your child's data in this research study you can opt-out by contacting** the school office who will pass details onto the schools project lead. **You can also opt-out by contacting the research team directly using the Project Administrator contact details below.** You can opt-out at any time during the project until September 2018.

Does the research have ethical approval?

The research study has received ethical approval from Ethics Committees at Durham University (date: 14/12/15), the University of Manchester (DATE) and the University of Nottingham (08/10/15).

Who should I contact about questions or concerns?

If you have any questions, requests or concerns about the study please contact Clare Collyer, Project Administrator, Durham University, in the first instance on 0191 334 4682, or email ICCAMS@cem.dur.ac.uk. These will then be passed on to the best person to answer them.

Any formal concerns about this study should be addressed to the School of Education Ethics Sub-Committee, Durham University via email to ed.ethics@durham.ac.uk and/or to the Research Governance and Integrity Manager, by emailing: research.complaints@manchester.ac.uk or by telephoning 0161 275 2674 or 275 2046.

Yours faithfully,

Victoria Menzies, Research Trial Lead

Durham University

ELECTRONIC SIGNATURE

Maria Pampaka, Evaluation Lead,

University of Manchester

ELECTRONIC SIGNATURE

Jeremy Hodgen, ICCAMS Developer Lead

University of Nottingham

Appendix 4C: Research Privacy Notice

MANCHESTER 1824
The University of Manchester

Privacy Notice for Research Participants

Research at UoM

The University of Manchester (We) conducts research to the highest standards of research integrity to ensure it is both beneficial and enriches higher learning. As stated in our University Charter our research outcomes are in the public interest. As part of our commitment to research integrity, we follow the General Data Protection Regulation (GDPR), the UK Data Protection Act 2018 (DPA) and in the case of health and care research, the UK Policy Framework for Health and Social Care Research.

We promise to respect the confidentiality and sensitivity of the personal information that you provide to us, that we get from other organisations, and that we share with other collaborating organisations (such as other Universities or our research funders). We will tell you how we will use your information, how we will keep it safe and who it will be shared with. We commit to keeping your personal information secure and will not use it to contact you for any other purpose unless you have agreed to this.

Research has a special status under GDPR. Research conducted by our staff and postgraduate research students (those studying for a PhD or Masters in Philosophy) is defined as making an original contribution to knowledge which is published in order to share that knowledge.

Research projects may also be conducted by undergraduate and taught postgraduate (Masters in Arts/Science etc.) students to fulfil the requirements of their programme of study. Although these projects are not intended to make an original contribution to knowledge, nor are they usually published, they are essential to the student's education and are therefore included under our definition of research.

We are usually the Data Controller for research studies. This means that we will decide how your personal information is created, collected, used, shared, archived and deleted (processed). When we do this we will ensure that we collect only what is necessary for the project and that you have agreed to this. If any other organisation will make decisions about your information, this will be made clear in the participant information sheet provided to you.

If more than one organisation work together on a project, there may be two or more Data Controllers for a specific project. If this happens, the organisations will have agreements in place which outline their responsibilities and details of this will be make clear in the Participant Information Sheet, provided to you.

Information about you

'Personal data' means any information which can identify you. It can include information such as your name, gender, date of birth, address/postcode or other information such as your opinions or thoughts. It can also include information which makes it possible to identify you, even if your name has been removed (such as quotes or social media postings).

We will only ever collect personal information that is appropriate and necessary for the specific research project being conducted. The specific information that we will collect about you will be listed in the Participant Information Sheet, given to you by the research team.

We may process some information about you that is considered to be 'sensitive' and this is called 'special category' personal data. This includes, but is not limited to, information such as your ethnicity, sexual orientation, gender identity, religious beliefs, details about your health or past criminal convictions. These types of personal information require additional protections, particularly in relation to sharing, which the University ensures are in place.

Under GDPR we must have special safeguards in place to help protect your rights and freedoms when using your personal information and these are:

- Policies and procedures that tell our staff and students how to collect and use your information safely.
- Training which ensures our staff and students understand the importance of data protection and how to protect your data.
- Security standards and technical measures that ensure your information is stored safely and securely.
- All research projects involving personal data are scrutinised and approved by a research ethics committee in line with University policies and procedures.
- Contracts with companies or individuals not associated with the University have confidentiality clauses to set out each party's responsibilities for protecting your information.
- We carry out data protection impact assessments on high risk projects to ensure that your privacy, rights as an individual or freedoms are not affected.
- If we use collaborators outside of Europe, we will ensure that they have adequate data protection laws or are part of privacy and security schemes such as the privacy shield in the US.

In addition to the above University safeguards the GDPR and the DPA also require us to meet the following standards when we conduct research with your personal information:

(a) the research will not cause damage or distress to someone (e.g., physical harm, financial loss or psychological pain).

(b) the research is not carried out in order to do or decide something in relation to an individual person, unless the processing is for medical research approved by a research ethics committee.

(c) the Data Controller has technical and organisational safeguards in place (e.g. appropriate staff training and security measures).

(d) if processing a special category of data, this must be subject to a further public interest test to make sure this particularly sensitive information is required to meet the research objectives.

The Legal Part

Data protection law requires us to have a valid legal reason to process and use personal data about you. This is often called a 'legal basis'. GDPR requires us to be explicit with you about the legal basis upon which we rely in order to process information about you.

For research the legal reason is *"Processing is necessary for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller"* (Article 6 of GDPR):

For sensitive information the legal reason is: *"the processing is necessary for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes... which shall be proportionate to the aim pursued, respect the essence of the right to data protection and provide for suitable and specific measures to safeguard the fundamental rights and the interests of the data subject"*. (Article 9 of GDPR).

When research involves criminal convictions, the legal reason is listed in Schedule 1 of the Data Protection Act 2018 which requires that special safeguards are in place.

Where we need to rely on a different legal reason, such as consent, this will be listed in the Participant Information Sheet provided to you. In clinical trials or medical studies, for example, we may use the following reason:

- *"Processing is necessary for the purposes of preventive or occupational medicine, for the assessment of the working capacity of the employee, medical diagnosis, the provision of health or social care or treatment or the management of health or social care systems and services on the basis of Union or Member State law or pursuant to contract with a health professional and subject to the conditions and safeguards"*.

We may also use your personal information for additional research purposes, such as other analysis or future projects on the same research topics. This is known as a secondary use or purpose.

If we want to do this it will be explained to you in the Participant Information Sheet and we will ensure that your information will not be used in ways which might have a direct impact on you (such as damage or distress) or will lead to decisions being made about you.

Sharing your information

Your personal information will be kept confidential at all times and researchers are asked to de-identify it (anonymise), pseudonymise (remove any information which can identify you such as your name and replace this with a unique code or key) or delete it as soon as possible. However in some cases it may not be possible to de-identify your information as it is necessary in order to achieve the aims of the research. If this is the case you will be informed of this in the Participant Information Sheet.

Your personal information as well as any de-identified information will only be shared with members of the research team in order to conduct the project. If they need to share your information with anyone else including anyone outside of the European Economic Area (which includes all countries of the European Union as well as Norway, Iceland and Liechtenstein), you will be told who they are and why this is the case in the Participant Information Sheet.

We also sometimes use products or services provided by third parties who carry out a task on our behalf, such as Dropbox for Business, which is used for sharing research data. These third parties are known as data processors and when we use them we have agreements in place to ensure your information is kept safe. This does not always mean that they access your information but if they do this will be outlined in the Participant Information Sheet. As Data Controller, we will always remain responsible for keeping your information safe throughout the research.

We will only keep your personal information for as long as necessary to complete the aims of the research. However, some personal information (including signed records of consent) will be kept for a minimum amount of time as required by external funders or our policies and procedures. You can read more about how long we will keep this information for in our retention schedule. The Participant Information Sheet will state how long your personal information will be kept and for what purpose.

For some research projects, your de-identified or pseudonymised information will be kept after the project has ended, placed into a data repository/online archive for sharing with other researchers or used in future research. If the researchers would like to do this with your information you will be told in the Participant Information Sheet.

When using research repositories, researchers are often required to upload their supporting or underlying data which may be identifiable or sensitive. The repositories have technical controls in place to ensure that only authorised individuals can access the information.

Your rights

By law you have rights in relation to the personal information we hold about you. These include the right to:

- See the information/receive a copy of the information;
- Correct any inaccurate information;
- Have any information deleted;
- Limit or raise concerns to our processing of the information;
- Move your information ("portability").

These rights only apply to your information before it is anonymised as once this happens we can no longer identify your specific information. Sometimes your rights may be limited if it would prevent or delay the research. If this happens you will be informed and have the right to complain about this to the Information Commissioner.

If you have any questions about how your personal information is used, or wish to exercise any of your rights, please consult the University's data protection webpages. If you need further assistance, please contact the University's Data Protection Officer, Alex Daybank (dataprotection@manchester.ac.uk) or write to:

The Data Protection Officer
Information Governance Office, Christie Building
University of Manchester, Oxford Road
Manchester M13 9PL

If you are not happy with the way your information is being handled, or with the response received from us, you have the right to lodge a complaint with the Information Commissioner's Office at Wycliffe House, Water Lane, Wilmslow, SK9 5AF (https://ico.org.uk/).

Appendix 5: Updated Letters to Parents and Schools (after GDPR)

Appendix 5A: GDPR Letter to Schools (June 2018)

Room B4.1, Ellen Wilkinson Building
University of Manchester
Greater Manchester
M13 9PL

6th June 2018

Dear [insert name of head or lead teacher],

Information on ICCAMS Maths Independent Evaluation Research Study

What is this study?

As you know you are taking part in the evaluation of a project called ICCAMS Maths. This study is funded by the Educational Endowment Foundation (EEF) and involved Year 7 (now Year 8) students in 109 schools around England. The project intervention and its delivery to schools is led by Jeremy Hodgen (UCL Institute of Education, previously at Nottingham University) and Vic Menzies (Durham University), and the independent evaluation by Maria Pampaka (University of Manchester).

More information on the project can be found at: https://educationendowmentfoundation.org.uk/projects-and-evaluation/projects/increasing-competence-and-confidence-in-algebra-and-multiplicative-structur/

What information are we collecting, and why?

You will already have been contacted by a member of the evaluation team to arrange for students to take a maths test and complete a brief questionnaire about their maths attitudes and perceptions of maths lessons. The results will help us find out whether the ICCAMS Maths programme makes a difference to pupil learning and attitudes. This will take 50 minutes and will be administered between June and July 2018 by staff from University of Manchester with support from invigilators from your school. In addition we will be sending a link (and hard copy) to a teacher survey about teachers' practices in mathematics lessons.

Who has access to the information?

For the purposes of research, the responses from the maths assessment and questionnaires will be linked to background information about pupils (name, date of birth, Key Stage 2 results, Free School Meals Status, gender, and Unique Pupil Number) held by the National Pupil Database (NPD, held by the Department for Education, part of the UK Government) or provided by the school. Pseudoanonymised data (information that does not contain a name but which enables identification by use of an identification number) will be shared with the Education Endowment Foundation (EEF, who funded the trial), EEF's data processors Fischer Family Trust, Durham University and, in an anonymised form, with other research teams and potentially the UK Data Archive. Further matching to NPD data may take place during subsequent research.

Test results will be disclosed to the school. It is then for the school to justify how you use this data – the school will be obliged to inform parents and carers about this.

How do we ensure this information is managed securely?

Student and teacher data will be treated with the strictest confidence. We will not be transferring any identifiable information outside the EU and will be taking appropriate measures to ensure it remains secure at all times. This will be achieved with the use of password protected transfer, and the use of secure servers when transferring data between the research teams and to Fischer Family Trust. We will not use your students' and teachers' names or the name of any school in any report arising from the research. A pseudoanonymised dataset will be transferred to EEF's data processors, Fischer Family Trust at the end of the project. Responses to tests and questionnaire responses will be linked to NPD data and then analysed anonymously. Once matching and reporting of findings is completed all personal data will be destroyed in line with our universities' procedures (maximum length held 10 years).

Data for this project is being used in line with public interest (Article 6 (1)(e) of the General Data Protection Regulation) to carry out research and inform future educational provision in relation to mathematics teaching and learning.

Your choices

Students and teachers can withdraw at any time by 1st September 2018. If you know of students who chose (either on their own or via their parents/carers) NOT to take part in the research and their data not to be processed as above please let us know. Similarly if you have any questions about this research, please inform Jack Quinn on 0161 275 3385, or email **iccams-maths@manchester.ac.uk**. Alternative contacts are also provided at the end of this letter.

Thank you again for your support for this important study.

Kind regards,

Maria Pampaka

Evaluation Lead, University of Manchester

Vic Menzies

Trial Delivery Lead, Durham University

Jeremy Hodgen

ICCAMS Developer Lead, University College London

For further information about how the delivery team, Durham University and UCL, will process personal data as part of this project please contact:

ICCAMS Research Team – School of Education, Durham University, Leases Road, Durham, DH1 1TA

ICCAMS Project Administrator - Email: **mary.l.nezzo-thompson@durham.ac.uk** Phone: 0191 334 4682

Durham University's privacy statement relating to the project can be found at: **http://iccams-maths.org/durham-privacy-notice/**

The University of Manchester's privacy notice for research participants which explains how data is processed at Manchester can be found at: **https://www.manchester.ac.uk/discover/privacy-information/data-protection/privacy-notices/**

Appendix 5B: GDPR Letter to Parents and Carers (June 2018)

Room B4.1, Ellen Wilkinson Building
University of Manchester
Greater Manchester
M13 9PL

6th June 2018

Dear Parent/Carer,

ICCAMS Maths Independent Evaluation Research Study

What is this study?

I am writing to let you know about the final stage of the ICCAMS evaluation.

We have previously let you know about a project called ICCAMS Maths. This study is funded by the Educational Endowment Foundation (EEF) and involved Year 7 (now Year 8) pupils in 109 schools around England. The project intervention and its delivery to schools is led by Jeremy Hodgen (UCL Institute of Education, previously at Nottingham University) and Vic Menzies (Durham University), and the independent evaluation by Maria Pampaka (University of Manchester).

More information on the project can be found at https://educationendowmentfoundation.org.uk/projects-and-evaluation/projects/increasing-competence-and-confidence-in-algebra-and-multiplicative-structur/

How will we collect this information, and why?

As part of this evaluation, we now need your child to take a maths test and complete a brief questionnaire about their maths attitudes and perceptions of maths lessons. The results will help us find out whether the ICCAMS Maths programme makes a difference to pupil learning and attitudes. This will take 50 minutes and will be administered between June and July 2018 by staff from University of Manchester with support from your child's school. We will also provide the maths tests results to the school for their own use as described in previous correspondence.

Who has access to the information?

For the purposes of research, the responses from the maths assessment and questionnaires will be linked to background information about pupils (name, date of birth, Key Stage 2 results, Free School Meals Status, gender, and Unique Pupil Number) held by the National Pupil Database (NPD, held by the Department for Education, part of the UK Government) or provided by the school. Pseudoanonymised data (information that does not contain a name but which enables identification by use of an identification number) will be shared with the Education Endowment Foundation (EEF, who funded the trial), EEF's data processors Fischer Family Trust, Durham University and, in an anonymised form, with other research teams and potentially the UK Data Archive. Further matching to NPD data may take place during subsequent research.

Test results will be shared with schools, as previously agreed, as this is expected to support your child's and others education. As a parent or carer, you have the right to object to the sharing of test results with the school. You will need to inform us if you object to this (see information at the end of this letter).

How do we ensure this information is managed securely?

Your child's data will be treated with the strictest confidence. We will not be transferring any identifiable information outside the EU and will be taking appropriate measures to ensure it remains secure at all times, including the use of password protected transfer, and the use of secure servers. We will not use your child's name or the name of the school in any report arising from the research. We expect that your child will enjoy doing the tests and being part of the project. A pseudoanonymised dataset will be transferred to EEF's data processors, Fischer Family Trust at the end of the project . Data from your child's test and questionnaire responses will be linked to NPD data and then analysed anonymously. Once matching and reporting of findings is complete all personal data will be destroyed in line with our universities' procedures.

Data for this project is being used in line with public interest (Article 6(1)(e) of the General Data Protection Regulation) to carry out research and inform future educational provision in relation to mathematics teaching and learning.

Your choices

Your child may withdraw at any time until 1st September 2018. If you would prefer your child NOT to take part in the research, or their data not to be processed as above, or have any questions about this research, please inform Jack Quinn on 0161 275 3385, or email iccams-maths@manchester.ac.uk**.** Your child will still have to take the test, but their test will not be passed to us. You could also use the alternative contacts at the end of this letter – your choices will be communicated between the teams so you only have to inform us once.

Thank you again for your support for this important study.

Kind regards,

Maria Pampaka

Evaluation Lead, University of Manchester

Vic Menzies

Trial Delivery Lead, Durham University

Jeremy Hodgen

ICCAMS Developer Lead, University College London

For further information about how the delivery team, Durham University and UCL, will process personal data as part of this project please contact:

ICCAMS Research Team – School of Education, Durham University, Leases Road, Durham, DH1 1TA

ICCAMS Project Administrator - Email: mary.l.nezzo-thompson@durham.ac.uk Phone: 0191 334 4682

Durham University's privacy statement relating to the project can be found at: http://iccams-maths.org/durham-privacy-notice/

The University of Manchester's privacy notice for research participants which explains how data is processed at Manchester can be found at: https://www.manchester.ac.uk/discover/privacy-information/data-protection/privacy-notices/

Appendix 6: ICCAMS Material Examples

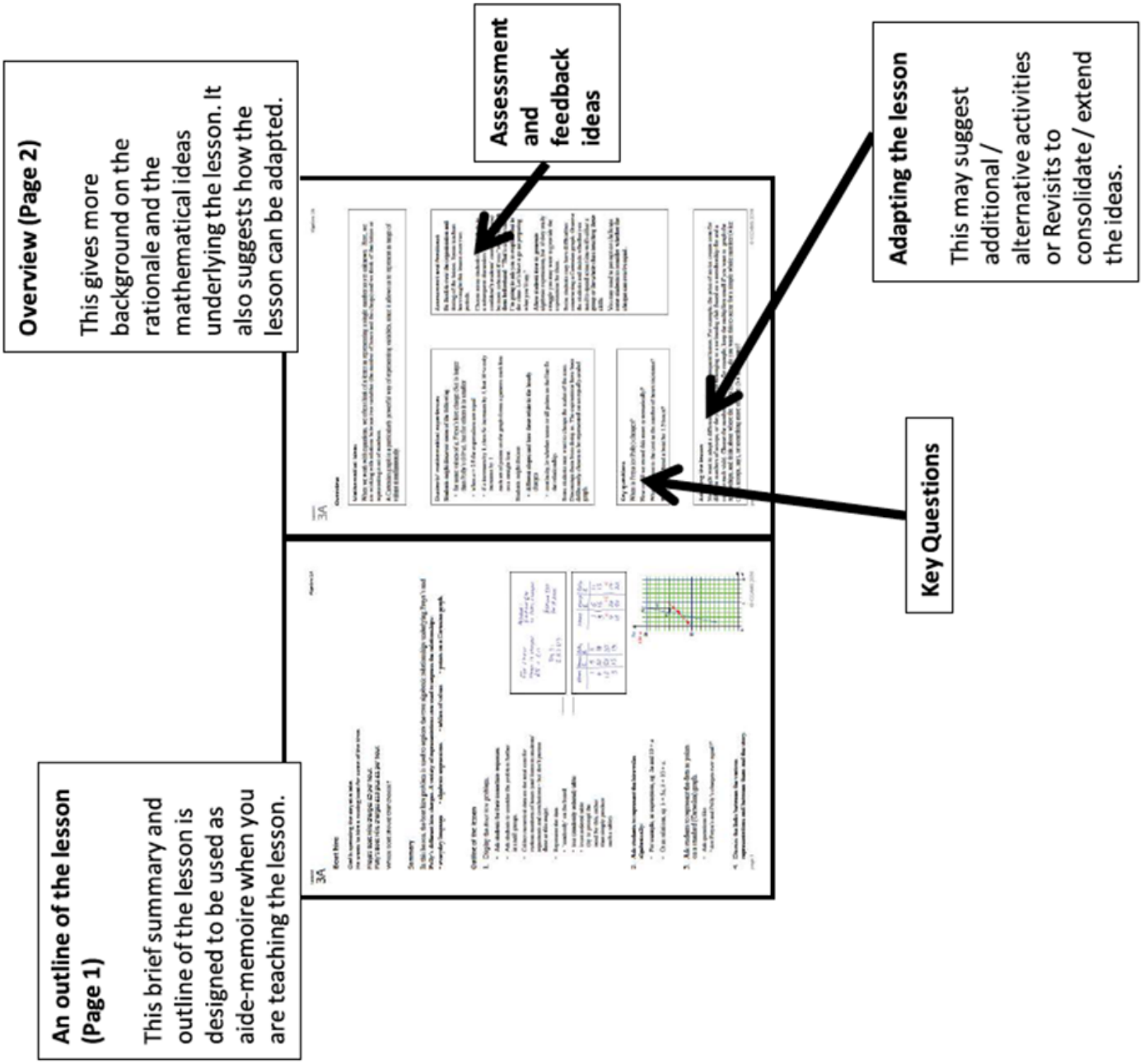


Figure 6A: Annotated description of Lesson 3A, as presented to LD during PD session 1 (from "PD session 1" slides)

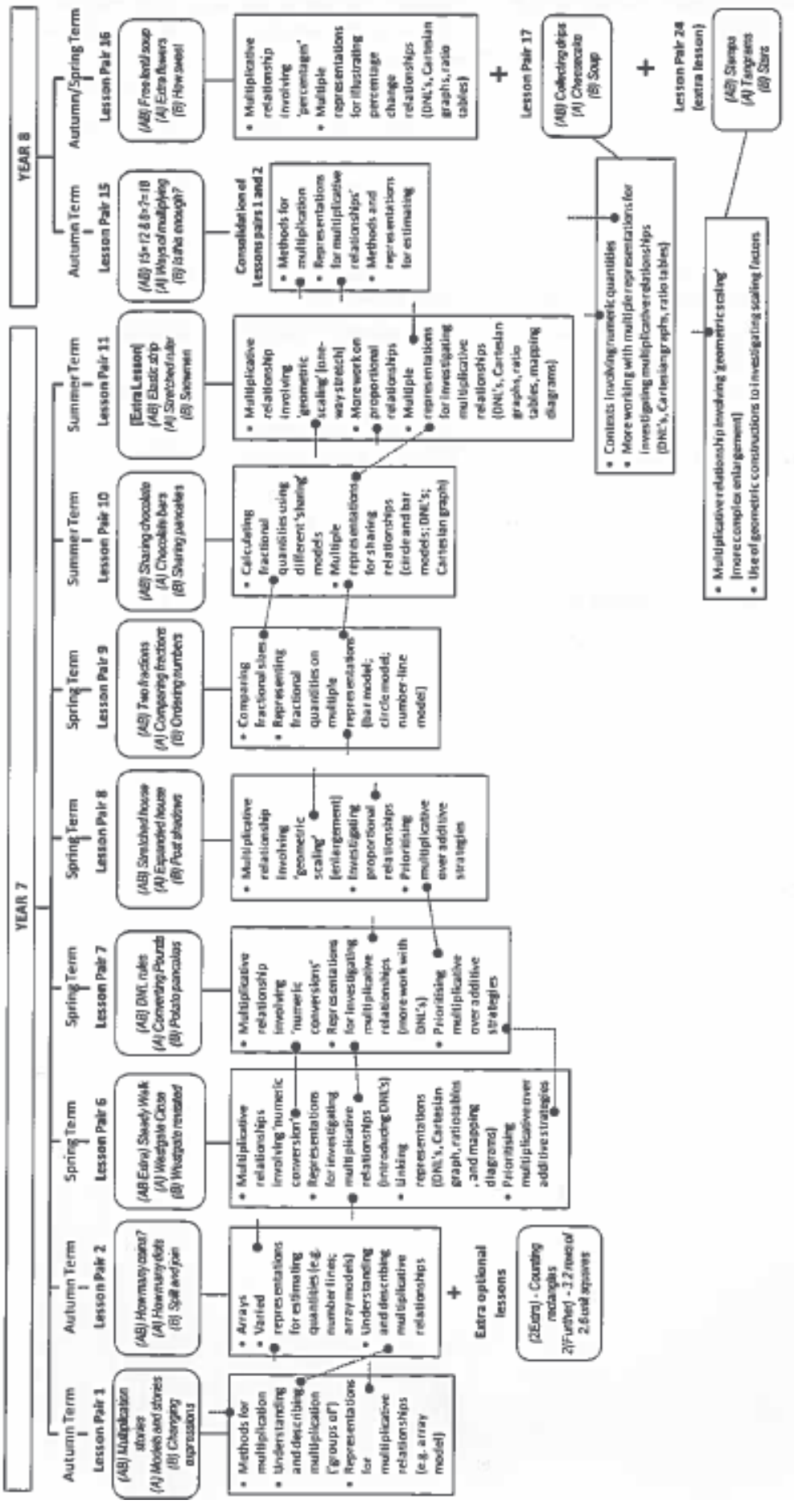


Figure 6B: Suggested flow of multiplication lessons from ICCAMS handbook

Appendix 7: Participant Information Sheet for Students and Student and Teacher Questionnaires

Appendix 7A: Participant Information Sheet for Students (Test and Questionnaire)

Teaching and Learning Mathematics (ICCAMS)

Dear Student,

You are being invited to take part in an evaluation study run by the University of Manchester (Dr Maria Pampaka) in conjunction with the UCL and Durham University. The study aims to find out if one particular approach of teaching mathematics, called ICCAMS maths, to Year 7 and 8 students gives different results than normal maths teaching. Before you decide to complete this questionnaire and maths assessment it is important for you to understand why the research is being done and what it will involve.

The ICCAMS project, which stands for Increasing Competence and Confidence in Algebra and Multiplicative Structures, is looking at ways of making school mathematics more interesting and relevant. Your school is one of the 109 schools that have agreed to take part in this study. Our team at the University of Manchester is responsible for finding out whether ICCAMS maths is any better than the usual maths teaching you get in secondary schools.

To do that we are asking you and all Year 8 students in the 109 schools to complete a questionnaire about your feelings and attitudes towards mathematics and your thoughts on how you learn mathematics and a maths test. This will allow us to compare results from schools who taught with ICCAMS and those without, to see if ICCAMS maths is any better.

We are asking you to provide your name to allow us to link your answers with those you provided at the start of Year 7 and also with other information about you which your school will provide to us. For the purpose of research, the responses will be linked with information from the National Pupil Database (held by the Department for Education) and shared between the three universities involved (University of Manchester, Durham University, and UCL), the Department for Education, EEF, EEF's data contractor (a company working for EEF) FFT Education in a form that will not allow you to be readily identified (your name will not appear) and in an anonymised form (all information which might enable you to be identified removed) to the UK Data Archive. Please note that your participation is entirely voluntary and you have the right to withdraw by contacting the named researcher below by 1st September 2018.

Your responses to this questionnaire will be treated confidentially and no-one else will see your individual answers. Your school will receive results of the maths assessment to help you and other students' learning of mathematics.

The researchers will analyse the data from all students and will use combined results in their reports. Please answer all questions as best as you can. By completing and returning this questionnaire we take it that you are happy to take part in this research. We thank you in advance for your help.

Yours faithfully,

Maria Pampaka
Evaluator of the ICCAMS Maths
The University of Manchester
maria.pampaka@manchester.ac.uk

For any questions about the study or how your data will be used or if you don't want us to use your data please inform Jack Quinn at iccams-maths@manchester.ac.uk

Appendix 7B: Student questionnaire

MANCHESTER 1824
The University of Manchester

Education Endowment Foundation

Teaching and Learning Mathematics (ICCAMS)
Student Questionnaire

SECTION A - ABOUT YOU AND YOUR CLASS

Today's date:	
First name:	
Last name:	
Date of birth:	
I am a *(please circle)*:	Boy Girl
School name:	
Class name:	
Maths teacher's name:	
Second maths teacher's name *(if you have one)*:	

SECTION B - YOUR FEELINGS ABOUT MATHEMATICS

How much do you agree or disagree with the following statements?
(Please circle the appropriate number in each line)

	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
1. Mathematics is important to me	1	2	3	4	5
2. Learning maths is enjoyable for me	1	2	3	4	5
3. I am interested in learning new things in maths	1	2	3	4	5
4. I never want to take another mathematics course	1	2	3	4	5
5. I prefer my future studies to include a lot of maths	1	2	3	4	5
6. I look forward to studying more mathematics after school	1	2	3	4	5
7. I would like to be a mathematician	1	2	3	4	5
8. Maths is one of the most interesting school subjects	1	2	3	4	5
9. Maths is important for my future (after school)	1	2	3	4	5

SECTION C - THE WAY YOU LEARN MATHEMATICS

In this section, we want to find out how you are taught maths in general.

Please tell us how often does each of the following happen in your normal weekly maths lessons?

(Please circle the appropriate number in each line)

	Almost never	Some of the time	Most of the time	Almost always
1. We (students) use only the methods the teacher taught us.	1	2	3	4
2. We choose which questions to tackle.	1	2	3	4
3. We compare different methods for doing questions.	1	2	3	4
4. The teacher draws links between different topics.	1	2	3	4
5. We work collaboratively in small groups.	1	2	3	4
6. We discuss our own ideas.	1	2	3	4
7. We work collaboratively in pairs.	1	2	3	4
8. We invent our own methods.	1	2	3	4
9. The teacher tells us which questions to tackle.	1	2	3	4
10. The teacher asks questions to check what we understood.	1	2	3	4
11. The teacher teaches each topic separately.	1	2	3	4
12. What we learn is related to everyday real life situations.	1	2	3	4
13. We learn from each other.	1	2	3	4
14. We explain our work to the whole class.	1	2	3	4
15. The teacher questions our methods.	1	2	3	4

Please tell us how you find your maths lessons in general.

(Please circle one answer)

Most of the time, my maths lessons are:	Too easy	About right	Too hard

Thank you very much for completing the survey.

Your responses will be treated as confidential.
If you have any queries about this research project, please contact
Maria Pampaka on 0161 275 7213 or Lawrence Wo at 0161 275 3415.

We wish you an enjoyable year!

Appendix 7C: Teacher questionnaire at Year 7

MANCHESTER 1824
The University of Manchester

Education Endowment Foundation

EVALUATION OF THE ICCAMS MATHS TRIAL – TEACHER QUESTIONNAIRE

Dear mathematics teacher,

You are being invited to take part in the independent evaluation of the ICCAMS (Increasing Competence and Confidence in Algebra and Multiplicative Structures) Maths project, funded by the Education Endowment Foundation (EEF) because your Head Teacher has agreed for your school to take part in this project. However, your participation in this evaluation study is entirely voluntary and you have the right to decline or withdraw at any time.

ICCAMS Maths aims to raise attainment in mathematics for all students. Our team at the University of Manchester is evaluating the programme by collecting data from students and teachers to compare schools which will deliver the ICCAMS maths to schools which continue to teach with normal practices.

We will be asking you to complete a questionnaire twice: one at the start of this academic year (2016-17) and once towards the end of the next academic year (2017-18). The questionnaire is intended to investigate and measure teaching practice. You do not have to answer all of the questions if this is not possible. When completed this should be returned by posting back to the address given on the questionnaire form. In the case of the online questionnaire, the submission process completes the return. We are asking for your name so as to collate these two responses along with those of your students.

The questionnaire you are about to complete is split into two parts: the first part asks for some background information whilst the second part is about your teaching with the KS3 mathematics classes you teach.

The questionnaire is **strictly confidential**. Once collected, the data will be kept in secure databases. In the case of hard copies, questionnaire responses will be entered to the relevant databases and hard copies will be kept in locked drawers until the completion of the project. After that these will be shredded. When electronic data has been collated, personal identifiers will be removed so the data files are anonymous from that point.

For the purpose of research, the responses will be linked with students that you teach and shared between the three universities involved (Durham University, University of Manchester and University of Nottingham), the Department for Education, EEF, EEF's data contractor FFT Education and in an anonymised form to the UK Data Archive.

By completing and returning this questionnaire you are granting implied consent to take part in this research. Thank you for reading this.

Please enter your name and your school's name:	
Your name/initials	
School name	

SECTION A – ABOUT YOU AND YOUR TEACHING EXPERIENCE

Q1. What is your gender?

	Male
	Female

Q2. Which of the following qualifications do you have? *(tick all that apply)*			
	Undergraduate degree in Maths (BA, BSc)		Other undergraduate degree*
	Undergraduate degree in Education		PGCE Secondary Mathematics
	Undergraduate degree in Engineering		Other PGCE course (Teach First, GTP, etc.)*
	Undergraduate degree in Science		Other postgraduate degree (MA, MSc, not PGCE)*
	Joint undergraduate degree in Maths and Other Subject		Doctorate (PhD)
*Other degree subject			
If you have never taken a course in the teaching of mathematics, check the box.			
	Never taken a course		

Q3. How many years have you taught mathematics prior to this school year? *(please state)*	_____ years

Q4. In the last 2 years, have you received training in these areas or taken part in any of the activities?

(Mark one response on each line.)	Yes	No
Trained in using the ICCAMS material through external Professional Development?	1	2
Trained in using the ICCAMS material in school?	1	2
Trained in the integration of technology into the classroom teaching?	1	2
Taught or helped lead any in-service workshops in (teaching) mathematics?	1	2
Mentored another maths teacher as part of a formal recognised arrangement?	1	2
Received any grants or awards for mathematics teaching?	1	2
Served on a school, inter-school, or local authority mathematics curriculum committee?	1	2
Received any other training relevant to formative assessment?*	1	2
*If Yes to the last question, please tell us which one:		

PART B – ABOUT YOUR TEACHING WITH KEY STAGE 3 CLASSES

In this section, we would like you to answer some questions about how you teach at KS3, and in particular Year 7 and 8.

Q5. Which of the following best describes the ability of the students in your class(es) relative to the other students in this school? *(tick all that apply)*

	Year 7	Year 8
Fairly homogeneous (setted) and low in ability		
Fairly homogeneous (setted) and average in ability		
Fairly homogeneous (setted) and high in ability		
Mixed ability with two or more ability levels		
Other setting *(Please describe below)*		

Q6. Thinking about a typical lesson (or a typical week), how is the total teaching time spent?

(Please report the percentage for each general activity)	Year 7	Year 8
Teacher talk/ presentation		
Student talk/presentation		
Students working on their own		
Students working in pairs/small groups on their own		
Students working in pairs/small groups with teacher interaction/support		

Q7. About how often do you do each of the following in your mathematics instruction **in Year 7 and Year 8**?

Thinking of your teaching maths practice with each year group how often do you do the following in a normal week
(Please tick the Not Applicable (NA) box on top if you don't teach a particular group)

Please select one option per year group, or leave empty if you don't teach that year group	Year 7 [NA ☐]				Year 8 [NA ☐]			
	Rarely	Sometimes	Often	Almost always	Rarely	Sometimes	Often	Almost always
I introduce a new topic by first determining what the students already know about it	1	2	3	4	1	2	3	4
I use activities in contexts that the students can engage with	1	2	3	4	1	2	3	4
I use activities which allow connections to be made between mathematical ideas	1	2	3	4	1	2	3	4
I allow students to work at their own pace	1	2	3	4	1	2	3	4
I teach the whole class at once	1	2	3	4	1	2	3	4
Students start with easy questions and work up to harder questions	1	2	3	4	1	2	3	4
When a student asks a question, I give clues instead of the correct answer	1	2	3	4	1	2	3	4
I ask students to explain their reasoning when giving an answer	1	2	3	4	1	2	3	4
I encourage students to discuss the mistakes they make	1	2	3	4	1	2	3	4
Students use only the methods I taught them	1	2	3	4	1	2	3	4
Students choose which questions to tackle	1	2	3	4	1	2	3	4
Students compare different methods for doing questions	1	2	3	4	1	2	3	4
Students work collaboratively in small groups.	1	2	3	4	1	2	3	4
Students discuss their ideas.	1	2	3	4	1	2	3	4
Students work collaboratively in pairs.	1	2	3	4	1	2	3	4
Students invent their own methods.	1	2	3	4	1	2	3	4
I tell students which questions to tackle.	1	2	3	4	1	2	3	4
I teach each topic separately	1	2	3	4	1	2	3	4
I provide feedback to students on their understanding of mathematical concepts	1	2	3	4	1	2	3	4
I check students' understanding for maths during lessons to assess specific intended learning outcomes	1	2	3	4	1	2	3	4
I assess students' maths conceptions and misconceptions in order to adapt my teaching	1	2	3	4	1	2	3	4
I provide feedback on what students have understood in relation to what they should do next	1	2	3	4	1	2	3	4
I encourage students to learn from each other	1	2	3	4	1	2	3	4

Q8. Think about your **plans for your mathematics teaching** for the entire year. How much emphasis each of the following student objectives received? (Please tick the Not Applicable (NA) box on top if you don't teach a particular group)

(Please circle the appropriate number in each line for each Year group)	Year 7 [NA ☐]			Year 8 [NA ☐]		
	Min	Moderate	Max	Min	Moderate	Max
Increase students' interest in mathematics	1	2	3	1	2	3
Learn mathematical concepts	1	2	3	1	2	3
Learn mathematical algorithms/procedures	1	2	3	1	2	3
Develop students' computational skills	1	2	3	1	2	3
Learn how to solve problems	1	2	3	1	2	3
Learn how mathematics ideas connect with one another	1	2	3	1	2	3
Prepare for further study in mathematics	1	2	3	1	2	3
Learn to explain ideas in mathematics effectively	1	2	3	1	2	3
Learn how to apply mathematics in business and industry	1	2	3	1	2	3
Prepare students for standardized tests/exams	1	2	3	1	2	3

Thank you very much for completing the survey.

Appendix 7D: Teacher questionnaires at Year 8 (cascade teacher)

EVALUATION OF THE ICCAMS MATHS TRIAL – CASCADE TEACHER QUESTIONNAIRE

Dear mathematics teacher,

You are being invited to take part in the independent evaluation of the ICCAMS (Increasing Competence and Confidence in Algebra and Multiplicative Structures) Maths project, funded by the Education Endowment Foundation (EEF) as your schools has been part of the project since September 2016. Your participation in this evaluation study is entirely voluntary and you have the right to decline or withdraw at any time.

To help evaluate the effectiveness of ICCAMS Maths, we are asking teachers to complete a questionnaire to investigate and measure teaching practice as well as get more detailed information about the delivery of the ICCAMS Maths programme in your school. You do not have to answer all of the questions if this is not possible. When completed this should be returned by posting back to the address given on the questionnaire form. In the case of the online questionnaire, the submission process completes the return. We are asking for your name and the name of your school to collate these with your previous responses along with those of your students.

For the purpose of research, the responses will be linked with the questionnaires and tests of the students that you teach, and shared between the three universities involved (Durham University, University of Manchester and UCL). Once matched, any personal information will be removed and data will be made anonymous. Data will be treated with the strictest confidence ensuring it remains secure at all times. The personal data for this project is being used in line with the public interest task (Article 6 (1)(e) of the General Data Protection Regulation) to carry out research and inform future educational provision in relation to mathematics teaching and learning. For further information about how the teams will process personal data as part of this project please see the links to privacy notices below.

As a reminder ICCAMS Maths aims to raise attainment in mathematics for all students. A team at the University of Manchester (led by Maria Pampaka) is evaluating the programme by collecting data from students and teachers to compare schools delivering ICCAMS maths to schools which continued to teach with normal practices. The project intervention and its delivery to schools is led by Jeremy Hodgen (UCL Institute of Education, previously at Nottingham University) and Vic Menzies (Durham University). You might recall being invited by the evaluation team to complete another questionnaire about your teaching practice at the start of the academic year 2016-17 and a questionnaire from Durham at the end of the 2016-17 academic year about the implementation of ICCAMS.

The questionnaire you are about to complete is split into three parts: the first part asks for some background information, the second part is about your general teaching practices with the Year 8 mathematics classes you teach, and the final part is about your experience with the ICCAMS Maths programme this year.

By completing and returning this questionnaire you are agreeing to take part in this research. Thank you for reading this.

Kind regards,

Maria Pampaka, Evaluation Lead, University of Manchester
Vic Menzies, Trial Delivery Lead, Durham University
Jeremy Hodgen, ICCAMS Developer Lead, University of Nottingham

Privacy notices

Durham University's privacy statement relating to the project can be found at:
http://iccams-maths.org/durham-privacy-notice/

The University of Manchester's privacy notice for research participants which explains how data is processed at Manchester can be found at:
https://www.manchester.ac.uk/discover/privacy-information/data-protection/privacy-notices/

EVALUATION OF THE ICCAMS MATHS TRIAL – CASCADE TEACHER QUESTIONNAIRE

Please enter your name, school's name and circle the ICCAMS region you teach in:					
Your name/initials					
School name					
ICCAMS region you teach in	South West	London	East Anglia	East Midlands	Yorkshire
	Other	Please specify:			

SECTION A – ABOUT YOU AND YOUR TEACHING EXPERIENCE

Q1. What is your gender?

	Male
	Female

Q2. Which of the following qualifications do you have? *(tick all that apply)*

	Undergraduate degree in Maths (BA, BSc)		Other undergraduate degree*
	Undergraduate degree in Education		PGCE Secondary Mathematics
	Undergraduate degree in Engineering		Other PGCE course (Teach First, GTP, etc.)*
	Undergraduate degree in Science		Other postgraduate degree (MA, MSc, not PGCE)*
	Joint undergraduate degree in Maths and Other Subject		Doctorate (PhD)

*Other degree subject	

If you have never taken a course in the teaching of mathematics, check the box.

	Never taken a course

Q3. How many years have you taught mathematics prior to this school year? *(please state)*	_____ years

Q4. In the last 2 years, have you received training in these areas or taken part in any of the activities?

(Mark one response on each line.)	Yes	No
Trained in using the ICCAMS material through external Professional Development?	1	2
Trained in using the ICCAMS material in school?	1	2
Trained in the integration of technology into the classroom teaching?	1	2
Taught or helped lead any in-service workshops in (teaching) mathematics?	1	2
Mentored another maths teacher as part of a formal recognised arrangement?	1	2
Received any grants or awards for mathematics teaching?	1	2
Served on a school, inter-school, or local authority mathematics curriculum committee?	1	2
Received any other training relevant to formative assessment?*	1	2
*If Yes to the last question, please tell us which one:		

PART B – ABOUT YOUR GENERAL TEACHING WITH YEAR 8 CLASSES

In this section, we would like you to answer some questions about how you teach Year 8.

Q5. Which of the following best describes the ability of the students in your class(es) relative to the other students in this school? *(tick all that apply, e.g. for different Year 8 classes)*

	Year 8
Fairly homogeneous (setted) and low in ability	
Fairly homogeneous (setted) and average in ability	
Fairly homogeneous (setted) and high in ability	
Mixed ability with two or more ability levels	
Other setting *(Please describe below)*	

Q6. Thinking about a typical lesson (or a typical week), how is the total teaching time spent?

(Please report the percentage for each general activity to total 100%)	Percentage of time
Teacher talk/ presentation	
Student talk/presentation	
Students working on their own	
Students working in pairs/small groups on their own	
Students working in pairs/small groups with teacher interaction/support	

Q7. Approximately how often do you do each of the following in your mathematics instruction **in Year 8**?

Thinking of your teaching maths practice with the Year 8 classes you teach, how often do you do the following in a normal week *(Please tick the Not Applicable (NA) box on top if you don't teach any Year 8 class)*	Year 8 [NA ☐]			
	Rarely	Sometimes	Often	Almost always
I introduce a new topic by first determining what the students already know about it	1	2	3	4
I use activities in contexts that the students can engage with	1	2	3	4
I use activities which allow connections to be made between mathematical ideas	1	2	3	4
I allow students to work at their own pace	1	2	3	4
I teach the whole class at once	1	2	3	4
Students start with easy questions and work up to harder questions	1	2	3	4
When a student asks a question, I give clues instead of the correct answer	1	2	3	4
I ask students to explain their reasoning when giving an answer	1	2	3	4
I encourage students to discuss the mistakes they make	1	2	3	4
Students use only the methods I taught them	1	2	3	4

	Rarely	Sometimes	Often	Almost always
Students choose which questions to tackle	1	2	3	4
Students compare different methods for doing questions	1	2	3	4
Students work collaboratively in small groups.	1	2	3	4
Students discuss their ideas.	1	2	3	4
Students work collaboratively in pairs.	1	2	3	4
Students invent their own methods.	1	2	3	4
I tell students which questions to tackle.	1	2	3	4
I teach each topic separately	1	2	3	4
I provide feedback to students on their understanding of mathematical concepts	1	2	3	4
I check students' understanding for maths during lessons to assess specific intended learning outcomes	1	2	3	4
I assess students' maths conceptions and misconceptions in order to adapt my teaching	1	2	3	4
I provide feedback on what students have understood in relation to what they should do next	1	2	3	4
I encourage students to learn from each other	1	2	3	4

Q8. Think about your **plans for your mathematics teaching** for the entire year. How much emphasis did each of the following student objectives receive? (Please tick the Not Applicable (NA) box on top if you don't teach any Year 8 class) group)

(Please circle the appropriate number in each line for each Year group)	Year 8 [NA ☐]		
	Minimum	**Moderate**	**Maximum**
Increase students' interest in mathematics	1	2	3
Learn mathematical concepts	1	2	3
Learn mathematical algorithms/procedures	1	2	3
Develop students' computational skills	1	2	3
Learn how to solve problems	1	2	3
Learn how mathematics ideas connect with one another	1	2	3
Prepare for further study in mathematics	1	2	3
Learn to explain ideas in mathematics effectively	1	2	3
Learn how to apply mathematics in business and industry	1	2	3
Prepare students for standardized tests/exams	1	2	3

PART C – ABOUT YOUR EXPERIENCE WITH TEACHING WITH ICCAMS

In this section, we would like you to answer some questions about your experience with ICCAMS.

Q9. Considering the ICCAMS material and lessons you taught, please tell us how much you agree with the following statements.

(Please circle the appropriate number in each line)	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
I feel confident teaching the ICCAMS lessons.	1	2	3	4	5
Teaching ICCAMS lessons is no more demanding for me than the other lessons I am teaching.	1	2	3	4	5
The materials for ICCAMS have helped me feel confident.	1	2	3	4	5
Other support for ICCAMS has helped me feel confident.	1	2	3	4	5
I feel I need some further training to teach these lessons with confidence.	1	2	3	4	5
The training I received was useful	1	2	3	4	5
Teaching ICCAMS lessons matches my teaching skills and experience well.	1	2	3	4	5
I would feel confident to teach these lessons again next year if I am asked to do.	1	2	3	4	5
I would prefer to teach the ICCAMS lessons instead of other maths courses/units, if I had a choice.	1	2	3	4	5

Training and Support

Q10. How long are the cascade training sessions, most of the time? (please tick one box)

	I've attended all training sessions
	I'm missed 1 training session
	I've missed more than 1 training session
	There have been no ICCAMS training sessions delivered in my school

Q11. Do you receive any additional support on ICCAMS from the Lead ICCAMS teachers?

	Yes
	No
If yes, please give details:	

Delivering ICCAMS

This section concerns your delivery of ICCAMS with year 8 this academic year.

Q12. The ICCAMS Maths intervention recommends that, in Year 8, each class is taught 20 lessons, which are organised in pairs of lessons with an initial assessment activity. Please list all the Year 8 maths classes that you have taught this year and tell us how many ICCAMS lessons you will have taught by the end of the summer term.

Class Name (please list)	ICCAMS taught?	How many ICCAMS lessons have you delivered? (out of the 20 compulsory)
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	

Q13. Are there any ICCAMS lessons that you did not deliver (for any of the above classes?)

	Yes
	No
If yes, please tell us which lessons, and the reasons why you did not deliver these:	

Q14. When planning ICCAMS lessons, which parts of the ICCAMS handbook do you refer to? *(tick any that apply)*

	Lesson outline
	Lesson overview
	Extended annotated outline
	Background
	I don't refer to it

Q15. When do you normally deliver the mini-assessment for an ICCAMS lesson? *(tick one box)*

	1 to 2 days before the lesson
	Between 3 and 7 days before the lesson
	More than 7 days before the lesson
	At the beginning of the lesson
	I don't normally deliver the mini assessments

Q16. How long, on average, do you spend doing a mini assessment?

	5 minutes or less
	Around 5 to 10 minutes
	Around 10 to 15 minutes
	More than 15 minutes
	I don't normally deliver the mini assessments

Q17. How closely do you follow the ICCAMS lesson plans?

	I follow the lesson plans closely
	I make some changes to the lessons
	I make significant changes to the lessons*
	* *Please describe the types of changes you have made to the ICCAMS lessons:*

Q18. Please describe any significant difficulties / barriers you have encountered when planning or delivering ICCAMS lessons.

Q19. If there are any other comments about your experiences of ICCAMS please add them here:

Thank you very much for completing the survey.

Appendix 7E: Teacher questionnaires at Year 8 (lead teacher)

EVALUATION OF THE ICCAMS MATHS TRIAL – LEAD TEACHER QUESTIONNAIRE

Dear mathematics teacher,

You are being invited to take part in the independent evaluation of the ICCAMS (Increasing Competence and Confidence in Algebra and Multiplicative Structures) Maths project, funded by the Education Endowment Foundation (EEF) as your schools has been part of the project since September 2016. Your participation in this evaluation study is entirely voluntary and you have the right to decline or withdraw at any time.

To help evaluate the effectiveness of ICCAMS Maths, we are asking teachers to complete a questionnaire to investigate and measure teaching practice as well as get more detailed information about the delivery of the ICCAMS Maths programme in your school. You do not have to answer all of the questions if this is not possible. When completed this should be returned by posting back to the address given on the questionnaire form. In the case of the online questionnaire, the submission process completes the return. We are asking for your name and the name of your school to collate these with your previous responses along with those of your students.

For the purpose of research, the responses will be linked with the questionnaires and tests of the students that you teach, and shared between the three universities involved (Durham University, University of Manchester and UCL). Once matched, any personal information will be removed and data will be made anonymous. Data will be treated with the strictest confidence ensuring it remains secure at all times. The personal data for this project is being used in line with the public interest task (Article 6 (1)(e) of the General Data Protection Regulation) to carry out research and inform future educational provision in relation to mathematics teaching and learning. For further information about how the teams will process personal data as part of this project please see the links to privacy notices below.

As a reminder ICCAMS Maths aims to raise attainment in mathematics for all students. A team at the University of Manchester (led by Maria Pampaka) is evaluating the programme by collecting data from students and teachers to compare schools delivering ICCAMS maths to schools which continued to teach with normal practices. The project intervention and its delivery to schools is led by Jeremy Hodgen (UCL Institute of Education, previously at Nottingham University) and Vic Menzies (Durham University). You might recall being invited by the evaluation team to complete another questionnaire about your teaching practice at the start of the academic year 2016-17 and a questionnaire from Durham at the end of the 2016-17 academic year about the implementation of ICCAMS.

The questionnaire you are about to complete is split into three parts: the first part asks for some background information, the second part is about your general teaching practices with the Year 8 mathematics classes you teach, and the final part is about your experience with the ICCAMS Maths programme this year.

By completing and returning this questionnaire you are agreeing to take part in this research. Thank you for reading this.

Kind regards,

Maria Pampaka, Evaluation Lead, University of Manchester
Vic Menzies, Trial Delivery Lead, Durham University
Jeremy Hodgen, ICCAMS Developer Lead, University of Nottingham

Privacy notices

Durham University's privacy statement relating to the project can be found at:
http://iccams-maths.org/durham-privacy-notice/

The University of Manchester's privacy notice for research participants which explains how data is processed at Manchester can be found at:
https://www.manchester.ac.uk/discover/privacy-information/data-protection/privacy-notices/

EVALUATION OF THE ICCAMS MATHS TRIAL – LEAD TEACHER QUESTIONNAIRE

Please enter your name, school's name and circle the ICCAMS region you teach in:					
Your name/initials					
School name					
ICCAMS region you teach in	South West	London	East Anglia	East Midlands	Yorkshire
	Other	Please specify:			

SECTION A – ABOUT YOU AND YOUR TEACHING EXPERIENCE

Q1. What is your gender?

	Male
	Female

Q2. Which of the following qualifications do you have? *(tick all that apply)*

	Undergraduate degree in Maths (BA, BSc)		Other undergraduate degree*
	Undergraduate degree in Education		PGCE Secondary Mathematics
	Undergraduate degree in Engineering		Other PGCE course (Teach First, GTP, etc.)*
	Undergraduate degree in Science		Other postgraduate degree (MA, MSc, not PGCE)*
	Joint undergraduate degree in Maths and Other Subject		Doctorate (PhD)

*Other degree subject	

If you have never taken a course in the teaching of mathematics, check the box.

	Never taken a course

Q3. How many years have you taught mathematics prior to this school year? *(please state)*	_____ years

Q4. In the last 2 years, have you received training in these areas or taken part in any of the activities?

(Mark one response on each line.)	Yes	No
Trained in using the ICCAMS material through external Professional Development?	1	2
Trained in using the ICCAMS material in school?	1	2
Trained in the integration of technology into the classroom teaching?	1	2
Taught or helped lead any in-service workshops in (teaching) mathematics?	1	2
Mentored another maths teacher as part of a formal recognised arrangement?	1	2
Received any grants or awards for mathematics teaching?	1	2
Served on a school, inter-school, or local authority mathematics curriculum committee?	1	2
Received any other training relevant to formative assessment?*	1	2
*If Yes to the last question, please tell us which one:		

PART B – ABOUT YOUR GENERAL TEACHING WITH YEAR 8 CLASSES

In this section, we would like you to answer some questions about how you teach Year 8.

Q5. Which of the following best describes the ability of the students in your class(es) relative to the other students in this school? *(tick all that apply, e.g. for different Year 8 classes)*

	Year 8
Fairly homogeneous (setted) and low in ability	
Fairly homogeneous (setted) and average in ability	
Fairly homogeneous (setted) and high in ability	
Mixed ability with two or more ability levels	
Other setting *(Please describe below)*	

Q6. Thinking about a typical lesson (or a typical week), how is the total teaching time spent?

(Please report the percentage for each general activity to total 100%)	Percentage of time
Teacher talk/ presentation	
Student talk/presentation	
Students working on their own	
Students working in pairs/small groups on their own	
Students working in pairs/small groups with teacher interaction/support	

Q7. Approximately how often do you do each of the following in your mathematics instruction **in Year 8**?

Thinking of your teaching maths practice with the Year 8 classes you teach, how often do you do the following in a normal week *(Please tick the Not Applicable (NA) box on top if you don't teach any Year 8 class)*	Year 8 [NA ☐]			
	Rarely	Sometimes	Often	Almost always
I introduce a new topic by first determining what the students already know about it	1	2	3	4
I use activities in contexts that the students can engage with	1	2	3	4
I use activities which allow connections to be made between mathematical ideas	1	2	3	4
I allow students to work at their own pace	1	2	3	4
I teach the whole class at once	1	2	3	4
Students start with easy questions and work up to harder questions	1	2	3	4
When a student asks a question, I give clues instead of the correct answer	1	2	3	4
I ask students to explain their reasoning when giving an answer	1	2	3	4
I encourage students to discuss the mistakes they make	1	2	3	4
Students use only the methods I taught them	1	2	3	4

	Rarely	Sometimes	Often	Almost always
Students choose which questions to tackle	1	2	3	4
Students compare different methods for doing questions	1	2	3	4
Students work collaboratively in small groups.	1	2	3	4
Students discuss their ideas.	1	2	3	4
Students work collaboratively in pairs.	1	2	3	4
Students invent their own methods.	1	2	3	4
I tell students which questions to tackle.	1	2	3	4
I teach each topic separately	1	2	3	4
I provide feedback to students on their understanding of mathematical concepts	1	2	3	4
I check students' understanding for maths during lessons to assess specific intended learning outcomes	1	2	3	4
I assess students' maths conceptions and misconceptions in order to adapt my teaching	1	2	3	4
I provide feedback on what students have understood in relation to what they should do next	1	2	3	4
I encourage students to learn from each other	1	2	3	4

Q8. Think about your **plans for your mathematics teaching** for the entire year. How much emphasis did each of the following student objectives receive? (Please tick the Not Applicable (NA) box on top if you don't teach any Year 8 class) group)

(Please circle the appropriate number in each line for each Year group)	Year 8 [NA ☐]		
	Minimum	**Moderate**	**Maximum**
Increase students' interest in mathematics	1	2	3
Learn mathematical concepts	1	2	3
Learn mathematical algorithms/procedures	1	2	3
Develop students' computational skills	1	2	3
Learn how to solve problems	1	2	3
Learn how mathematics ideas connect with one another	1	2	3
Prepare for further study in mathematics	1	2	3
Learn to explain ideas in mathematics effectively	1	2	3
Learn how to apply mathematics in business and industry	1	2	3
Prepare students for standardized tests/exams	1	2	3

PART C – ABOUT YOUR EXPERIENCE WITH TEACHING WITH ICCAMS

In this section, we would like you to answer some questions about your experience with ICCAMS.

Q9. Considering the ICCAMS material and lessons you taught, please tell us how much you agree with the following statements.

(Please circle the appropriate number in each line)	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
I feel confident teaching the ICCAMS lessons.	1	2	3	4	5
Teaching ICCAMS lessons is no more demanding for me than the other lessons I am teaching.	1	2	3	4	5
The materials for ICCAMS have helped me feel confident.	1	2	3	4	5
Other support for ICCAMS has helped me feel confident.	1	2	3	4	5
I feel I need some further training to teach these lessons with confidence.	1	2	3	4	5
The training I received was useful	1	2	3	4	5
Teaching ICCAMS lessons matches my teaching skills and experience well.	1	2	3	4	5
I would feel confident to teach these lessons again next year if I am asked to do.	1	2	3	4	5
I would prefer to teach the ICCAMS lessons instead of other maths courses/units, if I had a choice.	1	2	3	4	5

Q10. How long have you been an ICCAMS lead teacher? *(please tick one box)*

	Since the start of 2016/17 school year
	Since part way through 2016/17 school year
	Since the start of 2017/18 school year
	Since part way through 2017/18 school year

Training and Cascade

The next 4 questions are about the cascade training in your school.

Q11. Between both lead teachers have you taught all of the cascade sessions over the 2 years?
(Teaching one per lesson pair, so 20 over the 2 years. This does not include optional/extension lessons.)

	Yes		No, we missed 1 or 2 sessions		No, we missed more than 2 sessions

Q12. How long are the cascade training sessions, most of the time? (please tick one box)

	An hour or more
	About half an hour
	Less than half an hour
	I don't know
	There were no cascade training sessions

Q13. Who attends the cascade training sessions, most of the time?

	All teachers together
	Different groups of teachers at different times
	Individual teachers
	Other, *Please Specify*:……

Q14. Please describe any difficulties you have encountered when organising or delivering ICCAMS cascade training.

Delivering ICCAMS – your own practice

This section concerns your delivery of ICCAMS with year 8 this academic year.

Q15. The ICCAMS Maths intervention recommends that, in Year 8, each class is taught 20 lessons, which are organised in pairs of lessons with an initial assessment activity. Please list all the Year 8 maths classes that you have taught this year and tell us how many ICCAMS lessons you will have taught by the end of the summer term.

Class Name (please list)	ICCAMS taught?	How many ICCAMS lessons have you delivered? (out of the 20 compulsory)
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	

Q16. Are there any ICCAMS lessons that you did not deliver (for any of the above classes?)

	Yes		No

If Yes, please tell us which lessons, and the reasons why you did not deliver these

Q17. When planning ICCAMS lessons, which parts of the ICCAMS handbook do you refer to? *(tick any that apply)*

	Lesson outline
	Lesson overview
	Extended annotated outline
	Background
	I don't refer to it

Q18. When do you normally deliver the mini-assessment for an ICCAMS lesson? *(tick one box)*

	1 to 2 days before the lesson
	Between 3 and 7 days before the lesson
	More than 7 days before the lesson
	At the beginning of the lesson
	I don't normally deliver the mini assessments

Q19. How long, on average, do you spend doing a mini assessment?

	5 minutes or less
	Around 5 to 10 minutes
	Around 10 to 15 minutes
	More than 15 minutes
	I don't normally deliver the mini assessments

Q20. How closely do you follow the ICCAMS lesson plans?

	I follow the lesson plans closely
	I make some changes to the lessons
	I make significant changes to the lessons*
	** Please describe the types of changes you have made to the ICCAMS lessons:*

Q21. Please describe any significant difficulties / barriers you have encountered when planning or delivering ICCAMS lessons

Delivering ICCAMS – at school level

Q22. Are all of the year 8 classes **in your school** receiving ICCAMS?

	Yes		No

If No, please list the classes which did not receive ICCAMS and explain the reasons.

About the Professional Development

Q23. How would you rate the quality of training from your Professional Development Lead?

	Excellent		Good		Average		Poor

Q24. How helpful and informative do you find the following elements of the ICCAMS Professional Development?

(Please circle the appropriate number in each line)	Not helpful at all	Not very helpful	Quite helpful	Extremely helpful
Reflection on lessons taught	1	2	3	4
Reflection on Cascade training	1	2	3	4
Planning for new lessons	1	2	3	4
Working through maths problems	1	2	3	4
Exploring examples of children's work	1	2	3	4
Planning for cascade	1	2	3	4

Q25. If there are any other elements of the Professional Development days that you found helpful and informative, please tell us below:

Q26. Did your PD lead observe you teaching an ICCAMS lesson?

	Yes		No

Q26a. If Yes, how useful did you find the experience? *(tick one box)*

	Not at all useful		Not Very useful		Quite useful		Extremely useful

Q27. If there are any other comments about your experiences of ICCAMS please add them here:

Thank you very much for completing the survey.

ICCAMS Test2018 – Guidance for schools

Contents

KEY INFORMATION AND FAQS

Why are we doing a test?

Your school is currently taking part in the ICCAMS (Increasing Competence and Confidence in Algebra and Multiplicative Structures) research project. As part of a randomised control trial, we hope to identify whether there is any difference in maths performance betweenschools that utilise ICCAMS teaching methods and those that do not. Pupils at both control and intervention schools will sit the test, allowing us to measure any difference.

The ICCAMS programme has been designed by a team at the University of Nottingham and is delivered by researchers at Durham University. Our team at the University of Manchester is evaluating the programme.

Do we have to take part?

Your school does have to take part. As participants in the project, your Head teacher signed a memorandum of understanding agreeing to take part in this testing.

Who should sit the test?

The test should be sat by all students in Year 8, unless their parent/guardian signed an opt-out form.

What is the MALT test and what does it test?

The test will be an adaptation of the Maths Assessment for Learning and Teaching (MALT), a standardised paper-based assessment which covers the full maths curriculum. The version used is for 13 year olds.

There areboth calculator and non-calculator sections in the test.

Where can the test take place?

The test will take place indesignated exam rooms, unless other arrangements have been agreed. Students with additional needs can take the test in classrooms and smaller rooms at the school's discretion.

When will the test happen?

Your school should have an arranged date and time booked in. The testing window is between 11th June and 13th July 2018.

How do we get the test papers?

We will send the test papers to the Exams Officerto arrive one week before your test date. The papers must be kept securely.

What happens to the papers afterwards?

Test administrators from our team will be present during the test. They will take the papers from the school.

Timing of the test

Please allow one hour for the administering of the test.

At the start, students will read an A4 sheet separate to the test paper. This contains information on the project and data protection and must be distributed for research ethics reasons.

There will be a 5 minute questionnaire. This asks how the student learns maths and their feelings about maths.

The test itself will then take 45 minutes.

What do we need to do when students take the test?

Equipment for students

Students will need to have a calculator as well as a pen or pencil. They can use a scientific calculator or a basic calculator. A phone cannot be used as a calculator.

Invigilation

There will need to be sufficient invigilators or school staff present to provide a light form of invigilation for the assessment. Considering this is an assessment for Year 8s, we would expect at least one invigilator to be a staff member who knows the students.

The Role of the University of Manchester's Test Administrators

Members of our team will help administer the test and will check test conditions for the purposes of our research. In most cases we will send two people to each school (but this may be one or three depending on school size).

Our administrators will arrive 45 minutes before the test.

We ask the school to ensure the papers are taken to the rooms used for testing. We will help distribute papers and we will brief anyinvigilators and school staff on the procedures for the test. One of our team will read the invigilation announcement statement, unless it is agreed a staff member or school invigilator is better placed to do this (see Appendix for announcement statement).

After the test we will take the papers from the school.

In early June, we will send the names of our test administrators to a named contact at the school.These names will be sent to the person specified as the 'Main contact for testing' on the *Form to complete and Return – Test Administration*.

What happens after the test?

We will mark the papers and use the results to evaluate the effectiveness of the ICCAMS intervention.
A report of test results will be sent to each school in September 2018.

Contact details

We are a team at the University of Manchester that is evaluating the ICCAMS research project, led by Dr Maria Pampaka.

Email: iccams-maths@manchester.ac.uk Phone: 0161 275 3385 (Jack Quinn)

ADMINISTERING THE TEST

Before the test

Please ensure that the *Form to complete and Return – Test Administration* (see Appendix 3) has been sent to us by 5pm on Thursday 24th May. This form was sent to the school's lead contact in an email attachment along with this document. Once completed, inform us of any changes to the information you have stated on the form.

Please ensure the exam rooms will be set up, that enough invigilators will be present to maintain test conditions, and that arrangements have been made for students with additional needs.

We will deliver to the address specified by the school. Please keep question papers and other examination materials secure.

Ensure all candidates have a calculator and a pen or pencil.

At the beginning of the test

Please inform students in advance that they will be under exam conditions for this test.

Announcement to start the test

One of our team will read the announcement statement, unless it is agreed that a staff member or school invigilator is better placed to do this. See Appendix 1 for the statement to be read by a test administrator from the university. See Appendix 2 for an alternative announcement statement read by a school invigilator or staff member.

During the test

Following the questionnaire, the maths assessment is 45 minutes in total. The calculator and non-calculator sections do not have separate time limits. Thecalculator section should take around 15 minutes, but this will differ for each pupil. The paper asks students to put calculators on the floor once when they have finished this section.

We will comply with the school's policy for late students.

At the end of the test

No student should be dismissed until the test is over.

Once the scripts have been collected they will be takenfrom the premises by the University of Manchester team.

ADJUSTMENTS FOR STUDENTS WITH ADDITIONAL NEEDS

Students with additional needs can take the test in smaller rooms and classrooms at the school's discretion. We are happy to rely on the school's judgment regarding the needs of specific students.

We can provide:Coloured papers and Large-type papers

Specific requirements and numbers can be listed on the *Form to Complete and Return*.

You would need to provide:Readers and Scribes

Please ensure the number of students that require a reader or a scribe is also listed on the form. This information is helpful for our data collection.

Reader pens can be used.

Any other requirements

With regards to **extra-time allowances**, students can receive between 25% and 50% extra-time if this is in the support plan of the student (or is expected once the support plan for that student is established).

Students can use **learning support assistants** and take **supervised rest breaks** as appropriate.

Please contact us regarding any other arrangements that are needed.

APPENDICES

Appendix 1 – Announcement by the University's Test Administrators

I'm working for the University of Manchester and we are conducting research into maths learning. To do that, we need your help in completing a questionnaire and a maths assessment.

We will need you to do three things today. Firstly, read a sheet with information on the project. Then complete a 5 minute questionnaire. And then complete a 45 minute maths assessment.

Please fill in the details on the front of your test paper. Today's date is……

(Pause to allow time for candidates to fill in the details)

We are going to go through some basic exam rules.

You should not communicate with another student whilst you are in the exam room. If you need to speak to us please raise your hand.

No student can leave the room until told to do so.

We are not expecting a fire alarm, but in the event of a fire alarm, please stay seated and wait for instructions from the invigilator.

If you are wearing a smart watch on please take it off. No mobile phones are permitted.

Please make sureyou have a pen or pencil and a working calculator. Phones cannot be used as calculators.

(Check)

You should all have a single A4 sheet with some information about the project. Please take the next couple of minutes to familiarise yourselves with this information.

(Wait)

There is a five minute questionnaire asking about the way you learn maths and asking for your feelings about maths. This questionnaire is at the front of your test booklet. The answers you provide will not be seen by your teachers. After completing the questionnaire, wait until told to do so before starting the test. Please open your booklets and take 5 minutes to complete the questionnaire.

(Wait until students have finished – even if it takes just over 5 minutes)

Thank you. Just a few quick points before you turn over the page to start the test.

You must write in the designated sections of the answer booklet and write all rough work in your answer booklet.

Please write clearly.

I will tell you when you have ten minutes remaining. And I'll inform you again when you have two minutes remaining.

There's a short calculator section at the start of the test. The rest of the paper is non-calculator. The paper will tell you to put your calculators on the floor once you have finished the calculator section. We will be coming around to check people haven't moved on to the non-calculator section without putting their calculator on the floor.

Please answer all the questions you can. You have 45 minutes.Good luck. You may start the paper.

(45 minutes)

(Give 10 minute warning)

(Give 2 minute warning)

Time's up. Thanks very much for taking part in this research.

Appendix 2 – Alternative Invigilator's announcement by the School's Invigilators or Staff

The University of Manchester are conducting research into maths learning. To do that, they need your help in completing a questionnaire and a maths assessment.

We will need you to do three things today. Firstly, read a sheet with information on the project. Then complete a 5 minute questionnaire. And then complete a 45 minute maths assessment.

Please fill in the details on the front of your test paper. Today's date is.....

(Pause to allow time for candidates to fill in the details)

We are going to go through some basic exam rules.

You should not communicate with another student whilst you are in the exam room. If you need to speak to us please raise your hand.

No student can leave the room until told to do so.

We are not expecting a fire alarm, but in the event of a fire alarm, please stay seated and wait for instructions from the invigilator.

If you are wearing a smart watch on please take it off. No mobile phones are permitted.

Please make sure you have a pen or pencil and a working calculator. Phones cannot be used as calculators.

(Check)

You should all have a single A4 sheet with some information about the project. Please take the next couple of minutes to familiarise yourselves with this information.

(Wait)

There is a five minute questionnaire asking about the way you learn maths and asking for your feelings about maths. This questionnaire is at the front of your test booklet. The answers you provide will not be seen by your teachers. After completing the questionnaire, wait until told to do so before starting the test. Please open your booklets and take 5 minutes to complete the questionnaire.

(Wait until students have finished – even if it takes just over 5 minutes)

Thank you. Just a few quick points before you turn over the page to start the test.

You must write in the designated sections of the answer booklet and write all rough work in your answer booklet.

Please write clearly.

I will tell you when you have ten minutes remaining. And I'll inform you again when you have two minutes remaining.

There's a short calculator section at the start of the test. The rest of the paper is non-calculator. The paper will tell you to put your calculators on the floor once you have finished the calculator section. We will be coming around to check people haven't moved on to the non-calculator section without putting their calculator on the floor.

Please answer all the questions you can. You have 45 minutes. Good luck. You may start the paper.

(45 minutes)

(Give 10 minute warning)

(Give 2 minute warning)

Time's up. Thanks very much for taking part in this research.

Appendix 3 – Form to Complete and Return - Test Administration

Form to complete and return – ICCAMS test administration

Please return this form to iccams-maths@manchester.ac.uk by Wednesday 6th June.

Confirming details

Please confirm that you are aware your ICCAMS test has been booked for (date) at (time)?	Yes/No (please delete)
Is this booked in on your school calendar?	Yes/No (please delete)
You are aware all pupils will need a calculator?	Yes/No (please delete)
Number of pupils to be tested:	

Access arrangements

Paper modifications	**Please specify number and details**
Coloured papers	
Large type papers	

Arrangement type	**Number to be used (please specify any other details)**
Scribes*	
Readers/Reader pens*	
Extra time (25% and 50%)	

*We will not provide readers/scribes.

Invigilation

Schools have been asked to provide a 'light form of invigilation' for the assessment, using invigilators or school staff. We will send at least one or two members of our team members to help administer the test (depending on school size).

Please confirm you will able to provide sufficient invigilation:	Yes/No (please delete)

Locations for exam

We have requested that the test take place in suitable examination spaces, with smaller rooms and classroomsan option for students with additional needs if required. Being aware of the number of exam spaces to be used will help us administer the test.

	Please specify number
Number of exam rooms to be used?	
Number of extra classrooms (please skip if unknown)?	

Delivery of test papers

Exam Officer name:	
Exam Office Address:	

Contact details

Your name:	
Name of main contact for testing (if not you):	
Main contact email address:	
Main contact phone number:	
Contact to meet us at the school on the test day (if known):	

Late students

We will follow the school's policy for late students.

Please detail the school's policy for students arriving late to exams:

Other

Please detail other requirements or concerns:

Appendix 9: Marking and Data Entry – Guidelines

Marking instructions

Please use the attached mark scheme for marking the scripts. The list includes the correct answers with some variants for some items.

It might be helpful if you use an empty test to add the correct answers along the questions to make the process more efficient (see attached).

Correct answers should be given a mark of 1 and wrong answers a mark of 0.

If the question was not attempted and there is no answer please leave empty.

Add your mark on the box on the right hand side of the margins, as shown below.

Do not add sums at the end of each page or at the end of the test.

Data entry instructions

Use the attached spreadsheet for data entry. **Please do not change that spreadsheet**. If there are any issues you think should be amended please let us know.

Enter each school on separate sheets – you will need to copy the template. You could use the provided **school ids** to name the sheet.

Start numbering the tests for each school from 1. Add these numbers in a circle on the top of the front page (above the box) on the original scripts. This will be the **"Questionnaire_id"** variable.

General rule for whole script: when a response is empty, please leave the cell in excel empty.

Front Page Data Entering

Complete all fields but note that some will only need copying and pasting.

For gender, use: Boy = 1, Girl=2

Questionnaire Data entry

Section A and B, enter the numbers as chosen on the papers.

For 'lesson difficulty', use: Too easy =1, About right =2, Too hard=3

Test data entry

Enter as marked using 0 (for wrong), 1 (for correct) and leave empty if not attempted.

There is a column at the end to add any comments on data entry for each script.

Appendix 10: Randomisation Process and list of random allocation

Random allocation was at the school level based on the school recruitment information provided by Durham in June 2016.

In order to account for this confounding, deal with the missing information (i.e. not available) for some schools, as well as ensure balance in the overall design and school split it was considered more useful to define the groups/blocks based on 3 categories per strata (i.e. low, medium and high). Randomisation of schools within each of the five regional Maths Hubs (to achieve a 50:50 allocation) was then performed with the following steps:

Step 1: Setting Criteria for High, Medium, and Low: Cut values of 50% and 70% (inclusive) were chosen for GCSE, and 20%, 50% for FSM. The cut-values of 50% and 70% (GCSE), and 20% and 50% were selected as reasonable cut lines by inspection of the whole distribution of scores.

Step 2: Dealing with Missing data: Schools with missing data were assigned to cells by imputation: using the probability that they should fall in a given cell in their area, based on existing frequencies of cells in that area. For example, with a school where low FSM is reported but no GCSE data is provided, we look at how the low FSM schools are distributed across low, medium and high GCSE figures.

A first set of random numbers was used for this step using the Random Number Generation in Excel's built-in Analysis ToolPak Add-in, with settings of 109 numbers with values between 0 and 1 from a uniform distribution, using the random seed of 27783. These were matched to schools in the order they were presented in the original spreadsheet.

Step 3: Inspecting blocks by area and applying tolerances: Once the locations of the schools with missing data were imputed within the blocks defined in Step 1, each area's scatterplot was inspected for borderline cases, block size and potential outliers (i.e. single cases). The following rules are applied:

- Tolerance of ±2% at the cut-offs is applied to allow for some schools that would otherwise be placed in a cell on their own or result in an odd cell frequency
- Rare single cases moved to the nearest neighbour block.

Step 4 – Setting Allocation rules and allocating schools: A second random number was generated for each school using the same Random Number Generation tool and settings as above, except for a different random seed of 19135. The rules for allocation were as follows:

- Sort the dataset by area, FSM group, GCSE group and second random number.
- Within each FSM/GCSE block, the schools with the higher random numbers will be allocated to the intervention (experimental) arm and the lower random numbers to control.
- *Selections from blocks with odd frequencies:* Assignment of schools to the Intervention groups in the 'smaller areas' were privileged (marginally) by assigning to these groups the even number in an odd cell (e.g. a cell containing 11 schools would get 6 intervention -schools in these smaller areas, to ensure that there were at least ten E-schools). For the larger groups the opposite was applied (e.g. the even number will be assigned to the control group first).
- In the event of more than one odd blocks in the same area the 'privilege' was alternated on the order of the blocks shown in the generic blockage figure (Figure 10.A) (chosen arbitrary in advance for consistency).

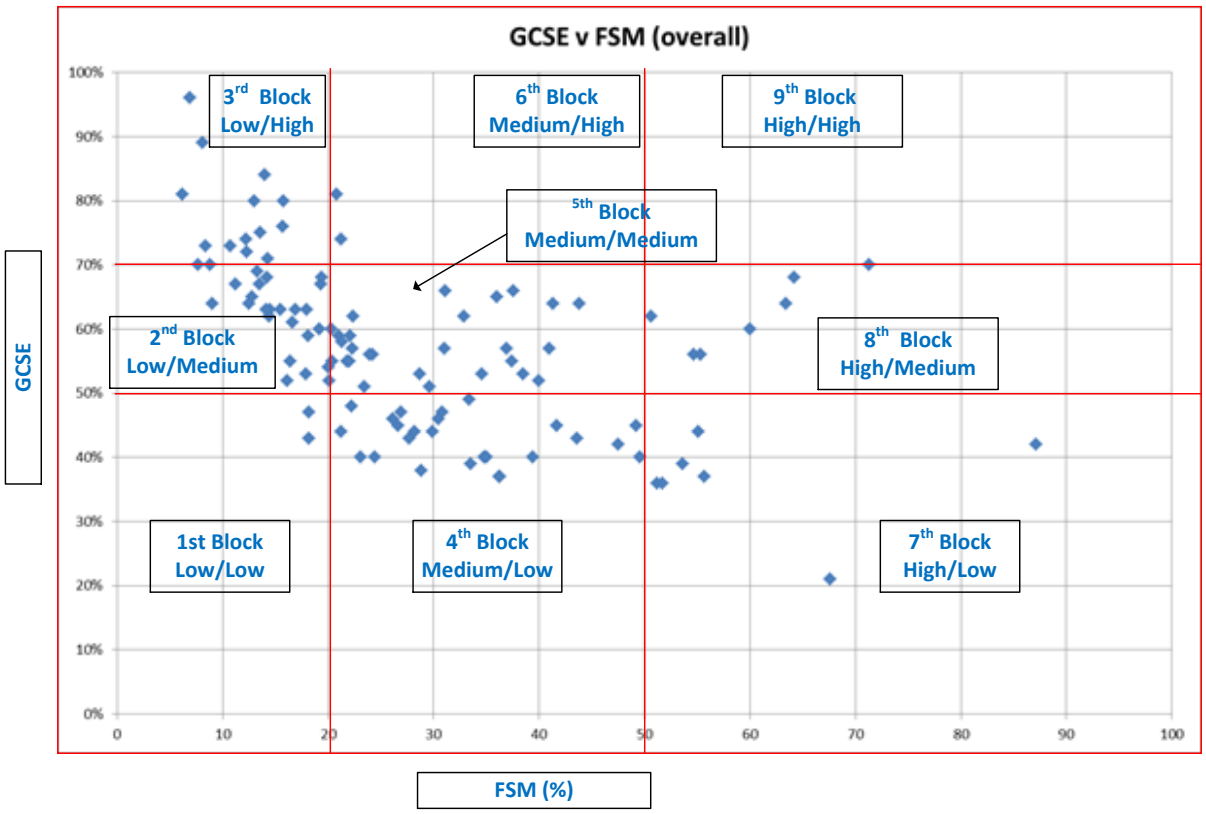


Figure 10.A: Block definition for randomisation within regions

The actual manifestations and how this split is to be implemented is shown in Table 10.B. As shown, there were only 4 instances of off block frequencies.

Table 10.B: Allocation for even sized blocks (Intervention/Control)

	Hub 1	Hub 2	Hub 3	Hub 4	Hub 5
1st Block	0	0	0	0	0
2nd Block	2	4	6	2	**7 (3/4)**
3rd Block	2	4	2	2	**7 (4/3)**
4th Block	**7 (4/3)**	0	**7 (4/3)**	11 **(5/6)**	4
5th Block	6	4	4	8	6
6th Block	0	0	0	0	0
7th Block	2	0	0	2	2
8th Block	0	8	0	0	0
9th Block	0	0	0	0	0

As a result of this process, which was repeated in each of the 5 regions, there were 55 schools assigned to the Experimental group and 54 to the Control group in total (as discussed in the main report document).

The details of the randomisation process have been recorded (both school lists and employed tool for the algorithm) and the outcome was shared with the delivery team. The schools were then informed (by Durham) of their random allocation in July, in order to make the necessary arrangements needed for the teachers to attend the ICCAMS PD sessions. All Year 7 students and teachers are expected to complete the first 'Disposition' Questionnaire (students) and teaching practice surveys (teachers) (i.e. pre-survey) at the beginning of the academic year 2016-17.

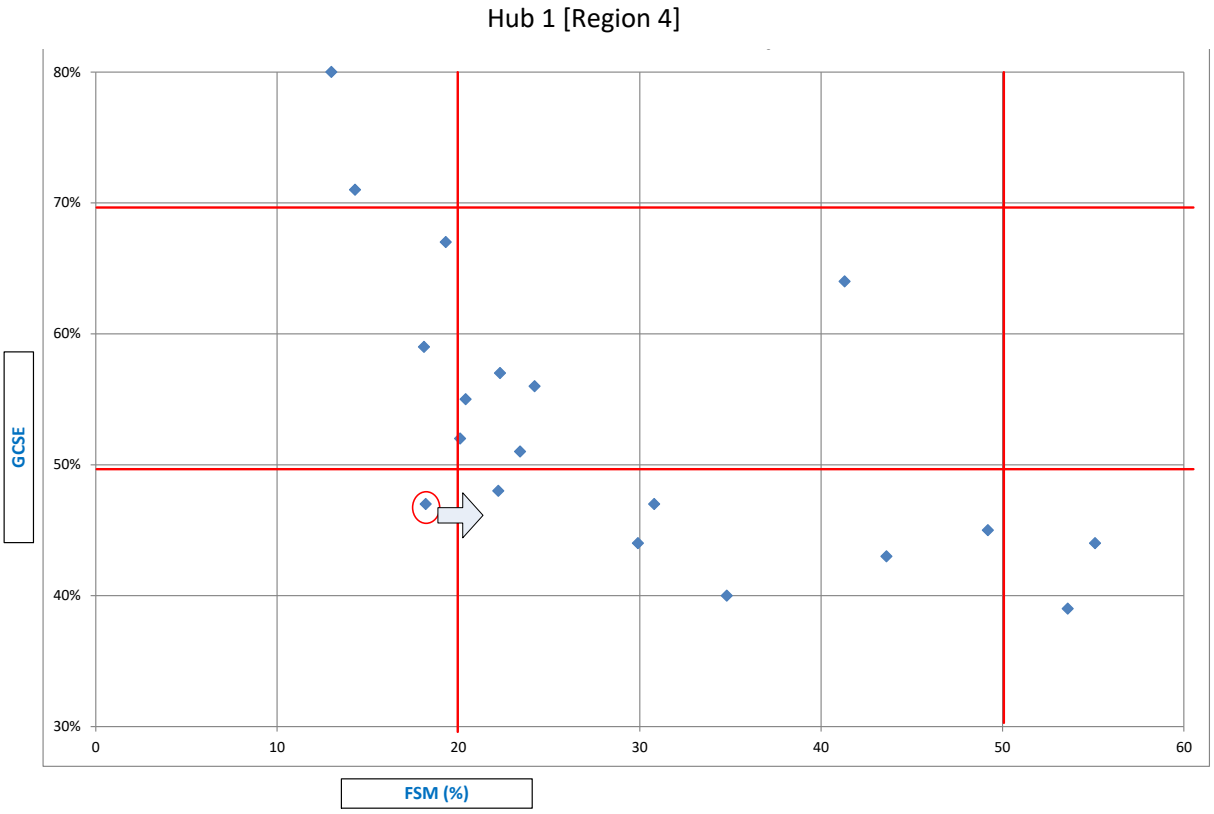


Figure 10.B: Block definition for randomisation within Region 4 [Hub 1]

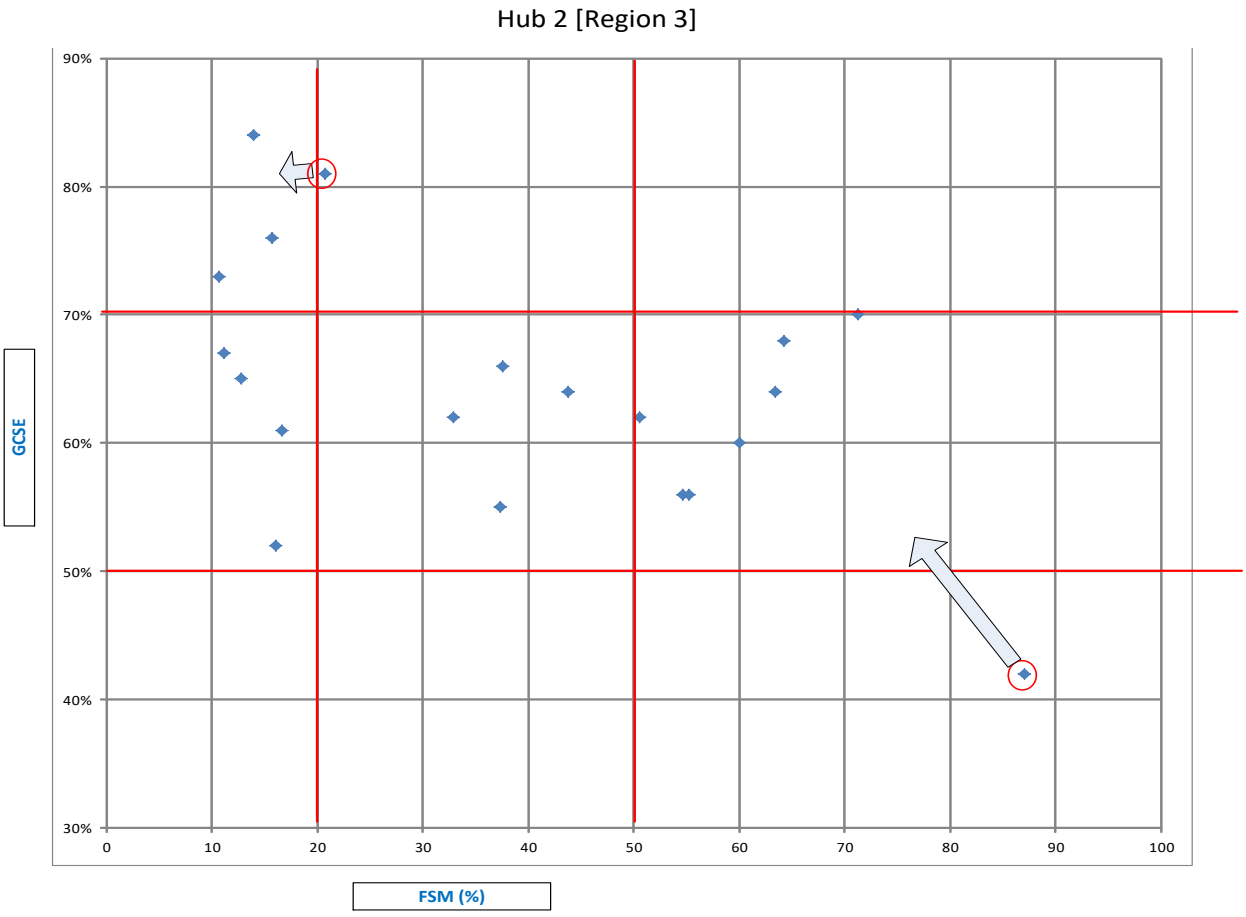


Figure 10.C: Block definition for randomisation within Region 3 [Hub 2]

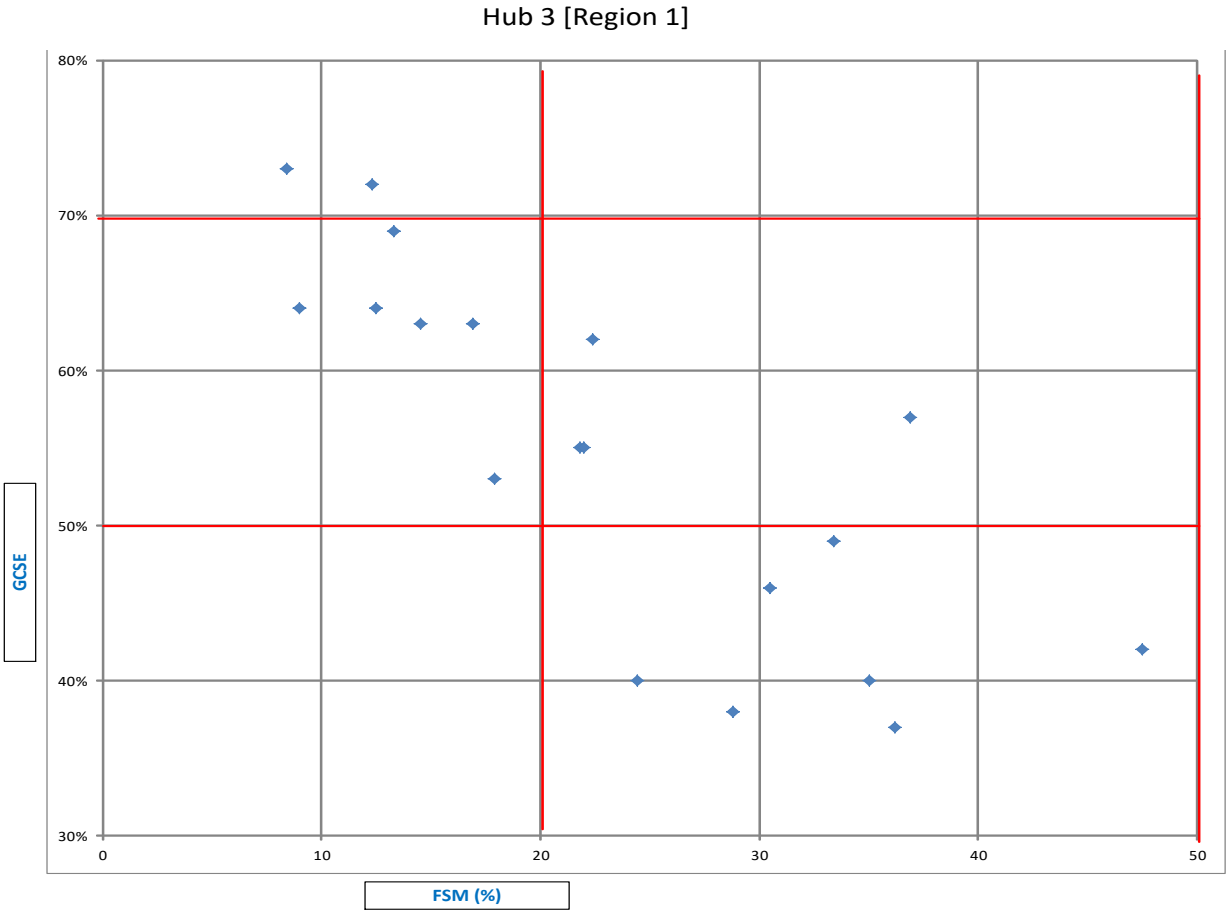


Figure 10.D: Block definition for randomisation within Region 1 [Hub 3]

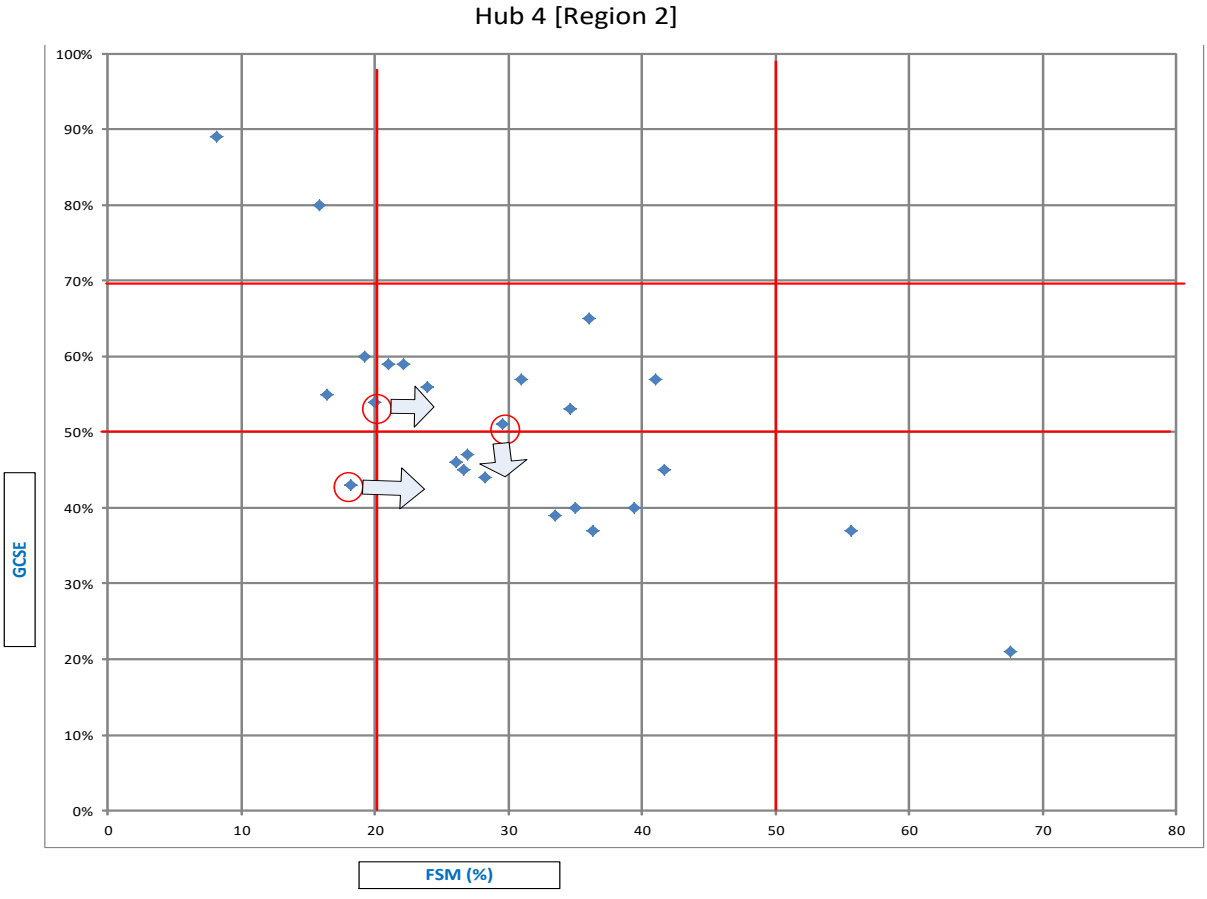


Figure 10.E: Block definition for randomisation within Region 2 [Hub 4]

Hub 5 [Region 5]

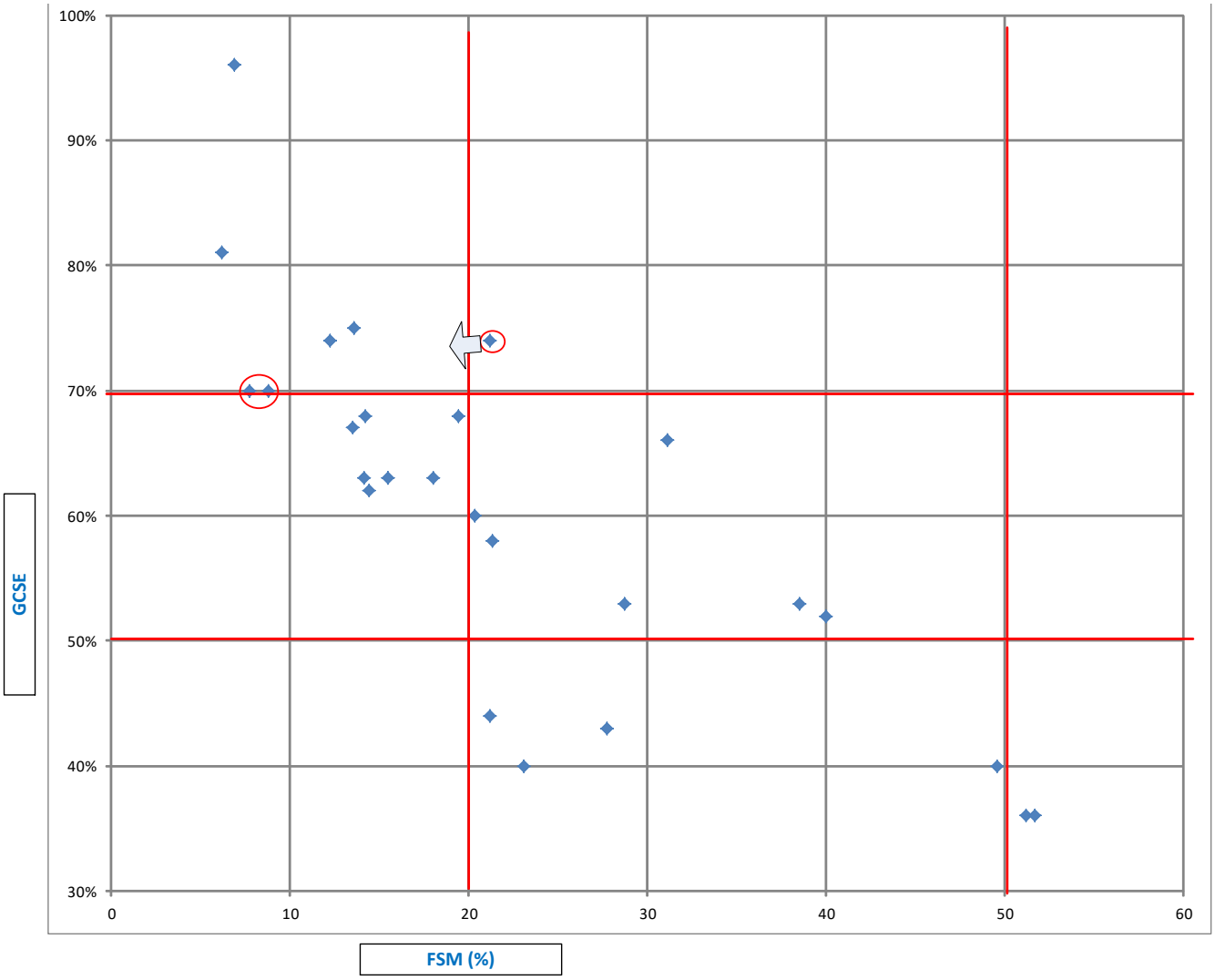


Figure 10.F: Block definition for randomisation within Region 5 [Hub 5]

Appendix 11: Technical Details of Measurement Approach

In this appendix we present extra technical detail in support to the report section on measure construction and validation, extending on the example of mathematics disposition as presented in the main document.

Item fit statistics and dimensionality diagnostics: Fit statistics (i.e. Infit and Outfit mean-squares, MNSQ) are used in the Rasch context to check fulfilment of the uni-dimensionality assumption and to flag items that may be problematic in this respect. In a 'perfect' measure these statistics should be 1, but an acceptable range is usually between 0.6 to 1.4 depending on the analysis context. For most of our analyses we take the value of 1.4 and above as a value for infit and outfit mean squares that suggest causes for concern (a low value, of less than 0.6, may signal redundancy, a high value signals possible non- or multidimensionality) and we explore those more.

ITEM STATISTICS: ENTRY ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
1	144735	35534	-1.50	.01	.79	-9.9	.79	-9.9	.68	.64	62.7	54.6	statement1
2	119751	35427	-.19	.01	.73	-9.9	.74	-9.9	.76	.69	57.1	48.4	statement2
3	134190	35287	-.95	.01	.78	-9.9	.77	-9.9	.72	.67	58.1	50.9	statement3
4	119859	35108	-.25	.01	1.56	9.9	1.72	9.9	.53	.69	43.7	48.4	statement4
5	105722	35212	.43	.01	.75	-9.9	.76	-9.9	.76	.71	56.3	46.6	statement5
6	96944	35381	.85	.01	.76	-9.9	.77	-9.9	.77	.71	55.4	46.4	statement6
7	69087	35371	2.20	.01	.99	-.7	.99	-1.3	.69	.68	57.8	53.1	statement7
8	101557	35372	.64	.01	1.03	3.5	1.01	1.4	.75	.71	44.7	46.4	statement8
9	140128	35476	-1.24	.01	1.59	9.9	1.58	9.9	.54	.65	44.0	53.1	statement9
MEAN	114664	35352	.00	.01	1.00	-3.0	1.02	-3.3			53.3	49.8	
S.D.	22680.9	124.3	1.10	.00	.32	8.3	.35	8.1			6.8	3.0	

Figure 11A: Item Fit Statistics output from Winsteps

As shown in Figure 9, two items appear higher than the acceptable fit range: these both have to do with studying mathematics in the future –perhaps as in this age group students do not yet have a choice to drop mathematics. As statement 4 [I never want to take another mathematics course] was the only reversed statement this may further explain its high misfit value, but as these items do not seem to present a threat for the validity of this measure, the decision was to keep them as they are useful for the definition of this measure. This decision was further corroborated with dimensionality diagnostics, which in the Rasch context involves a principal components analysis of residuals. This showed that the eigenvalues for unexplained variance in additional contrasts were smaller than 2 (that suggests that there are no serious issues with the construct's unidimensionality) and the Rasch dimension explains 35.4% of the variance in the data, much bigger than the variance explained by the first contrast in the residuals (7%) as shown below:

Table 11A: Principal components analysis of residuals

Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)

		-- Empirical --		Modeled
Total raw variance in observations	=	24.5	100.0%	100.0%
Raw variance explained by measures	=	15.5	63.3%	63.0%
Raw variance explained by persons	=	6.8	27.9%	27.8%
Raw Variance explained by items	=	8.7	35.4%	35.3%
Raw unexplained variance (total)	=	9.0	36.7% 100.0%	37.0%
Unexplned variance in 1st contrast	=	1.7	7.0% 19.2%	

It can be seen that all the eigenvalues for unexplained variance in additional contrasts are smaller than 2 (that suggests that there are no serious issues with the construct's unidimensionality).The Rasch dimension explains 35.4% of the variance in the data, much bigger than the variance explained by the first contrast in the residuals (7%). However, the percentage of unexplained variance in the first contrast is over the suggested limit of 15% (19.2%) suggesting that it may be a secondary dimension or sub-scaling within these items.

Separation and reliability: In the Rasch context, item separation is used to verify the items hierarchy, whilst person separation is used to classify persons (in this case, students). Both come with a corresponding reliability score, with the Winsteps' person reliability considered as equivalent to the traditional 'test' reliability(Linacre, 2006). For the constructed measure under investigation the results are as follows:

- Person separation: 2.35, Reliability: 0.85
- Item separation: 144.36, Reliability: 1

This shows good item separation (greater than 3, with reliability > 0.9) which implies that the person sample is large enough to precisely locate the items on the latent variable, i.e. to confirm the construct validity of the instrument (Linacre, 2006). Similarly, the person separation is above the minimum requirement of 2 (with reliability > 0.8) and suggests that the instrument can classify well respondents into at least two groups.

Category Statistics: Rating scales and their response formats serve as tools with which the researcher communicates with the respondents, a function defined as 'communication validity'. Examining category statistics is essential within the rating scale measurement framework in order to confirm the appropriateness of the Likert scale used and its interpretation by the respondents. A well-functioning scale should, at least, present ordered average measures, and ordered step calibrations (Linacre, 2002) with acceptable fit statistics. In the probability plot of the appendix, the four thresholds (i.e. boundary between category 1 and 2, 2 and 3, 3 and 4, 4 and 5) are denoted with arrows superimposed on the probability curves of each category. All these seem to be ordered, which indicates a good use of the response options and a good measure.

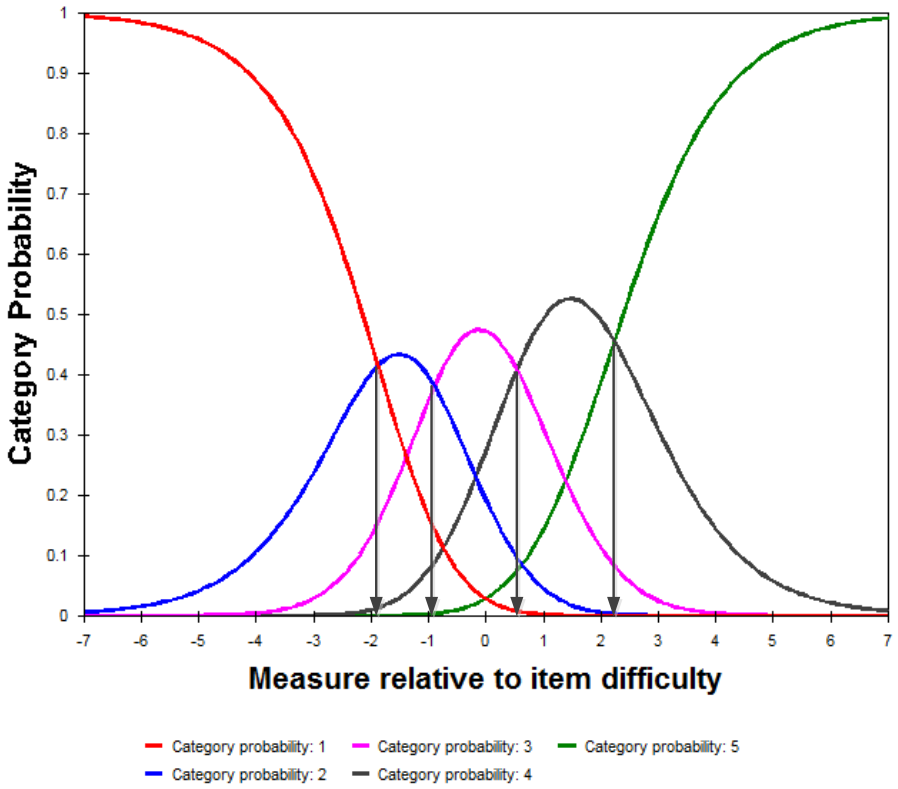


Figure 11B: Probability Curves for Response Categories

Table 11B: Category Statistics output from Winsteps

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	35713	11	-2.11	-2.11	1.10	1.21	NONE	(-3.20)	1
2	2	51968	16	-.97	-.92	.86	.87	-1.88	-1.51	2
3	3	84726	27	.12	.10	.92	.95	-.90	-.12	3
4	4	90659	28	1.17	1.13	.88	.90	.54	1.48	4
5	5	55102	17	2.30	2.36	1.18	1.17	2.23	(3.46)	5
MISSING		2100	1	.24						

Differential Item Functioning - to ensure measurement invariance

When a measure is intended for use with different subject groups or for different occasions, it is also important to establish its invariance across groups (or occasions): only if the item calibrations are invariant from group to group can meaningful comparisons of person measures be made (Wright and Masters, 1982). A statistical way to inform this process is to check for Differential Item Functioning (DIF), which can be a serious threat to the validity of items and tests/instruments when used with different groups and could indicate a source of item bias. For this analysis we are primarily concerned with gender differences, survey timing (DP1 vs DP2, i.e. baseline/post) and condition (i.e. intervention/control)[2]. Figure 10 presents the result of this analysis in regard to condition and there are only small and ignorable differences. In the Appendix 8 we show the DIF comparisons for gender and DP where we can observe some small differences (statistically significant due to the huge sample sizes, (Smith et al., 2008)). On exploring the items, we suspect these gender differences represent 'real' differences in perceptions by gender ('construct relevant' variance) rather than bias in the items themselves ('construct irrelevance') and, therefore, we reserve doubt about these items' gender bias.

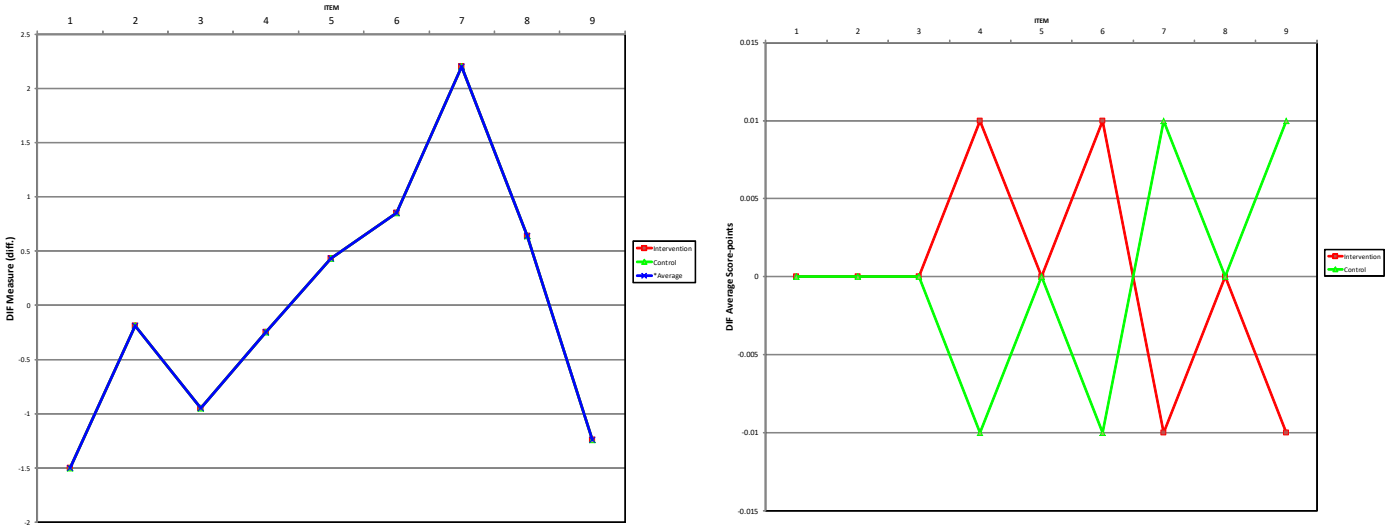


Figure 11C: Test of DIF by condition (intervention vs control)

[2] Ideally we would have also checked for FSM/Non-FSM however at the time of analysis the ONS/SRS did not provide access to the software needed for such analysis (Winsteps).

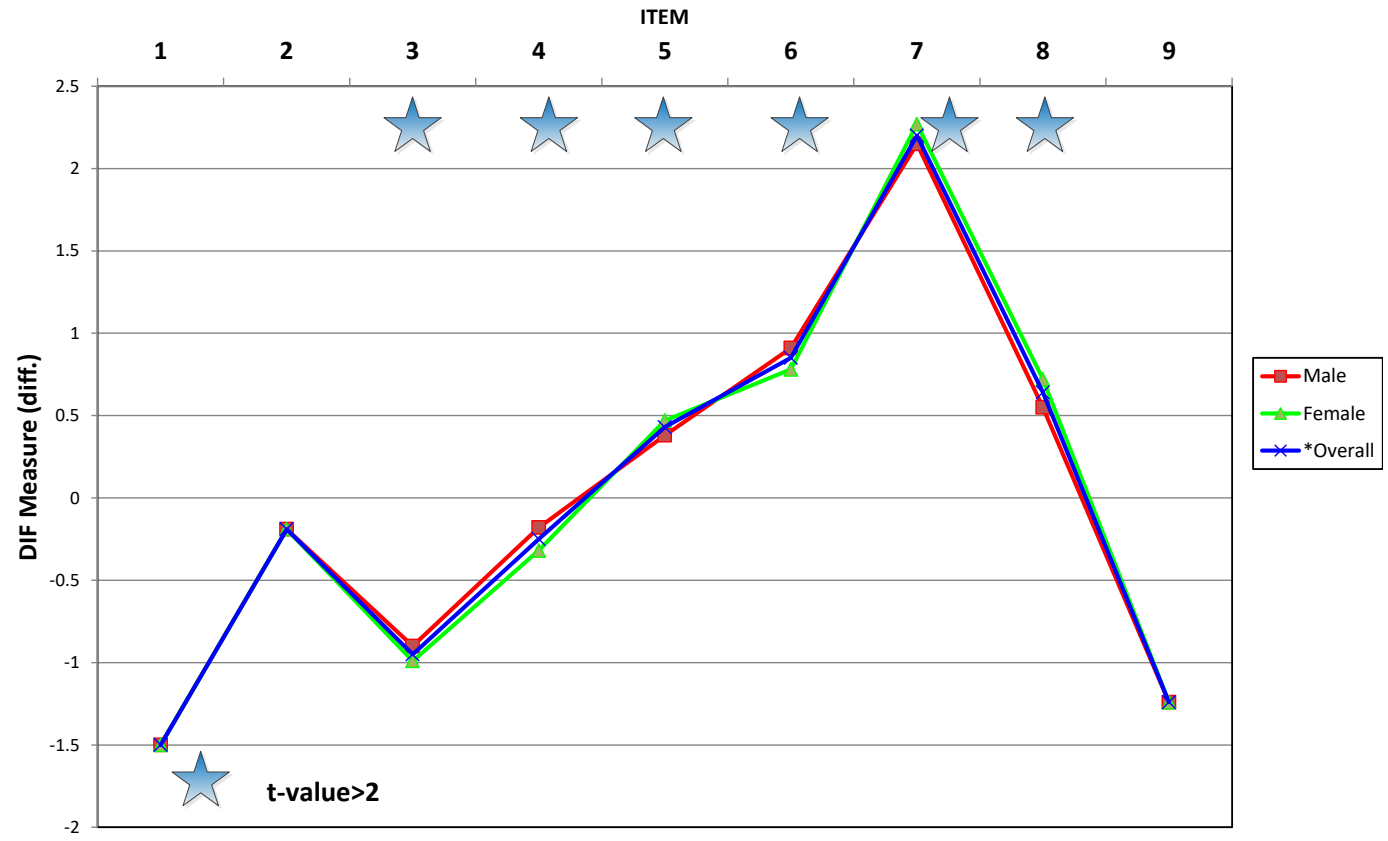


Figure 11D: Differential Item Functioning, by gender

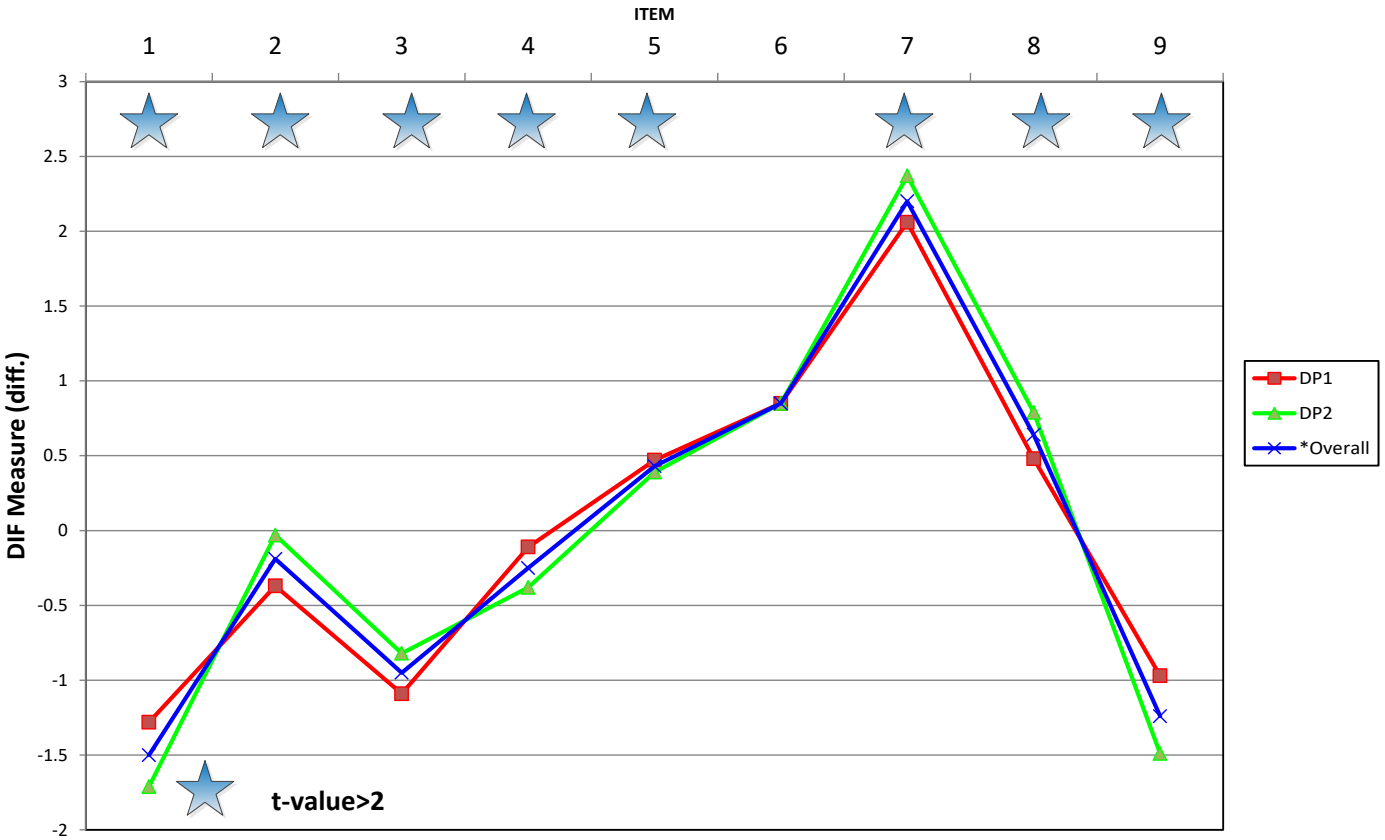


Figure 11E: Differential Item Functioning, by data point (DP1: start of Year 7, DP2: end of Year 8)

Equivalence of logit measure with raw scores

Table 11C: Raw scores correspondence to logit measures

SCORE	MEASURE	S.E.	SCORE	MEASURE	S.E.	SCORE	MEASURE	S.E.
9	-5.76E	1.84	22	-.95	.42	35	1.41	.46
10	-4.51	1.03	23	-.78	.42	36	1.63	.48
11	-3.76	.75	24	-.61	.42	37	1.87	.49
12	-3.29	.64	25	-.43	.42	38	2.12	.51
13	-2.93	.57	26	-.26	.42	39	2.39	.54
14	-2.63	.53	27	-.09	.42	40	2.70	.57
15	-2.36	.50	28	.09	.42	41	3.05	.62
16	-2.13	.48	29	.26	.42	42	3.48	.69
17	-1.91	.46	30	.44	.43	43	4.04	.81
18	-1.70	.45	31	.62	.43	44	4.90	1.09
19	-1.50	.44	32	.81	.44	45	6.23E	1.88
20	-1.32	.43	33	1.01	.44			
21	-1.13	.42	34	1.20	.45			

```
CURRENT VALUES, UMEAN=.0000 USCALE=1.0000
TO SET MEASURE RANGE AS 0-100, UMEAN=48.0169 USCALE=8.3410
TO SET MEASURE RANGE TO MATCH RAW SCORE RANGE, UMEAN=26.2861 USCALE=3.0028
Predicting Score from Measure: Score = Measure * 4.0312 + 17.9751
Predicting Measure from Score: Measure = Score * .2370 + -4.2601
```

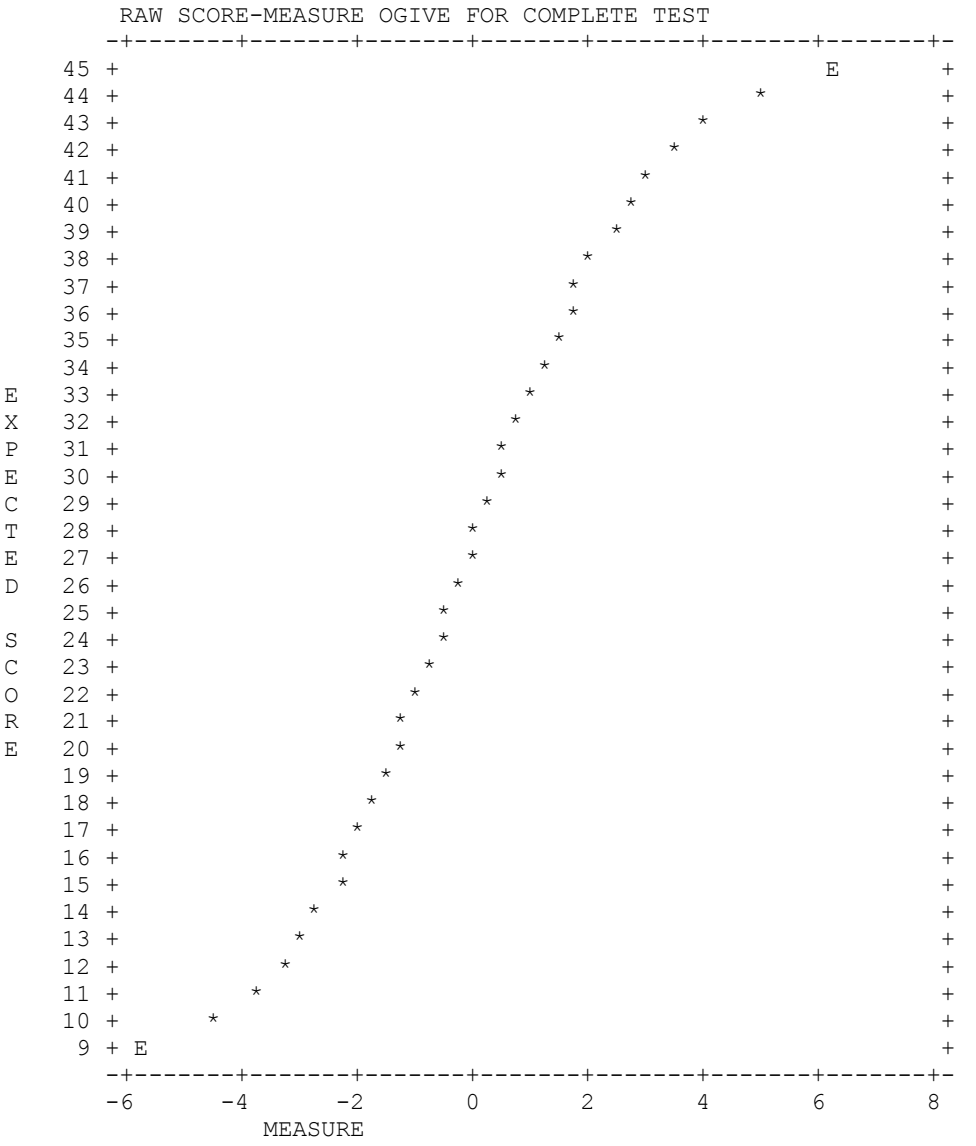


Figure 11F: Measure (logit) to expected raw score

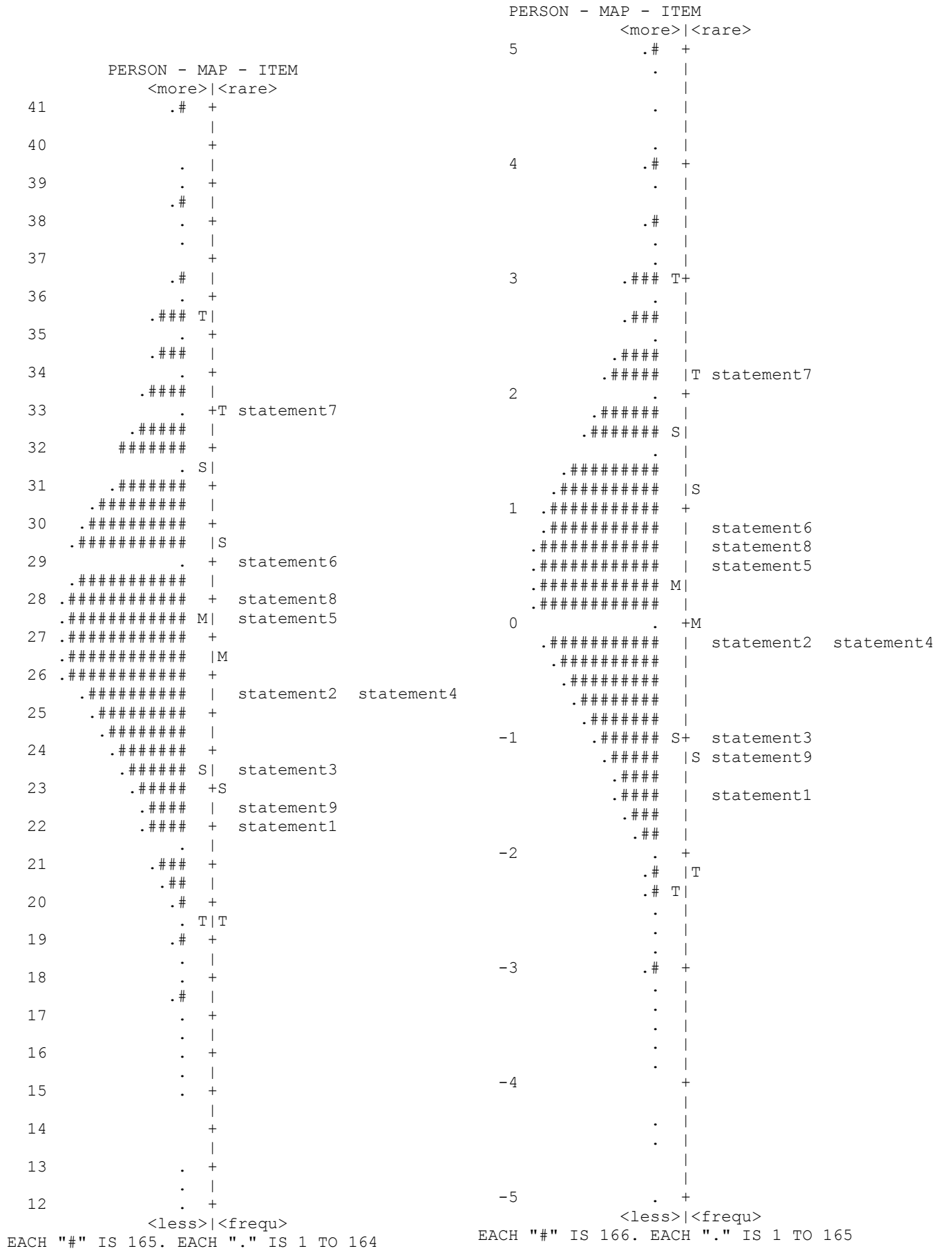


Figure 11G: Item-person maps for scale based on original scoring (left) comparatively to the logit scale used (right)

Appendix 12: Measures for Attainment

Rasch validation: Overall measure

Fit statistics

```
INPUT: 21701 PERSON  46 ITEM  REPORTED: 18056 PERSON  46 ITEM  92 CATS WINSTEPS 3.72.3
-------------------------------------------------------------------------------
PERSON: REAL SEP.: 2.72  REL.: .88 ... ITEM: REAL SEP.: 64.78  REL.: 1.00

         ITEM STATISTICS:  ENTRY ORDER

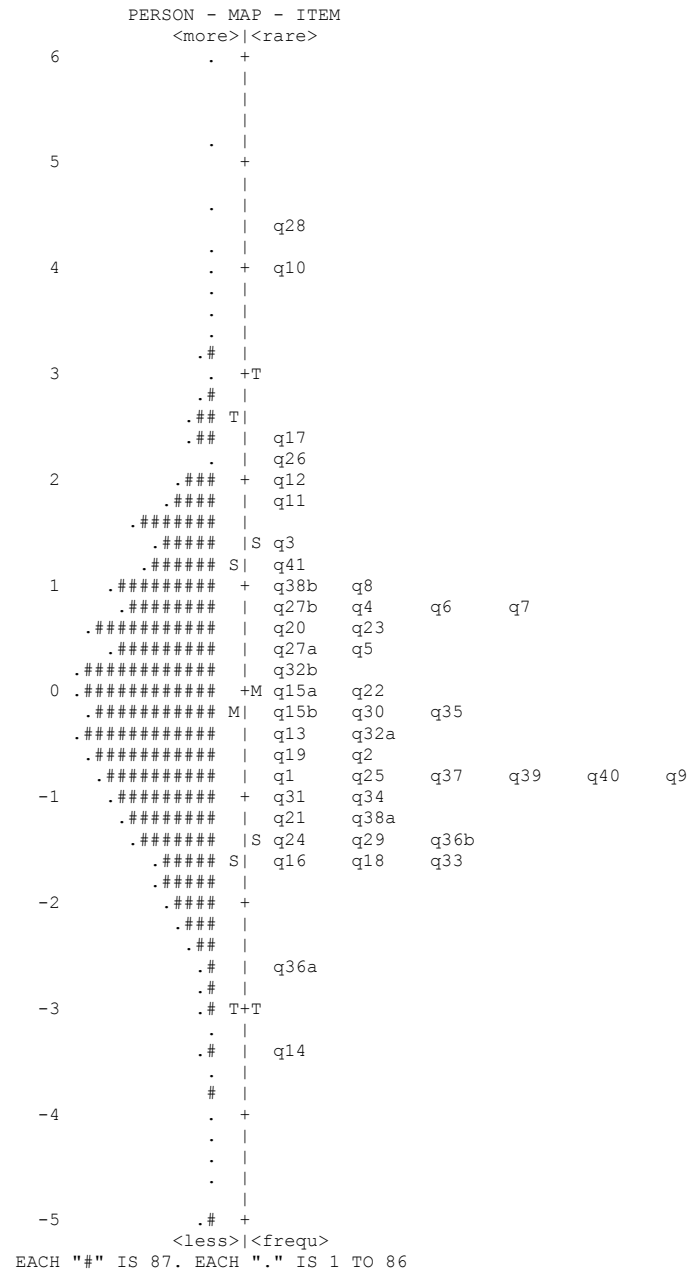
-------------------------------------------------------------------------------------------------
|ENTRY   TOTAL  TOTAL           MODEL|   INFIT  |  OUTFIT  |PT-MEASURE |EXACT MATCH|          |
|NUMBER  SCORE  COUNT  MEASURE  S.E. |MNSQ  ZSTD|MNSQ  ZSTD|CORR.  EXP.| OBS%  EXP%| ITEM  G  |
|-----------------------------------+----------+----------+-----------+-----------+----------|
|     1  11025  17371    -.84     .02|1.18   9.9|1.30   9.9|  .38   .50| 68.9  74.3| q1    0  |
|     2  10653  17462    -.69     .02|1.04   4.8|1.07   4.3|  .47   .50| 72.3  73.4| q2    0  |
|     3   3849  15542    1.46     .02| .90  -9.6| .79  -8.3|  .52   .45| 81.5  79.6| q3    0  |
|     4   4991  14286     .86     .02|1.03   3.7| .98   -.8|  .48   .49| 72.7  74.9| q4    0  |
|     5   6641  15532     .41     .02| .95  -6.6| .92  -5.2|  .53   .50| 74.5  72.5| q5    0  |
|     6   4966  13336     .86     .02| .97  -3.1| .92  -3.9|  .50   .48| 74.2  73.6| q6    0  |
|     7   5665  17142     .88     .02| .98  -1.9| .98  -1.1|  .49   .48| 75.7  75.4| q7    0  |
|     8   5481  16502     .91     .02| .90  -9.9| .79  -9.9|  .54   .48| 77.7  75.3| q8    0  |
|     9   9369  14454    -.88     .02|1.24   9.9|1.27   9.9|  .37   .50| 66.5  75.2| q9    0  |
|    10    628  14852    3.97     .04| .98   -.5| .77  -3.5|  .27   .25| 95.9  95.9| q10   0  |
|    11   2862  13011    1.70     .02| .75  -9.9| .56  -9.9|  .59   .45| 85.9  81.6| q11   0  |
|    12   2517  14111    2.06     .02| .85  -9.9| .59  -9.9|  .52   .42| 86.0  84.2| q12   0  |
|    13   9017  16102    -.36     .02| .86  -9.9| .80  -9.9|  .59   .50| 77.6  72.5| q13   0  |
|    14  16462  17774   -3.41     .03|1.01   .5|1.53   8.5|  .32   .35| 93.3  93.2| q14   0  |
|    15   8158  16514     .00     .02| .88  -9.9| .82  -9.9|  .57   .50| 76.6  71.7| q15a  0  |
|    16   8870  16485    -.23     .02|1.08   9.8|1.09   5.7|  .45   .50| 68.6  71.9| q15b  0  |
|    17  13121  16920   -1.70     .02| .99  -1.3| .96  -1.7|  .46   .45| 81.6  81.3| q16   0  |
|    18   2218  16246    2.36     .03| .90  -6.4| .95  -1.4|  .44   .38| 88.4  87.5| q17   0  |
|    19  12836  17006   -1.56     .02|1.01   1.0|1.13   5.3|  .44   .46| 80.5  80.0| q18   0  |
|    20   9091  14431    -.59     .02| .87  -9.9| .85  -8.8|  .57   .49| 79.1  73.8| q19   0  |
|    21   5762  13752     .58     .02| .93  -8.9| .84  -9.0|  .54   .49| 74.5  72.4| q20   0  |
|    22  12185  17110   -1.29     .02| .94  -6.5| .87  -6.7|  .52   .48| 78.9  77.5| q21   0  |
|    23   7560  14962     .02     .02|1.13   9.9|1.17   9.9|  .42   .50| 66.8  71.6| q22   0  |
|    24   6518  17256     .59     .02|1.19   9.9|1.31   9.9|  .37   .49| 67.5  73.7| q23   0  |
|    25  11981  16569   -1.31     .02| .87  -9.9| .83  -8.3|  .55   .47| 81.6  78.1| q24   0  |
|    26  10335  16521    -.72     .02|1.05   6.5|1.11   6.2|  .45   .49| 72.3  73.7| q25   0  |
|    27   2735  16949    2.11     .02|1.09   6.4|1.72   9.9|  .31   .40| 85.1  85.4| q26   0  |
|    28   6628  16064     .42     .02| .87  -9.9| .81  -9.9|  .58   .50| 77.8  73.0| q27a  0  |
|    29   5244  15078     .82     .02| .90  -9.9| .96  -2.1|  .54   .49| 78.2  75.0| q27b  0  |
|    30    396  14224    4.46     .05|1.04   .8|1.20   2.3|  .19   .21| 97.3  97.3| q28   0  |
|    31  11916  16475   -1.32     .02|1.06   6.0|1.17   7.3|  .43   .47| 77.0  78.1| q29   0  |
|    32   8762  16607    -.20     .02|1.00   .5|1.05   3.1|  .49   .50| 71.9  71.9| q30   0  |
|    33  10680  15210   -1.08     .02|1.03   3.4|1.23   9.9|  .44   .47| 77.1  76.8| q31   0  |
|    34   9197  16362    -.37     .02|1.02   2.2|1.00   .2|  .49   .50| 71.4  72.1| q32a  0  |
|    35   7348  15601     .15     .02|1.13   9.9|1.43   9.9|  .40   .50| 68.2  71.9| q32b  0  |
|    36  11671  15268   -1.52     .02| .99  -1.1|1.10   3.8|  .45   .45| 81.4  80.5| q33   0  |
|    37  10816  16306    -.95     .02|1.03   3.2|1.04   2.3|  .47   .48| 74.4  75.1| q34   0  |
|    38   8484  15900    -.20     .02| .99  -1.5|1.04   2.7|  .50   .50| 72.4  71.9| q35   0  |
|    39  13053  14815   -2.53     .03| .85  -8.4| .96   -.9|  .46   .39| 90.6  89.3| q36a  0  |
|    40  11066  14676   -1.39     .02| .90  -8.9| .95  -2.1|  .51   .45| 82.7  79.8| q36b  0  |
|    41   9929  15633    -.74     .02|1.28   9.9|1.88   9.9|  .27   .49| 67.0  74.0| q37   0  |
|    42   9482  12823   -1.20     .02| .84  -9.9| .76  -9.9|  .57   .47| 82.9  79.2| q38a  0  |
|    43   4155  10891     .92     .02|1.10   9.9|1.35   9.9|  .40   .48| 71.5  73.4| q38b  0  |
|    44   9634  14913    -.78     .02| .87  -9.9| .79  -9.9|  .57   .49| 78.5  74.5| q39   0  |
|    45   9803  14863    -.87     .02|1.00   .0|1.07   3.6|  .48   .49| 76.0  75.1| q40   0  |
|    46   4191  13625    1.17     .02|1.04   3.7|1.00   .0|  .45   .47| 74.8  76.3| q41   0  |
|-----------------------------------+----------+----------+-----------+-----------+----------|
| MEAN  7998.9  15512     .00     .02| .99  -1.1|1.04   .0|           | 77.7  77.5|          |
| S.D.  3610.2 1425.7    1.50     .01| .11   7.3| .26   7.2|           |  7.4   6.4|          |
```

Principal component analysis of the residuals

```
INPUT: 21701 PERSON  46 ITEM  REPORTED: 18056 PERSON  46 ITEM  92 CATS WINSTEPS 3.72.3
-------------------------------------------------------------------------------

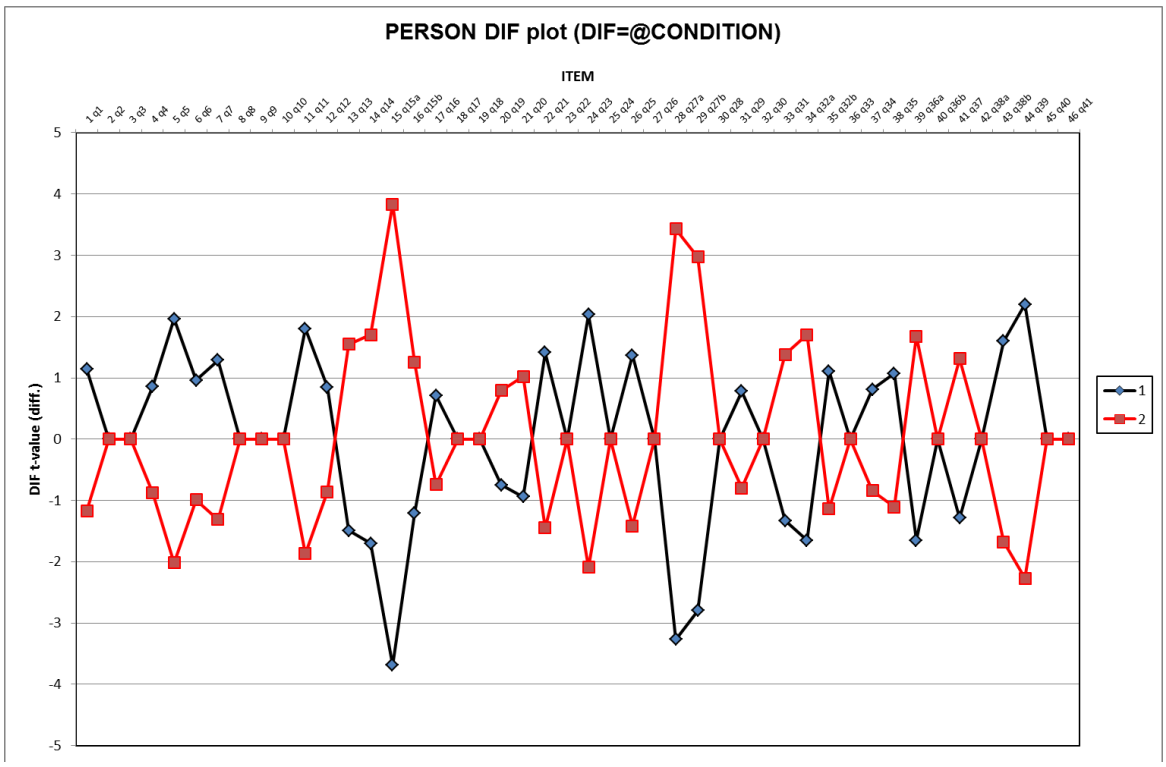
     Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                        -- Empirical --    Modeled
Total raw variance in observations     =         75.5 100.0%         100.0%
  Raw variance explained by measures   =         29.5  39.1%          38.9%
    Raw variance explained by persons  =         14.7  19.5%          19.3%
    Raw Variance explained by items    =         14.8  19.6%          19.5%
  Raw unexplained variance (total)     =         46.0  60.9% 100.0%   61.1%
    Unexplned variance in 1st contrast =          1.7   2.2%   3.6%
    Unexplned variance in 2nd contrast =          1.5   1.9%   3.2%
    Unexplned variance in 3rd contrast =          1.4   1.9%   3.1%
    Unexplned variance in 4th contrast =          1.3   1.7%   2.8%
    Unexplned variance in 5th contrast =          1.2   1.6%   2.7%
INPUT: 21701 PERSON  46 ITEM  REPORTED: 18056 PERSON  46 ITEM  92 CATS WINSTEPS 3.72.3
-------------------------------------------------------------------------------
```

Person-item map



DIF by gender – check again!
DIF by condition

Differential Item Functioning (by condition, 1=intervention, 2=control)



Subscale: Multiplication

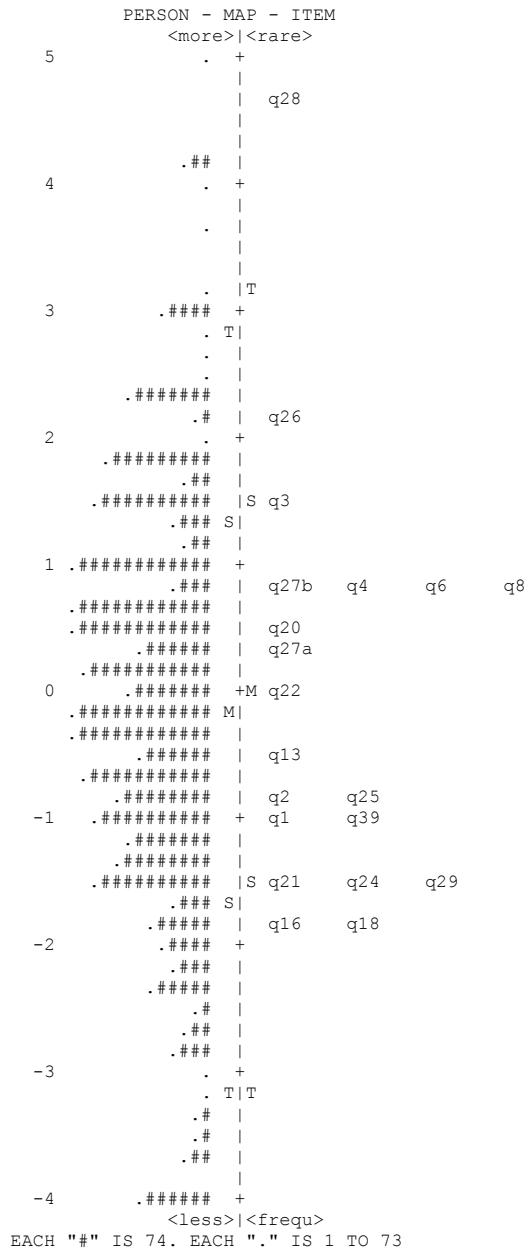
Item fit statistics

```
INPUT: 21701 PERSON  20 ITEM  REPORTED: 18045 PERSON  20 ITEM  40 CATS WINSTEPS 3.72.3
-------------------------------------------------------------------------------
PERSON: REAL SEP.: 1.90  REL.: .78 ... ITEM: REAL SEP.: 64.39  REL.: 1.00

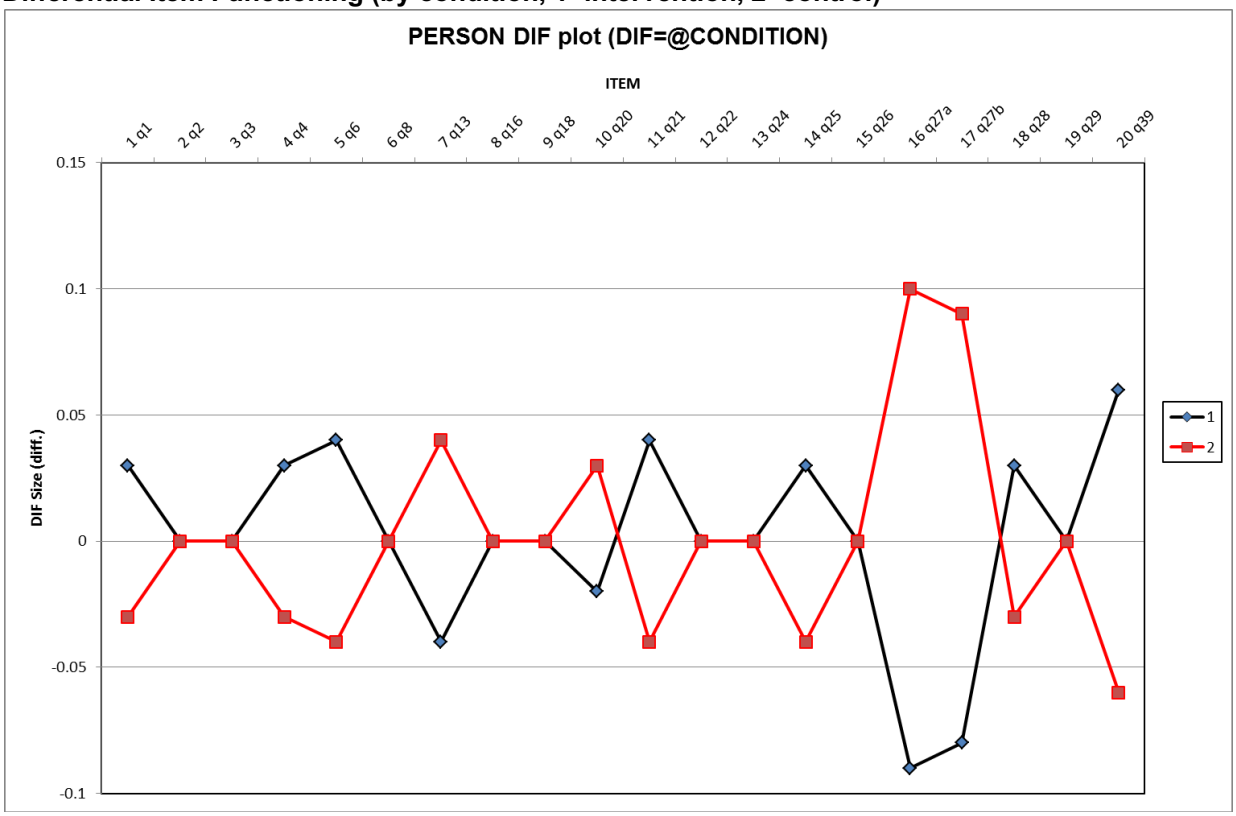
         ITEM STATISTICS:  ENTRY ORDER

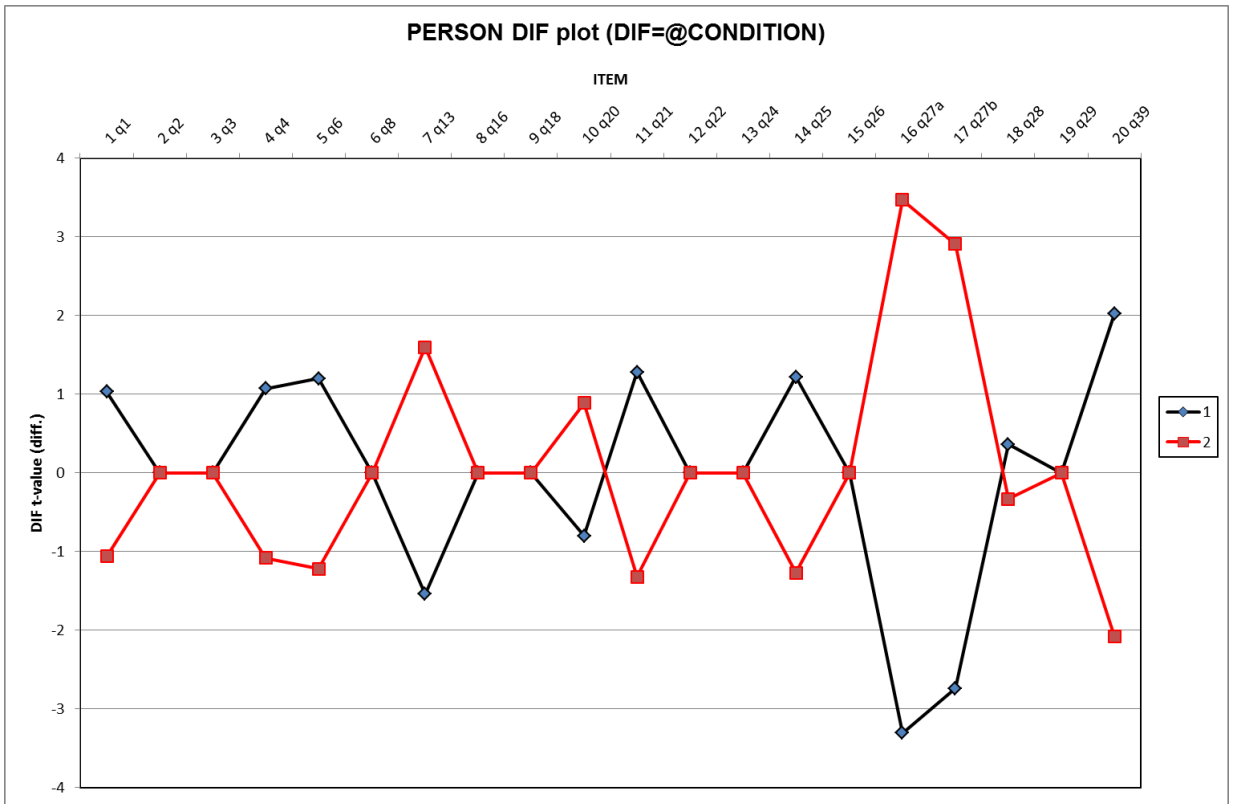
-----------------------------------------------------------------------------------------------
|ENTRY   TOTAL  TOTAL           MODEL|   INFIT  |  OUTFIT  |PT-MEASURE |EXACT MATCH|          |
|NUMBER  SCORE  COUNT  MEASURE  S.E. |MNSQ  ZSTD|MNSQ  ZSTD|CORR.  EXP.| OBS%  EXP%| ITEM  G  |
|------------------------------------+----------+----------+-----------+-----------+----------|
|     1  11025  17371   -1.00    .02|1.22   9.9|1.37   9.9|  .42   .54| 69.4  75.7| q1    0  |
|     2  10653  17462    -.84    .02|1.07   7.8|1.10   5.0|  .50   .54| 73.0  74.9| q2    0  |
|     3   3849  15542    1.44    .02| .90  -9.0| .78  -8.5|  .54   .48| 81.6  80.1| q3    0  |
|     4   4991  14286     .82    .02|1.03   3.1|1.01    .3|  .51   .52| 74.2  75.8| q4    0  |
|     5   4966  13336     .81    .02|1.02   2.4|1.01    .5|  .50   .51| 73.9  74.7| q6    0  |
|     6   5481  16502     .86    .02| .91  -9.9| .80  -9.9|  .56   .51| 77.9  76.2| q8    0  |
|     7   9017  16102    -.48    .02| .87  -9.9| .81  -9.9|  .61   .54| 78.5  74.1| q13   0  |
|     8  13121  16920   -1.91    .02| .99   -.6| .96  -1.3|  .50   .50| 82.6  82.3| q16   0  |
|     9  12836  17006   -1.76    .02|1.05   4.4|1.22   7.2|  .47   .51| 80.9  81.1| q18   0  |
|    10   5762  13752     .53    .02| .91  -9.9| .83  -9.7|  .57   .52| 76.0  73.7| q20   0  |
|    11  12185  17110   -1.48    .02| .97  -2.6| .90  -3.8|  .54   .52| 79.3  78.8| q21   0  |
|    12   7560  14962    -.06    .02|1.14   9.9|1.18   9.9|  .46   .53| 68.6  73.2| q22   0  |
|    13  11981  16569   -1.50    .02| .88  -9.9| .86  -5.6|  .57   .51| 82.4  79.3| q24   0  |
|    14  10335  16521    -.86    .02|1.07   7.6|1.14   6.9|  .49   .53| 73.1  75.2| q25   0  |
|    15   2735  16949    2.13    .02|1.12   8.0|1.96   9.9|  .34   .43| 84.8  85.8| q26   0  |
|    16   6628  16064     .35    .02| .85  -9.9| .78  -9.9|  .61   .53| 78.8  74.3| q27a  0  |
|    17   5244  15078     .77    .02| .88  -9.9| .93  -3.6|  .57   .52| 80.1  76.0| q27b  0  |
|    18    396  14224    4.63    .06|1.06   1.3|1.42   4.3|  .21   .25| 97.4  97.4| q28   0  |
|    19  11916  16475   -1.51    .02|1.08   7.6|1.22   7.5|  .47   .51| 77.7  79.3| q29   0  |
|    20   9634  14913    -.94    .02| .91  -9.6| .83  -8.1|  .58   .53| 78.7  76.0| q39   0  |
|------------------------------------+----------+----------+-----------+-----------+----------|
| MEAN  8015.8  15857     .00    .02|1.00  -1.0|1.05   -.4|           | 78.4  78.2|          |
| S.D.  3644.9 1229.8    1.55    .01| .10   7.8| .28   7.3|           |  6.1   5.4|          |
-----------------------------------------------------------------------------------------------
INPUT: 21701 PERSON  20 ITEM  REPORTED: 18045 PERSON  20 ITEM  40 CATS WINSTEPS 3.72.3
-------------------------------------------------------------------------------
```

Person-item map



Differential Item Functioning (by condition, 1=intervention, 2=control)





Subscale: Algebra

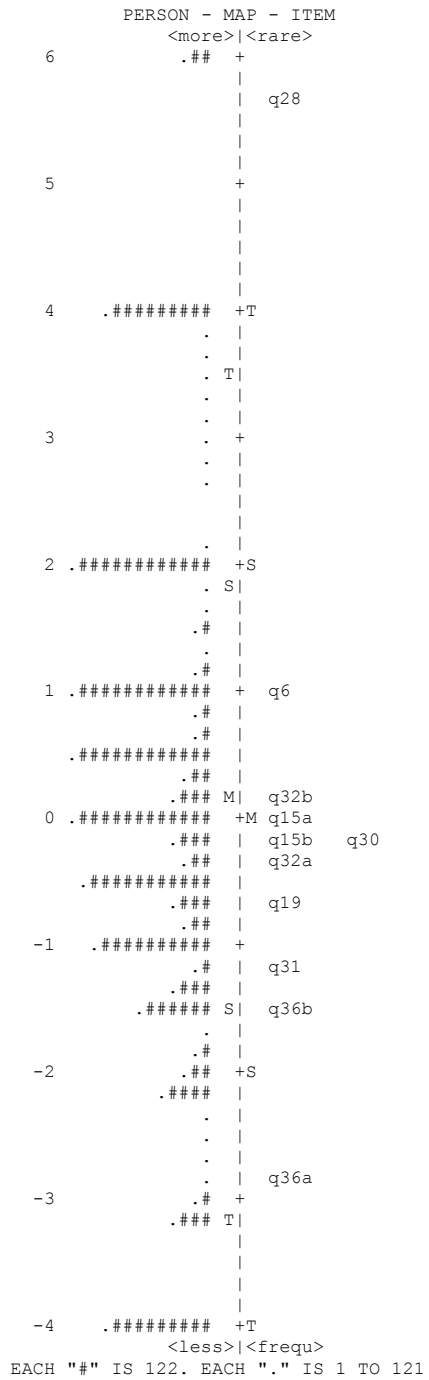
Item fit statistics

```
INPUT: 21701 PERSON  11 ITEM  REPORTED: 17856 PERSON  11 ITEM  22 CATS WINSTEPS 3.72.3
-------------------------------------------------------------------------------
PERSON: REAL SEP.: 1.24  REL.: .61 ... ITEM: REAL SEP.: 69.25  REL.: 1.00

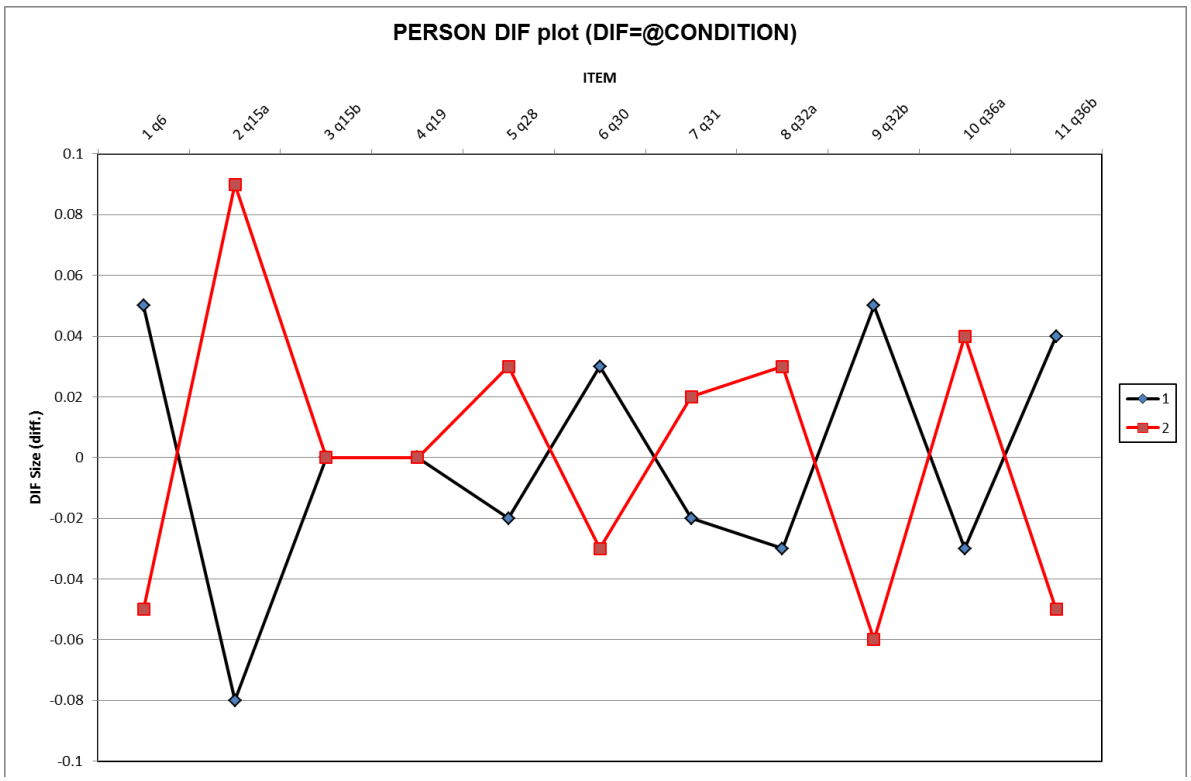
         ITEM STATISTICS:  ENTRY ORDER

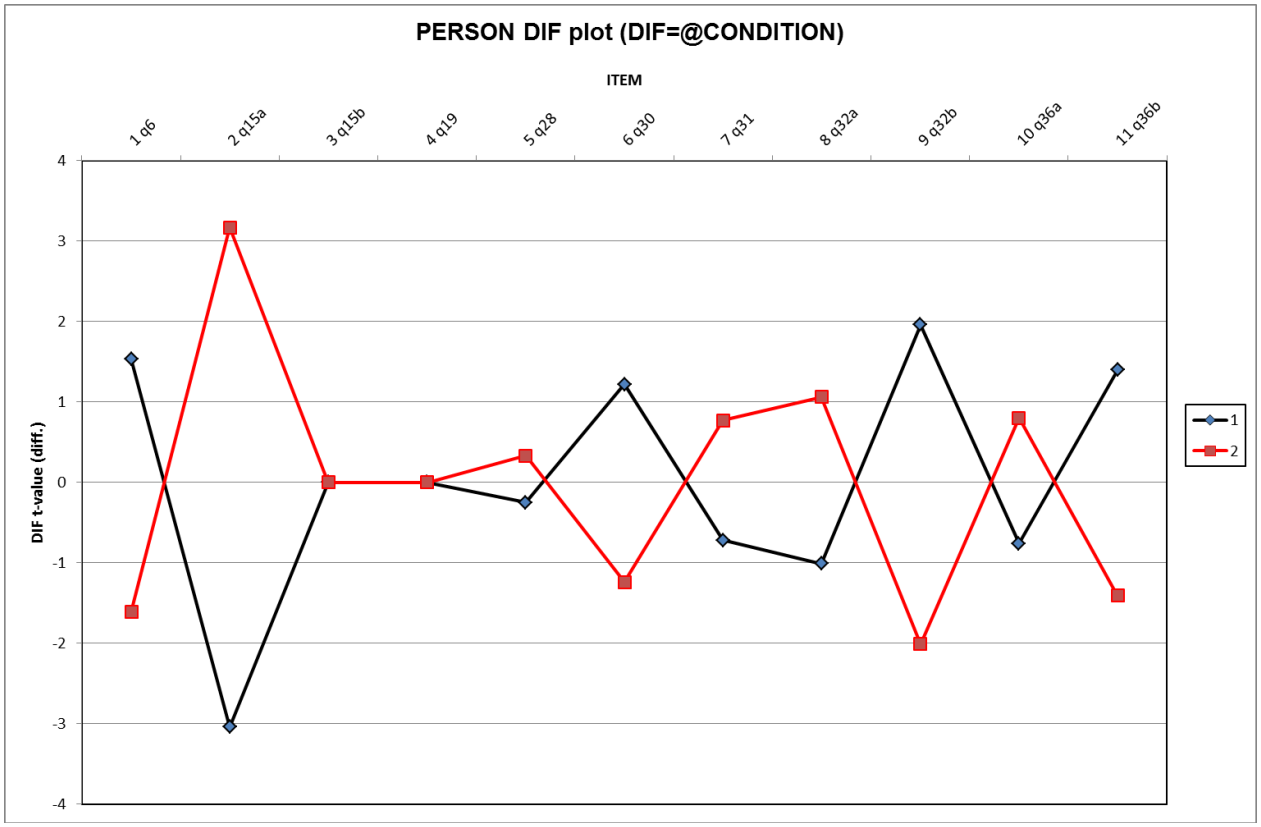
-----------------------------------------------------------------------------------------------
|ENTRY   TOTAL  TOTAL           MODEL|   INFIT  |  OUTFIT  |PT-MEASURE |EXACT MATCH|         |
|NUMBER  SCORE  COUNT  MEASURE  S.E. |MNSQ  ZSTD|MNSQ  ZSTD|CORR.  EXP.| OBS%  EXP%| ITEM  G |
|------------------------------------+----------+----------+-----------+-----------+---------|
|     1   4966  13336    1.05     .02| .98  -1.6| .89  -4.8|  .59   .58| 76.7  76.9| q6    0 |
|     2   8158  16514     .03     .02| .87  -9.9| .79  -9.9|  .62   .57| 78.2  73.8| q15a  0 |
|     3   8870  16485    -.24     .02|1.06   7.5|1.02   1.1|  .54   .56| 71.4  73.9| q15b  0 |
|     4   9091  14431    -.63     .02| .87  -9.9| .79  -7.5|  .60   .55| 80.6  75.8| q19   0 |
|     5    396  14224    5.68     .06|1.14   2.6|3.47   9.9|  .26   .35| 98.0  97.9| q28   0 |
|     6   8762  16607    -.19     .02|1.01   1.5|1.00   -.1|  .56   .56| 73.8  73.9| q30   0 |
|     7  10680  15210   -1.16     .02|1.04   3.5|1.29   7.3|  .49   .52| 78.7  78.5| q31   0 |
|     8   9197  16362    -.38     .02|1.03   3.5|1.00   -.1|  .54   .55| 73.2  74.1| q32a  0 |
|     9   7348  15601     .22     .02|1.14   9.9|1.32   9.9|  .50   .57| 70.8  74.4| q32b  0 |
|    10  13053  14815   -2.85     .03| .89  -5.3| .96   -.7|  .47   .44| 92.0  90.6| q36a  0 |
|    11  11066  14676   -1.53     .02| .91  -7.7| .97   -.7|  .53   .50| 84.2  81.5| q36b  0 |
|------------------------------------+----------+----------+-----------+-----------+---------|
| MEAN  8326.1  15296     .00     .03| .99   -.5|1.23    .4|           | 79.8  79.2|         |
| S.D.  3196.3 1053.5    2.04     .01| .09   6.5| .73   6.2|           |  8.2   7.6|         |
```

Person-Item map



Differential Item Functioning (by condition, 1=intervention, 2=control)





Appendix 13: Measurement results for School Fidelity

Rating Scale Model – Results

Item statistics

```
INPUT: 53 PERSON  3 ITEM  REPORTED: 53 PERSON  3 ITEM  3 CATS    WINSTEPS 3.72.3
-------------------------------------------------------------------------------
PERSON: REAL SEP.: 1.05  REL.: .52 ... ITEM: REAL SEP.: 3.65  REL.: .93

         ITEM STATISTICS:  ENTRY ORDER

-----------------------------------------------------------------------------------------------------
|ENTRY   TOTAL  TOTAL          MODEL|   INFIT  |  OUTFIT  |PT-MEASURE |EXACT MATCH|               |
|NUMBER  SCORE  COUNT  MEASURE  S.E. |MNSQ  ZSTD|MNSQ  ZSTD|CORR.  EXP.| OBS%  EXP%| ITEM          |
|------------------------------------+----------+----------+-----------+-----------+---------------|
|     1    129     53   -1.72     .29| .65  -1.8|1.30   1.0|  .71   .70| 74.4  68.5| AttendanceFinal|
|     2     87     45     .78     .31|1.13    .6| .95   -.1|  .81   .80| 63.2  65.4| Lesson_Final   |
|     3     80     42     .94     .31|1.18    .9|1.00    .1|  .79   .79| 61.1  61.6| Cascade_min    |
|------------------------------------+----------+----------+-----------+-----------+---------------|
| MEAN    98.7   46.7     .00     .31| .99   -.1|1.08    .3|           | 66.2  65.2|               |
| S.D.    21.6    4.6    1.22     .01| .24   1.2| .16    .5|           |  5.9   2.8|               |
-----------------------------------------------------------------------------------------------------
```

Person-item map (here "person" = school)

```
INPUT: 53 PERSON  3 ITEM  REPORTED: 53 PERSON  3 ITEM  3 CATS    WINSTEPS 3.72.3
-------------------------------------------------------------------------------

        PERSON - MAP - ITEM
<more>|<rare>
    3   XXXXXXXX T+
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                 |
                 |
                 |
                 |
        XXXXXXXX |T
                 |
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    2            +
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                 |
                 |
                S|
                 |S
           XXXX  |
    1            +  Cascade_min
                 |
                 |  Lesson_Final
                 |
                 |
                 |
                 |
                 |
    0 XXXXXXXXXX +M
                 |
                M|
                 |
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                 |
                 |
                 |
   -1    XXXXXXX  +
                 |
                 |S
                 |
                 |
                 |
          XXXXX  |AttendanceFinal
                S|
   -2            +
             XX  |
                 |
        XXXXXXX  |T
                 |
                 |
                 |
                 |
   -3            +
                 |
                 |
                 |
                T|
                 |
                 |
                 |
   -4         XX  +
<less>|<frequ>
```

Partial Credit Model – Results

Item statistics

```
INPUT: 53 PERSON  3 ITEM  REPORTED: 51 PERSON  3 ITEM  8 CATS    WINSTEPS 3.72.3
-------------------------------------------------------------------------------
PERSON: REAL SEP.: .38  REL.: .13 ... ITEM: REAL SEP.: .00  REL.: .00

         ITEM STATISTICS:  ENTRY ORDER

-----------------------------------------------------------------------------------------------------------
|ENTRY   TOTAL  TOTAL           MODEL|   INFIT  |  OUTFIT  |PT-MEASURE |EXACT MATCH|                    |
|NUMBER  SCORE  COUNT  MEASURE  S.E. |MNSQ  ZSTD|MNSQ  ZSTD|CORR.  EXP.| OBS%  EXP%| ITEM            G |
|----------------------------------+----------+----------+-----------+-----------+--------------------|
|     1    129     53    -.39     .41|1.15    .9|1.21   1.0|  .65   .70| 62.1  68.1| AttendanceFinal 0 |
|     2     87     45     .11     .28| .93   -.2| .88   -.4|  .81   .79| 51.7  54.6| Lesson_Final    0 |
|     3     80     42     .28     .28| .94   -.2| .89   -.4|  .79   .77| 51.7  53.9| Cascade_min     0 |
|----------------------------------+----------+----------+-----------+-----------+--------------------|
| MEAN    98.7   46.7     .00     .33|1.01    .2| .99    .0|           | 55.2  58.9|                    |
| S.D.    21.6    4.6     .28     .06| .10    .5| .15    .6|           |  4.9   6.5|                    |
-----------------------------------------------------------------------------------------------------------
```

Person-item map (here “person” = school)

```
  PERSON - MAP - ITEM
<more>|<rare>
    2          #### T+
                    |
                    |
                    |
                    |
                    |
                    |
                    |
                    |
               ####  |
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    1              S+
                    |
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                    |
                    |T
                 ##  |
                    |
                    |
                    |S Cascade_min
                    |
                    |  Lesson_Final
                   M|
    0               +M
                    |
                    |
                    |
             #####  |S
                    |
                    |  AttendanceFinal
                    |
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Scores to measures

SCORE	MEASURE	S.E.	INFO	NORMED	S.E. NORMED	FREQ	FREQ%	CUM.FREQ	CUMFREQ%	PERCENTILE
3	-4.05	2	0.25	306	93	2	3.8	2	3.8	2
4	-2.35	1.31	0.58	385	61	14	26.4	16	30.2	17
5	-1	1.06	0.89	448	49	7	13.2	23	43.4	37
6	0.04	1	0.99	497	47	11	20.8	34	64.2	54
7	1.08	1.05	0.91	545	49	4	7.5	38	71.7	68
8	2.34	1.23	0.67	604	57	9	17	47	88.7	80
9	3.86	1.94	0.27	675	90	6	11.3	53	100	94

Appendix 14: Measurement results for Teachers

After pilot analysis of a preliminary instrument piloted during Summer 2016 (report available on request) a teacher survey was used to measure perceptions of teaching practice (all teachers) and confidence with delivering ICCAMS (only intervention teachers) therefore we have 23 items now scored with: 1 = Rarely, 2 = Sometimes, 3 = Often, 4 = Almost always.

		Transmissionism	FA Practice
1	I introduce a new topic by first determining what the students already know about it	Yes Reversed	Yes
2	I use activities in contexts that the students can engage with	Yes Reversed	Yes
3	I use activities which allow connections to be made between mathematical ideas	Yes Reversed	Yes
4	I allow students to work at their own pace	Yes Reversed	
5	I teach the whole class at once	Yes	Yes Reversed
6	Students start with easy questions and work up to harder questions)	Yes	
7	When a student asks a question, I give clues instead of the correct answer)	Yes Reversed	Yes
8	I ask students to explain their reasoning when giving an answer)	Yes Reversed	
9	I encourage students to discuss the mistakes they make)	Yes Reversed	
10	Students use only the methods I taught them)	Yes	
11	Students choose which questions to tackle)	Yes Reversed	
12	Students compare different methods for doing questions)	Yes Reversed	
13	Students work collaboratively in small groups.	Yes Reversed	Yes
14	Students discuss their ideas.	Yes Reversed	
15	Students work collaboratively in pairs.	Yes Reversed	Yes
16	Students invent their own methods.	Yes Reversed	Yes
17	I tell students which questions to tackle.	Yes	Yes Reversed
18	I teach each topic separately	Yes	
19	I provide feedback to students on their understanding of mathematical concepts		Yes
20	I check students' understanding for maths during lessons to assess specific intended learning outcomes		Yes
21	I assess students' maths conceptions and misconceptions in order to adapt my teaching		Yes
22	I provide feedback on what students have understood in relation to what they should do next		Yes
23	I encourage students to learn from each other		Yes

Transmissionist Teaching Practice

Item fit statistics

```
INPUT: 2040 PERSON  18 ITEM  REPORTED: 1364 PERSON  18 ITEM  4 CATS WINSTEPS 3.72.3
-------------------------------------------------------------------------------
PERSON: REAL SEP.: 1.58  REL.: .71 ... ITEM: REAL SEP.: 26.68  REL.: 1.00

         ITEM STATISTICS:  ENTRY ORDER
```

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
1	2566	1361	1.08	.04	1.25	6.4	1.25	6.5	.40	.43	48.6	54.4	teaching1
2	2970	1361	.41	.04	.94	-1.8	.94	-1.7	.41	.44	53.3	52.9	teaching2
3	2998	1349	.32	.04	.80	-6.1	.80	-6.0	.50	.44	58.1	52.7	teaching3
4	2948	1355	.42	.04	1.02	.6	1.03	.8	.30	.44	53.5	53.0	teaching4
5	4290	1352	-1.73	.04	1.07	1.9	1.07	1.9	.35	.43	52.5	53.0	teaching5
6	4121	1358	-1.41	.04	1.42	9.9	1.42	9.9	.28	.44	40.6	53.1	teaching6
7	2049	1354	2.06	.05	1.24	5.9	1.27	6.3	.28	.38	53.8	59.8	teaching7
8	2011	1357	2.17	.05	.95	-1.3	.93	-1.8	.41	.37	60.4	61.2	teaching8
9	2594	1359	1.02	.04	1.14	3.6	1.11	3.1	.47	.43	50.8	54.5	teaching9
10	3092	1355	.19	.04	1.00	-.1	1.01	.3	.29	.45	55.6	52.4	teaching10
11	3490	1355	-.43	.04	1.04	1.1	1.04	1.1	.46	.45	50.6	51.7	teaching11
12	3731	1354	-.81	.04	.75	-7.7	.75	-7.6	.59	.45	59.5	52.3	teaching12
13	3697	1358	-.74	.04	.91	-2.6	.91	-2.5	.56	.45	54.9	52.2	teaching13
14	2967	1357	.39	.04	.73	-8.3	.73	-8.3	.61	.44	57.6	52.9	teaching14
15	3136	1354	.12	.04	.87	-3.8	.86	-4.0	.50	.45	57.0	52.3	teaching15
16	4574	1351	-2.27	.05	.84	-4.6	.81	-5.3	.58	.40	64.3	56.4	teaching16
17	3396	1352	-.30	.04	1.00	.0	1.00	.1	.39	.45	51.6	51.7	teaching17
18	3486	1340	-.48	.04	1.07	1.9	1.07	1.9	.44	.45	53.4	51.7	teaching18
MEAN	3228.7	1354.6	.00	.04	1.00	-.3	1.00	-.3			54.2	53.8	
S.D.	682.2	4.8	1.15	.00	.18	4.7	.18	4.8			5.1	2.6	

Principal component analysis of the residuals (dimensionality diagnostics)

```
INPUT: 2040 PERSON  18 ITEM  REPORTED: 1364 PERSON  18 ITEM  4 CATS WINSTEPS 3.72.3
-------------------------------------------------------------------------------

     Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                              -- Empirical --     Modeled
Total raw variance in observations     =         32.9 100.0%          100.0%
  Raw variance explained by measures   =         14.9  45.2%           45.1%
    Raw variance explained by persons  =          3.1   9.3%            9.3%
    Raw Variance explained by items    =         11.8  35.9%           35.8%
  Raw unexplained variance (total)     =         18.0  54.8% 100.0%    54.9%
    Unexplned variance in 1st contrast =          2.3   7.1%  13.0%
    Unexplned variance in 2nd contrast =          1.8   5.5%  10.0%
    Unexplned variance in 3rd contrast =          1.5   4.6%   8.5%
    Unexplned variance in 4th contrast =          1.4   4.2%   7.7%
    Unexplned variance in 5th contrast =          1.2   3.7%   6.8%

  STANDARDIZED RESIDUAL LOADINGS FOR ITEM (SORTED BY LOADING)
```

CON- TRAST	LOADING	INFIT MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER	ITEM	LOADING	INFIT MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER	ITEM
1	.63	-.30	1.00	1.00	A 17	teaching17	-.49	.39	.73	.73	a 14	teaching14
1	.48	.19	1.00	1.01	B 10	teaching10	-.42	1.02	1.14	1.11	b 9	teaching9
1	.45	-1.41	1.42	1.42	C 6	teaching6	-.38	2.17	.95	.93	c 8	teaching8
1	.45	-1.73	1.07	1.07	D 5	teaching5	-.35	.12	.87	.86	d 15	teaching15
1	.41	-.43	1.04	1.04	E 11	teaching11	-.32	-.74	.91	.91	e 13	teaching13
1	.33	-.48	1.07	1.07	F 18	teaching18	-.31	-.81	.75	.75	f 12	teaching12
							-.25	.32	.80	.80	g 3	teaching3
							-.19	1.08	1.25	1.25	h 1	teaching1
							-.14	.41	.94	.94	i 2	teaching2
							-.14	2.06	1.24	1.27	I 7	teaching7
							-.10	-2.27	.84	.81	H 16	teaching16
							-.04	.42	1.02	1.03	G 4	teaching4

```
INPUT: 2040 PERSON  18 ITEM  REPORTED: 1364 PERSON  18 ITEM  4 CATS WINSTEPS 3.72.3
-------------------------------------------------------------------------------
 INPUT: 2040 PERSON  18 ITEM  REPORTED: 1364 PERSON  18 ITEM  4 CATS WINSTEPS 3.72.3
-------------------------------------------------------------------------------
```

Category Statistics

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	4099	17	-1.71	-1.69	.99	1.00	NONE	(-3.19)	4
2	2	9535	39	-.61	-.63	1.00	.99	-2.00	-1.03	3
3	3	8045	33	.33	.37	1.03	1.04	.04	1.04	2
4	4	2703	11	1.42	1.38	.97	.98	1.96	(3.16)	1
MISSING		170	1	.36						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

CATEGORY LABEL	STRUCTURE MEASURE	S.E.	SCORE-TO-MEASURE AT CAT.	----ZONE----	50% CUM. PROBABLTY	COHERENCE M->C	C->M	RMSR	ESTIM DISCR	
1	NONE		(-3.19)	-INF -2.27		67%	32%	.8621		4
2	-2.00	.02	-1.03	-2.27 .02	-2.11	53%	69%	.4950	1.02	3
3	.04	.02	1.04	.02 2.25	.03	51%	59%	.5802	.96	2
4	1.96	.02	(3.16)	2.25 +INF	2.08	71%	21%	.9654	1.04	1

Person-item Map

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FA Practice

```
Item fit statistics

INPUT: 2040 PERSON  14 ITEM  REPORTED: 1365 PERSON  14 ITEM  4 CATS WINSTEPS 3.72.3
-------------------------------------------------------------------------------
PERSON: REAL SEP.: 1.57  REL.: .71 ... ITEM: REAL SEP.: 29.15  REL.: 1.00

         ITEM STATISTICS:  ENTRY ORDER
```

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
1	4239	1361	-.76	.04	1.24	6.1	1.25	6.4	.48	.48	50.9	57.0	teaching1
2	3835	1361	-.02	.04	.90	-2.8	.90	-2.7	.52	.50	57.2	55.2	teaching2
3	3747	1349	.07	.04	.82	-5.3	.82	-5.2	.54	.50	58.2	54.9	teaching3
4	2470	1352	2.29	.04	1.21	5.5	1.26	6.8	.31	.49	51.5	55.1	teaching5
5	4721	1354	-1.82	.05	1.27	6.8	1.34	7.4	.33	.42	57.5	61.9	teaching7
6	3093	1358	1.22	.04	1.01	.2	1.01	.2	.53	.51	54.1	54.0	teaching13
7	3634	1354	.29	.04	.94	-1.6	.94	-1.7	.50	.50	57.2	54.3	teaching15
8	2181	1351	2.87	.05	.95	-1.3	.94	-1.5	.52	.47	62.0	58.9	teaching16
9	3364	1352	.74	.04	1.27	7.0	1.30	7.5	.26	.51	45.8	53.7	teaching17
10	4200	1352	-.73	.04	.89	-3.2	.89	-3.2	.54	.48	60.6	57.0	teaching19
11	4488	1354	-1.29	.05	.91	-2.6	.90	-2.9	.49	.45	64.3	58.6	teaching20
12	4430	1352	-1.18	.05	.84	-4.7	.83	-4.9	.56	.46	63.3	57.8	teaching21
13	4105	1351	-.56	.04	.81	-5.6	.81	-5.6	.62	.48	62.5	56.5	teaching22
14	4402	1353	-1.12	.05	.94	-1.7	.91	-2.6	.56	.46	58.5	57.8	teaching23
MEAN	3779.2	1353.9	.00	.04	1.00	-.2	1.01	-.1			57.4	56.6	
S.D.	738.3	3.5	1.33	.00	.17	4.4	.18	4.8			5.1	2.2	

Principal component analysis of the residuals (dimensionality diagnostics)

```
    Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                            -- Empirical --    Modeled
Total raw variance in observations     =         29.0 100.0%      100.0%
  Raw variance explained by measures   =         15.0  51.8%       51.7%
    Raw variance explained by persons  =          3.7  12.7%       12.7%
    Raw Variance explained by items    =         11.3  39.1%       39.0%
  Raw unexplained variance (total)     =         14.0  48.2% 100.0%  48.3%
    Unexplned variance in 1st contrast =          2.5   8.5%  17.6%
    Unexplned variance in 2nd contrast =          1.5   5.2%  10.8%
    Unexplned variance in 3rd contrast =          1.4   4.8%  10.0%
    Unexplned variance in 4th contrast =          1.1   4.0%   8.2%
    Unexplned variance in 5th contrast =          1.1   3.8%   7.9%


STANDARDIZED RESIDUAL LOADINGS FOR ITEM (SORTED BY LOADING)
```

CON- TRAST	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER	ITEM	LOADING	MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER	ITEM
1	.67	-1.29	.91	.90	A 11	teaching20	-.63	1.22	1.01	1.01	a 6	teaching13
1	.59	-1.18	.84	.83	B 12	teaching21	-.53	.29	.94	.94	b 7	teaching15
1	.57	-.73	.89	.89	C 10	teaching19	-.36	2.87	.95	.94	c 8	teaching16
1	.54	-.56	.81	.81	D 13	teaching22	-.32	2.29	1.21	1.26	d 4	teaching5
1	.14	-.76	1.24	1.25	E 1	teaching1	-.32	.74	1.27	1.30	e 9	teaching17
1	.09	-1.82	1.27	1.34	F 5	teaching7	-.10	-1.12	.94	.91	f 14	teaching23
1	.01	.07	.82	.82	G 3	teaching3	-.02	-.02	.90	.90	g 2	teaching2

Category Statistics

```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
```

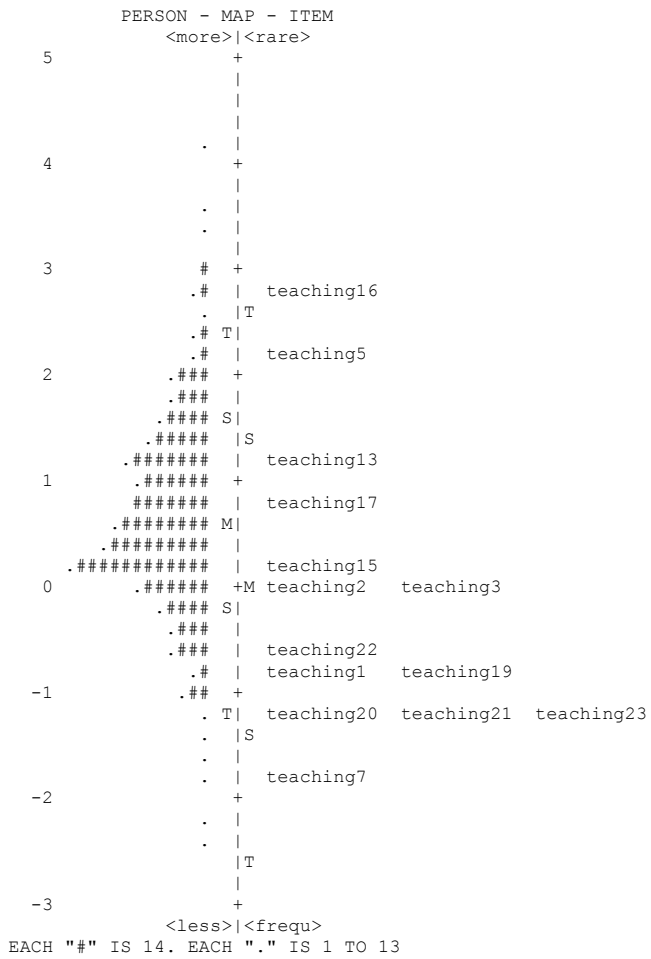
CATEGORY LABEL	OBSERVED SCORE	COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	STRUCTURE CALIBRATN	CATEGORY MEASURE	
1	1	1688	9	-1.73	-1.81	1.09	1.11	NONE	(-3.32)	1
2	2	4924	26	-.29	-.29	1.00	1.02	-2.13	-1.13	2
3	3	7995	42	1.01	1.06	1.01	1.01	-.06	1.10	3
4	4	4347	23	2.17	2.10	.93	.95	2.20	(3.37)	4
MISSING		156	1	-.06						

```
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
```

CATEGORY LABEL	STRUCTURE MEASURE	S.E.	SCORE-TO-MEASURE AT CAT.	----ZONE----	50% CUM. PROBABLTY	COHERENCE M->C	C->M	ESTIM RMSR	DISCR	
1	NONE		(-3.32)	-INF -2.39		64%	33%	.9254		1
2	-2.13	.03	-1.13	-2.39 -.03	-2.24	52%	49%	.6580	.94	2
3	-.06	.02	1.10	-.03 2.42	-.05	56%	77%	.4400	.96	3
4	2.20	.02	(3.37)	2.42 +INF	2.29	72%	40%	.7126	1.11	4

```
M->C = Does Measure imply Category?
```

Item-person map



ICCAMS confidence

Item fit statistics

```
INPUT: 2040 PERSON  9 ITEM  REPORTED: 192 PERSON  9 ITEM  5 CATS WINSTEPS 3.72.3
-------------------------------------------------------------------------------
PERSON: REAL SEP.: 2.65  REL.: .88 ... ITEM: REAL SEP.: 7.13  REL.: .98

         ITEM STATISTICS:  ENTRY ORDER
```

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
1	690	191	-.56	.11	.64	-3.9	.60	-4.3	.83	.73	70.5	57.0	iccams_1
2	591	191	.58	.10	1.53	4.6	1.64	5.4	.66	.74	46.8	52.1	iccams_2
3	642	192	.04	.11	.77	-2.4	.75	-2.6	.79	.74	68.1	54.3	iccams_3
4	652	191	-.12	.11	1.00	.0	1.00	.0	.73	.73	56.3	55.4	iccams_4
5	585	192	.68	.10	1.53	4.6	1.56	4.8	.67	.74	45.5	52.0	iccams_5
6	706	190	-.83	.11	1.05	.5	1.18	1.6	.64	.72	58.7	58.0	iccams_6
7	650	188	-.21	.11	.75	-2.6	.74	-2.6	.78	.74	58.3	55.9	iccams_7
8	741	191	-1.24	.12	.63	-3.9	.58	-4.0	.83	.71	70.5	60.1	iccams_8
9	493	192	1.67	.10	1.00	.0	1.04	.4	.71	.74	58.6	52.8	iccams_9
MEAN	638.9	190.9	.00	.11	.99	-.3	1.01	-.2			59.3	55.3	
S.D.	70.2	1.2	.83	.00	.32	3.1	.37	3.4			8.7	2.6	

```
INPUT: 2040 PERSON  9 ITEM  REPORTED: 192 PERSON  9 ITEM  5 CATS WINSTEPS 3.72.3
-------------------------------------------------------------------------------
```

The two highly misfiting items shown above were not removed to be consistent with the pilot analysis and as they do not seem to be violating the unidimensionality assumptions as per results below.

Principal component analysis of the residuals (dimensionality diagnostics)

```
     Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                              -- Empirical --    Modeled
Total raw variance in observations     =         22.5 100.0%        100.0%
  Raw variance explained by measures   =         13.5  60.0%         60.3%
    Raw variance explained by persons  =          8.0  35.4%         35.6%
    Raw Variance explained by items    =          5.5  24.6%         24.7%
  Raw unexplained variance (total)     =          9.0  40.0% 100.0%   39.7%
    Unexplned variance in 1st contrast =          1.9   8.4%  21.0%
    Unexplned variance in 2nd contrast =          1.3   5.9%  14.7%
    Unexplned variance in 3rd contrast =          1.2   5.4%  13.6%
    Unexplned variance in 4th contrast =          1.1   5.0%  12.4%
    Unexplned variance in 5th contrast =          1.1   4.8%  12.1%


  STANDARDIZED RESIDUAL LOADINGS FOR ITEM (SORTED BY LOADING)
```

CON- TRAST	LOADING	INFIT MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER	ITEM	LOADING	INFIT MEASURE	INFIT MNSQ	OUTFIT MNSQ	ENTRY NUMBER	ITEM
1	.78	-.12	1.00	1.00	4	iccams_4	-.47	.58	1.53	1.64	2	iccams_2
1	.59	.04	.77	.75	3	iccams_3	-.41	-.21	.75	.74	7	iccams_7
1	.58	-.83	1.05	1.18	6	iccams_6	-.31	-1.24	.63	.58	8	iccams_8
							-.26	.68	1.53	1.56	5	iccams_5
							-.18	-.56	.64	.60	1	iccams_1
							-.15	1.67	1.00	1.04	9	iccams_9

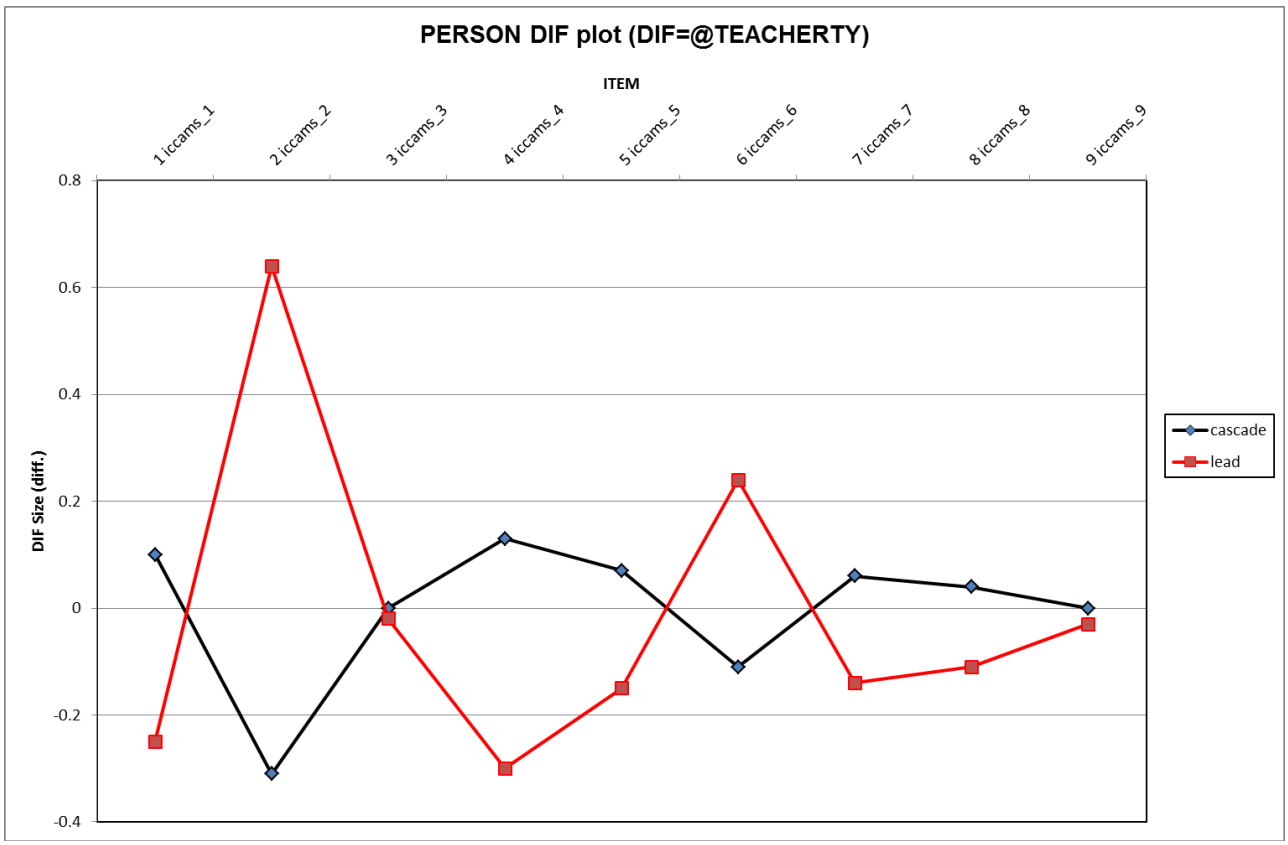
Category statistics

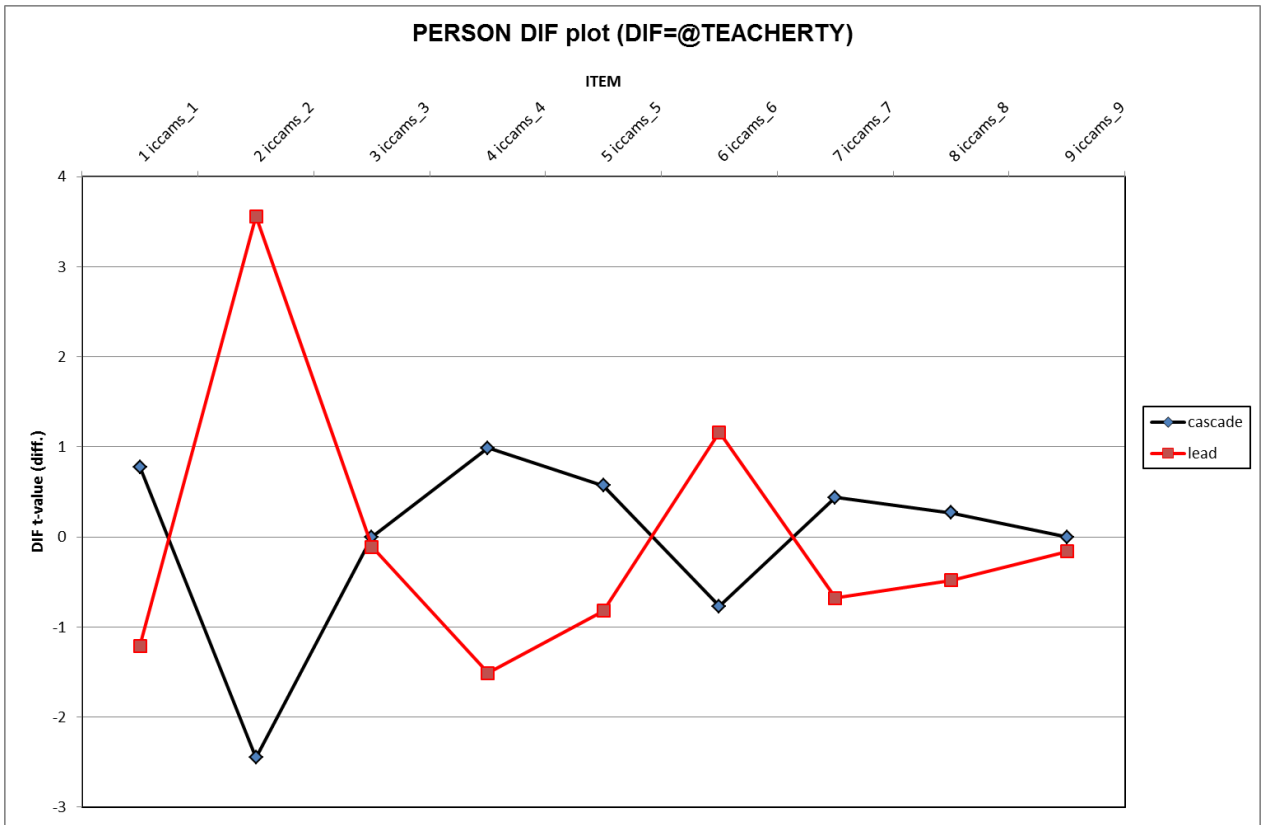
```
SUMMARY OF CATEGORY STRUCTURE.  Model="R"
-------------------------------------------------------------------
|CATEGORY   OBSERVED|OBSVD SAMPLE|INFIT OUTFIT||STRUCTURE|CATEGORY|
|LABEL SCORE COUNT %|AVRGE EXPECT|  MNSQ  MNSQ||CALIBRATN| MEASURE|
|-------------------+------------+------------++---------+--------|
|  1   1      92   5| -2.31 -2.47|  1.37  1.59||  NONE   |( -4.09)| 1
|  2   2     287  17| -1.03  -.98|   .91   .91||   -2.90 |  -2.00 | 2
|  3   3     496  29|   .19   .16|   .97   .99||    -.95 |   -.17 | 3
|  4   4     619  36|  1.35  1.41|   .93   .89||     .54 |   1.98 | 4
|  5   5     224  13|  3.45  3.33|  1.05  1.00||    3.31 |(  4.45)| 5
|-------------------+------------+------------++---------+--------|
|MISSING      10   1|  1.62      |            ||         |        |
-------------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.
-----------------------------------------------------------------------------------------
|CATEGORY    STRUCTURE    |  SCORE-TO-MEASURE    | 50% CUM.| COHERENCE       |ESTIM|
| LABEL    MEASURE  S.E. | AT CAT. ----ZONE----|PROBABLTY| M->C C->M  RMSR |DISCR|
|------------------------+---------------------+---------+-----------------+-----|
|   1      NONE          |( -4.09) -INF   -3.19|         |  76%  30% 1.2234|     | 1
|   2       -2.90    .14 |  -2.00  -3.19  -1.05|   -3.02 |  59%  48%  .7576|  .90| 2
|   3        -.95    .08 |   -.17  -1.05   .77|   -1.01 |  49%  63%  .5519| 1.01| 3
|   4         .54    .07 |   1.98    .77  3.46|     .66 |  63%  68%  .5501|  .95| 4
|   5        3.31    .09 |(  4.45)  3.46  +INF |    3.37 |  85%  54%  .7855| 1.11| 5
```

Person-Item map

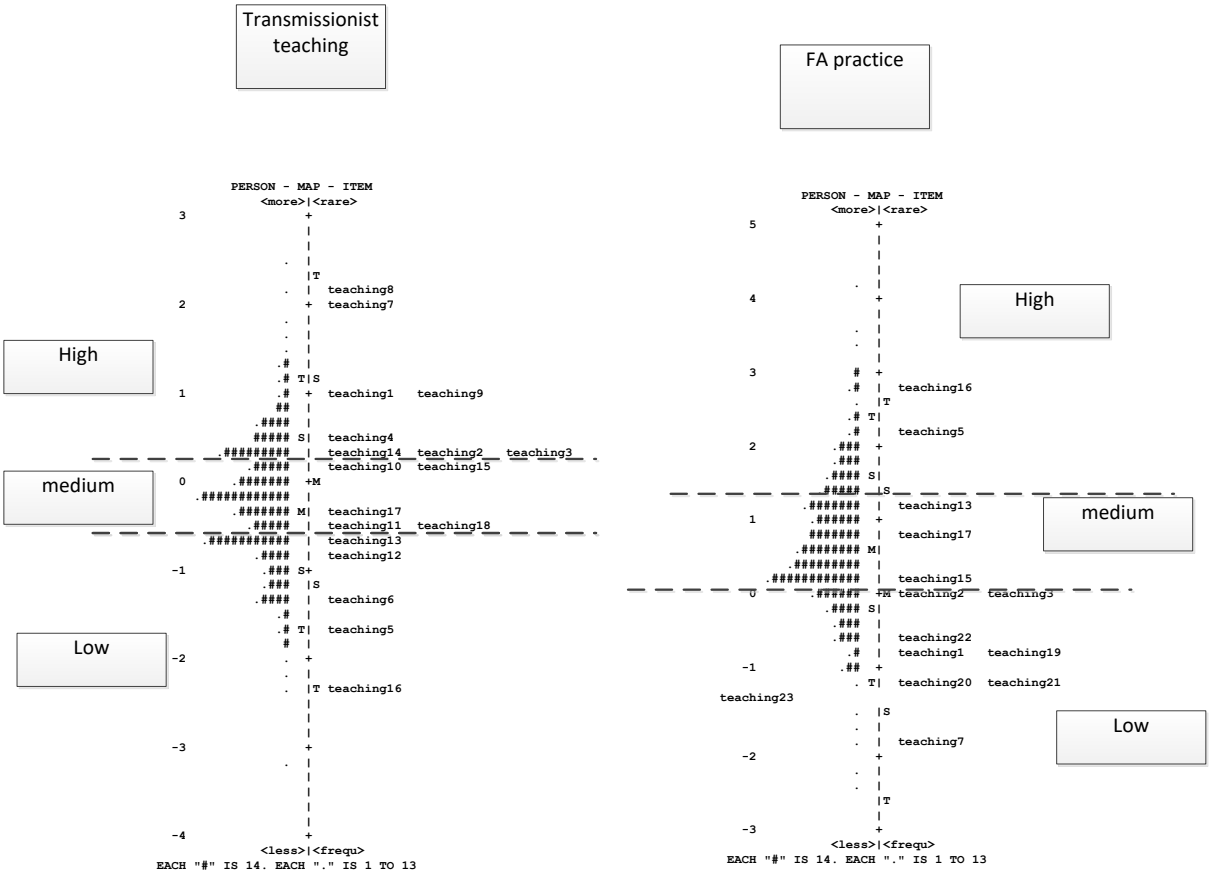
```
-----------------------------------------------------------------------------------------
           PERSON - MAP - ITEM
              <more>|<rare>
    6               +
                    |
                  #  |
                     |
                     |
    5                +
                .##  |
                     |
                     |
                  . T|
    4             .  +
                .##  |
                     |
                  #  |
                     |
    3           .###  +
                     |
                  .#  |
                 ### S|
                     |
    2             ###  +
                  ####  |
                        |T iccams_9
                .#####  |
               .#######  |
    1            ######  +
               .###### M|S
                     #  |  iccams_2  iccams_5
                   .##  |
                 #####  |
    0          .#######  +M iccams_3
                  .####  |  iccams_4  iccams_7
                 ######  |
                   .###  |  iccams_1
                   .###  |S iccams_6
   -1               ### S+
                     .#  |  iccams_8
                     .#  |
                     ##  |T
                     .#  |
   -2                 #  +
                         |
                      #  |
                      # T|
                         |
   -3                    +
                         |
                         |
                         |
                         |
   -4                    +
                         |
                      #  |
                         |
                         |
   -5                 .  +
                  <less>|<frequ>
EACH "#" IS 2. EACH "." IS 1.
```

Differential Item Functioning (by Teacher type)





Determining cut-off points for teacher perception measures (for interview quotes):



For Transmissionist teaching: High>0.19, Medium, Low <-0.73

FA Practice: High >1.33, medium, Low<0.12

TransYear8

Percentiles		Smallest		
1%	-2.08	-3.16		
5%	-1.54	-2.33		
10%	-1.26	-2.33	Obs	829
25%	-.73	-2.33	Sum of Wgt.	829
50%	-.24		Mean	-.2778046
		Largest	Std. Dev.	.7306031
75%	.19	1.69		
90%	.62	1.69	Variance	.5337809
95%	.88	2.15	Skewness	-.0435809
99%	1.54	2.51	Kurtosis	3.456693

FAPractYear8

Percentiles		Smallest		
1%	-1.28	-2.49		
5%	-.74	-2.25		
10%	-.39	-1.85	Obs	830
25%	.12	-1.85	Sum of Wgt.	830
50%	.64		Mean	.7111084
		Largest	Std. Dev.	.8852575
75%	1.33	2.99		
90%	1.8	2.99	Variance	.7836808
95%	2.21	3.31	Skewness	.1243988
99%	2.99	4.14	Kurtosis	3.308215

Appendix 15: Code and some outputs for models

Appendix 15A: **Primary ITT models (and example output)**

Code for ITT model for primary outcome:

```
mixed Newtotalscore AtrandomisationCondition KS2Math i.Regioncat i.EVERFSM_ALL_SPR18 ||
AtrandomisationSchoolID:, mle variance
estat icc
```

Example output

```
Performing EM optimization:

Performing gradient-based optimization:

Iteration 0:   log likelihood =  -55313.74
Iteration 1:   log likelihood =  -55313.74

Computing standard errors:

Mixed-effects ML regression                     Number of obs     =     17,163
Group variable: Atrandomisat~D                  Number of groups  =        105

                                                Obs per group:
                                                              min =          2
                                                              avg =      163.5
                                                              max =        350

                                                Wald chi2(7)      =   30493.86
Log likelihood =  -55313.74                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
           Newtotalscore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
AtrandomisationCondition |   .2322393   .3499097     0.66   0.507    -.4535711    .9180497
                 KS2Math |   1.199784   .0070858   169.32   0.000     1.185896    1.213672
                         |
              Region     |
              Region 2   |  -1.513217   .5447071    -2.78   0.005    -2.580823   -.4456103
              Region 3   |  -1.705135   .5890696    -2.89   0.004     -2.85969   -.5505796
              Region 4   |  -.7194327   .5876146    -1.22   0.221    -1.871136    .4322709
              Region 5   |  -.5710637   .5529153    -1.03   0.302    -1.654758    .5126305
                         |
    1.EVERFSM_ALL_SPR18  |  -1.415495   .1096927   -12.90   0.000    -1.630489   -1.200501
                  _cons  |  -101.2576   .8555037  -118.36   0.000    -102.9343   -99.58081
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   2.883676    .441204      2.136546    3.892072
-----------------------------+------------------------------------------------
               var(Residual) |   36.31798   .3932472      35.55535    37.09697
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 893.26        Prob >= chibar2 = 0.0000
.   estat icc

Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0735601   .0104584      .0555127    .0968729
------------------------------------------------------------------------------
```

Appendix 15B: **Compliance Analysis Models (2SLS)**

A compliance variable in three variants used within the 2SLS models, is shown in Table 15b.1 27:

Table 15B1. Definitions of compliance variables

Compliance Variable	Type of variable	Scoring details
Compliance = Fidelity	Continuous	Based on continuous "fidelity score" (only includes intervention cases)
Compliance 1	Indicator (0,1)	0=non-compliant if student at Year 8 is in a school which dropped out of the intervention or student changed school and the change involved condition change. 1= compliant (otherwise)
Compliance 2	Indicator (0,1)	0= as above plus schools with low fidelity

The results from the 2SLS models, given the above specifications for compliance, conform overall with the results of the ITT models and there are no significant compliance effects. Table 15B2 presents the second stage of these models for the primary outcome. The results for the secondary outcomes and from both stages of the modelling are presented in the rest of this Appendix.

Table 15B2. Second Stage of 2SLS models for Primary outcome, based on different compliance specifications

	Fidelity (treatment schools only)				**Compliance 1**				**Compliance2**			
	Coef.	**Robust SE**	**z**	**P>|z|**	**Coef.**	**Robust SE**	**z**	**P>|z|**	**Coef.**	**Robust SE**	**z**	**P>|z|**
Compliance	**-4.21**	**3.57**	**-1.18**	**0.24**	**-8.04**	**10.74**	**-0.75**	**0.45**	**-0.66**	**0.77**	**-0.85**	0.39
KS2Math	1.17	0.06	20.56	<0.001	1.20	0.01	86.78	<0.001	1.20	0.01	91.65	<0.001
Region (ref: Region 1):												
Region 2	9.34	10.22	0.91	0.36	-1.01	0.72	-1.40	0.16	-1.24	0.55	-2.26	0.02
Region 3	2.17	4.46	0.49	0.63	-1.40	0.79	-1.77	0.08	-1.46	0.60	-2.45	0.01
Region 4	11.18	11.06	1.01	0.31	0.04	0.74	0.06	0.95	-0.19	0.57	-0.34	0.74
Region 5	5.39	6.61	0.81	0.42	-0.14	0.68	-0.20	0.84	-0.49	0.49	-0.99	0.32
EVERFSM	-1.25	0.79	-1.58	0.11	-2.00	0.16	-12.36	<0.001	-1.96	0.15	-13.38	0.00
_cons	-103.83	4.78	-21.71	<0.001	-93.41	10.75	-8.69	<0.001	-100.85	1.44	-70.21	0.00
Model fit information (for second stage)												
N	8,997				17,163				17,163			
Wald chi2(7)	1173.97				9128.14				9867.16			
Prob > chi2	<0.001				<0.001				<0.001			
R-squared	0.1617				0.6314				0.6411			
Root MSE	9.4552				6.3175				6.2336			

General model specification:

```
ivregress 2sls Y-outcome KS2Math i.Region i.EVERFSM_ALL_SPR18 (compliance =
Condition), vce (cluster SchoolID)first
```

Example output from Primary outcome model with Compliance1 specification:

```
 ivregress 2sls Newtotalscore KS2Math i.Region i.EVERFSM_ALL_SPR18 (compliance =
AtrandomisationCondition ), vce (cluster AtrandomisationSchoolID)first

First-stage regressions
-----------------------

                                                Number of obs     =     17,163
                                                N. of clusters    =        105
                                                F(   7,  17155)   =       0.50
                                                Prob > F          =     0.8350
                                                R-squared         =     0.0439
                                                Adj R-squared     =     0.0435
                                                Root MSE          =     0.1365

------------------------------------------------------------------------------
             |               Robust
  compliance |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     KS2Math |   -.000407   .0004006    -1.02   0.310    -.0011921    .0003782
             |
   Region    |
    Region 2 |   .0518178   .0501125     1.03   0.301    -.0464079    .1500435
    Region 3 |   .0049186   .0674922     0.07   0.942     -.127373    .1372102
    Region 4 |   .0523655   .0508605     1.03   0.303    -.0473264    .1520574
    Region 5 |   .0534111   .0514693     1.04   0.299     -.047474    .1542961
             |
1.EV~L_SPR18 |   -.004338   .0040485    -1.07   0.284    -.0122734    .0035975
Atrandomis~n |  -.0350028   .0244121    -1.43   0.152     -.082853    .0128473
       _cons |   1.006428   .0515475    19.52   0.000     .9053891    1.107466
------------------------------------------------------------------------------


Instrumental variables (2SLS) regression          Number of obs   =     17,163
                                                  Wald chi2(7)    =    9128.14
                                                  Prob > chi2     =     0.0000
                                                  R-squared       =     0.6314
                                                  Root MSE        =     6.3175

              (Std. Err. adjusted for 105 clusters in AtrandomisationSchoolID)
------------------------------------------------------------------------------
             |               Robust
Newtotalsc~e |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  compliance |   -8.03774    10.7431    -0.75   0.454    -29.09382    13.01834
     KS2Math |   1.198787   .0138141    86.78   0.000     1.171712    1.225862
             |
   Region    |
   Region 2  |  -1.012546   .7229438    -1.40   0.161     -2.42949    .4043982
   Region 3  |  -1.401783   .7904205    -1.77   0.076    -2.950979    .1474122
   Region 4  |   .0428547   .7384387     0.06   0.954    -1.404458    1.490168
   Region 5  |  -.1381309   .6804031    -0.20   0.839    -1.471696    1.195435
             |
1.EV~L_SPR18 |  -1.996526   .1615439   -12.36   0.000    -2.313146   -1.679905
       _cons |  -93.41322   10.74999    -8.69   0.000    -114.4828   -72.34363
------------------------------------------------------------------------------
Instrumented:  compliance
Instruments:   KS2Math 2.Regioncat 3.Regioncat 4.Regioncat 5.Regioncat
               1.EVERFSM_ALL_SPR18 AtrandomisationCondition
```

A model considering the interaction of condition with compliance

```
. mixed Newtotalscore AtrandomisationCondition##compliance KS2Math i.Regioncat
> i.EVERFSM_ALL_SPR18 || AtrandomisationSchoolID:, mle variance

Performing EM optimization:

Performing gradient-based optimization:

Iteration 0:   log likelihood = -55312.205
Iteration 1:   log likelihood = -55312.205

Computing standard errors:

Mixed-effects ML regression                     Number of obs     =     17,163
Group variable: Atrandomisat~D                  Number of groups  =        105

                                                Obs per group:
                                                              min =          2
                                                              avg =      163.5
                                                              max =        350

                                                Wald chi2(9)      =   30502.40
Log likelihood = -55312.205                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
Newtotalsc~e |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
1.Atrandom~n |   2.581602   1.598627     1.61   0.106    -.5516483    5.714853
1.compliance |   2.272191   1.298646     1.75   0.080    -.2731081     4.81749
             |
Atrandomis~n#|
  compliance |
       1 1   |  -2.359897   1.586298    -1.49   0.137    -5.468985    .7491902
             |
     KS2Math |   1.199691   .0070854   169.32   0.000     1.185803    1.213578
             |
   Region    |
   Region 2  |  -1.509094   .5461022    -2.76   0.006    -2.579435   -.4387536
   Region 3  |   -1.70811    .588285    -2.90   0.004    -2.861128   -.5550928
   Region 4  |    -.71305   .5886837    -1.21   0.226    -1.866849    .4407487
   Region 5  |  -.5641328   .5544193    -1.02   0.309    -1.650775    .5225091
             |
1.EV~L_SPR18 |  -1.414475   .1096885   -12.90   0.000    -1.629461    -1.19949
       _cons |  -103.5171   1.547673   -66.89   0.000    -106.5505   -100.4837
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |    2.87529   .4405357       2.12944    3.882379
-----------------------------+------------------------------------------------
               var(Residual) |   36.31203   .3931857      35.54952     37.0909
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 887.53        Prob >= chibar2 = 0.0000
```

Summary tables with results of 2SLS Models

Primary outcome: Total score

	Compliance 1				Compliance2				Fidelity (only ICCAMS data)			
First stage	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**
KS2Math	0.00	0.00	-1.02	0.31	0.00	0.00	-1.31	0.19	-0.01	0.01	-1.41	0.16
Region (ref: 1)												
Region 2	0.05	0.05	1.03	0.30	0.29	0.10	2.76	0.01	2.78	0.69	4.05	0.00
Region 3	0.00	0.07	0.07	0.94	-0.03	0.12	-0.29	0.77	0.93	0.74	1.26	0.21
Region 4	0.05	0.05	1.03	0.30	0.28	0.12	2.32	0.02	2.89	0.88	3.28	0.00
Region 5	0.05	0.05	1.04	0.30	0.12	0.12	0.95	0.34	1.55	0.70	2.21	0.03
EVERFSM	0.00	0.00	-1.07	0.28	0.00	0.02	-0.02	0.99	0.11	0.16	0.70	0.48
Condition	-0.04	0.02	-1.43	0.15	-0.43	0.07	-6.33	0.00	-0.75	0.69	-1.09	0.27
_cons	1.01	0.05	19.52	0.00	1.00	0.13	7.77	0.00	0.30	1.12	0.27	0.79
Second stage	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**
Compliance	-8.04	10.74	-0.75	0.45	-0.66	0.77	-0.85	0.39	-4.21	3.57	-1.18	0.24
KS2Math	1.20	0.01	86.78	0.00	1.20	0.01	91.65	0.00	1.17	0.06	20.56	0.00
Region (ref: 1)												
Region 2	-1.01	0.72	-1.40	0.16	-1.24	0.55	-2.26	0.02	9.34	10.22	0.91	0.36
Region 3	-1.40	0.79	-1.77	0.08	-1.46	0.60	-2.45	0.01	2.17	4.46	0.49	0.63
Region 4	0.04	0.74	0.06	0.95	-0.19	0.57	-0.34	0.74	11.18	11.06	1.01	0.31
Region 5	-0.14	0.68	-0.20	0.84	-0.49	0.49	-0.99	0.32	5.39	6.61	0.81	0.42
EVERFSM	-2.00	0.16	-12.36	0.00	-1.96	0.15	-13.38	0.00	-1.25	0.79	-1.58	0.11
_cons	-93.41	10.75	-8.69	0.00	-100.85	1.44	-70.21	0.00	-103.83	4.78	-21.71	0.00
Model fit information (for second stage)												
N	17,163				17,163				8,997			
Wald chi2(7)	9128.14				9867.16				1173.97			
Prob > chi2	0				0				0			
R-squared	0.6314				0.6411				0.1617			
Root MSE	6.3175				6.2336				9.4552			

Secondary outcome: Algebra score

	Compliance 1				Compliance2				Fidelity (only ICCAMS data)			
First stage	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**
KS2Math	0.00	0.00	-1.02	0.31	0.00	0.00	-1.31	0.19	-0.01	0.01	-1.41	0.16
Region (ref: 1)												
Region 2	0.05	0.05	1.03	0.30	0.29	0.10	2.76	0.01	2.78	0.69	4.05	0.00
Region 3	0.00	0.07	0.07	0.94	-0.03	0.12	-0.29	0.77	0.93	0.74	1.26	0.21
Region 4	0.05	0.05	1.03	0.30	0.28	0.12	2.32	0.02	2.89	0.88	3.28	0.00
Region 5	0.05	0.05	1.04	0.30	0.12	0.12	0.95	0.34	1.55	0.70	2.21	0.03
EVERFSM	0.00	0.00	-1.07	0.28	0.00	0.02	-0.02	0.99	0.11	0.16	0.70	0.48
Condition	-0.04	0.02	-1.43	0.15	-0.43	0.07	-6.33	0.00	-0.75	0.69	-1.09	0.27
_cons	1.01	0.05	19.52	0.00	1.00	0.13	7.77	0.00	0.30	1.12	0.27	0.79
Second stage	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**
Compliance	-3.83	4.10	-0.93	0.35	-0.31	0.25	-1.25	0.21	-0.76	0.77	-0.99	0.32
KS2Math	0.30	0.00	72.86	0.00	0.30	0.00	77.53	0.00	0.30	0.01	24.97	0.00
Region (ref: 1)												
Region 2	-0.23	0.25	-0.92	0.36	-0.34	0.17	-1.97	0.05	1.46	2.18	0.67	0.50
Region 3	-0.43	0.34	-1.29	0.20	-0.46	0.20	-2.33	0.02	0.21	0.91	0.23	0.82
Region 4	0.13	0.27	0.46	0.65	0.01	0.19	0.07	0.94	2.09	2.31	0.91	0.37
Region 5	0.02	0.25	0.08	0.94	-0.15	0.16	-0.91	0.36	0.87	1.36	0.64	0.52
EVERFSM	-0.61	0.05	-11.06	0.00	-0.59	0.05	-12.14	0.00	-0.43	0.16	-2.77	0.01
_cons	-21.68	4.08	-5.32	0.00	-25.22	0.44	-57.31	0.00	-26.09	1.01	-25.94	0.00
Model fit information (for second stage)												
N	17,163				17,163				8,997			
Wald chi2(7)	6390.56				7096.58				1173.97			
Prob > chi2	0				0.00				0			
R-squared	0.4709				0.50				0.1617			
Root MSE	2.1631				2.10				9.4552			

Secondary outcome: Multiplication Score

	Compliance 1				Compliance2				Fidelity (only ICCAMS data)			
First stage	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**
KS2Math	0.00	0.00	-1.02	0.31	0.00	0.00	-1.31	0.19	-0.01	0.01	-1.41	0.16
Region (ref: 1)												
Region 2	0.05	0.05	1.03	0.30	0.29	0.10	2.76	0.01	2.78	0.69	4.05	0.00
Region 3	0.00	0.07	0.07	0.94	-0.03	0.12	-0.29	0.77	0.93	0.74	1.26	0.21
Region 4	0.05	0.05	1.03	0.30	0.28	0.12	2.32	0.02	2.89	0.88	3.28	0.00
Region 5	0.05	0.05	1.04	0.30	0.12	0.12	0.95	0.34	1.55	0.70	2.21	0.03
1.EV~L_SPR18	0.00	0.00	-1.07	0.28	0.00	0.02	-0.02	0.99	0.11	0.16	0.70	0.48
Condition	-0.04	0.02	-1.43	0.15	-0.43	0.07	-6.33	0.00	-0.75	0.69	-1.09	0.27
_cons	1.01	0.05	19.52	0.00	1.00	0.13	7.77	0.00	0.30	1.12	0.27	0.79
Second stage	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**
Compliance	-2.96	4.16	-0.71	0.48	-0.24	0.31	-0.77	0.44	-2.34	2.07	-1.13	0.26
KS2Math	0.54	0.01	96.02	0.00	0.54	0.01	101.36	0.00	0.52	0.03	16.41	0.00
Region (ref: 1)												
Region 2	-0.26	0.28	-0.92	0.36	-0.34	0.22	-1.56	0.12	5.75	5.93	0.97	0.33
Region 3	-0.29	0.28	-1.05	0.30	-0.32	0.23	-1.38	0.17	1.81	2.55	0.71	0.48
Region 4	0.01	0.30	0.03	0.98	-0.08	0.24	-0.33	0.74	6.38	6.41	1.00	0.32
Region 5	0.06	0.26	0.25	0.81	-0.06	0.20	-0.32	0.75	3.38	3.81	0.89	0.38
EVERFSM	-0.73	0.07	-10.84	0.00	-0.72	0.06	-11.09	0.00	-0.34	0.46	-0.73	0.46
_cons	-43.10	4.15	-10.38	0.00	-45.84	0.60	-76.35	0.00	-47.61	2.57	-18.53	0.00
Model fit information (for second stage)												
N	17,163				s = 17,163				= 8,997			
Wald chi2(7)	10992.1				11845.44				779.47			
Prob > chi2	0				0.00				0.00			
R-squared	0.6069				0.61				= .			
Root MSE	2.9838				2.96				5.03			

Secondary outcome: Mathematics Disposition

	Compliance 1				Compliance2				Fidelity (only ICCAMS data)			
First stage	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**
KS2Math	0.00	0.00	-1.05	0.29	0.00	0.00	-1.57	0.12	-0.02	0.01	-1.61	0.11
MathsDispos1	0.00	0.00	1.36	0.17	0.01	0.01	1.57	0.12	0.08	0.04	1.87	0.06
Region (ref: 1)												
Region 2	0.05	0.05	1.05	0.29	0.28	0.10	2.69	0.01	2.75	0.69	4.00	0.00
Region 3	0.00	0.07	0.03	0.97	-0.06	0.12	-0.52	0.60	0.90	0.71	1.26	0.21
Region 4	0.06	0.05	1.07	0.28	0.27	0.13	2.11	0.04	2.76	0.92	3.02	0.00
Region 5	0.06	0.05	1.06	0.29	0.10	0.13	0.81	0.42	1.48	0.72	2.05	0.04
1.EV~L_SPR18	-0.01	0.00	-1.29	0.20	0.01	0.02	0.42	0.68	0.16	0.15	1.03	0.30
Condition	-0.04	0.02	-1.45	0.15	-0.42	0.07	-6.09	0.00	-0.52	0.74	-0.71	0.48
_cons	1.01	0.05	18.56	0.00	1.07	0.14	7.50	0.00	0.64	1.31	0.49	0.63
Second stage	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**	**Coef.**	**Robust Std. Err.**	**z**	**P>|z|**
Compliance	-1.11	1.36	-0.81	0.42	-0.10	0.10	-0.93	0.35	-0.41	0.44	-0.94	0.35
KS2Math	0.02	0.00	7.82	0.00	0.02	0.00	8.36	0.00	0.01	0.01	0.62	0.53
MDisp1	0.41	0.01	37.46	0.00	0.41	0.01	37.93	0.00	0.45	0.04	10.21	0.00
Region (ref: 1)												
Region 2	0.14	0.11	1.36	0.17	0.11	0.08	1.42	0.16	1.14	1.20	0.95	0.34
Region 3	0.09	0.11	0.84	0.40	0.08	0.08	1.03	0.30	0.46	0.49	0.94	0.35
Region 4	0.08	0.11	0.73	0.46	0.04	0.08	0.55	0.59	1.14	1.26	0.90	0.37
Region 5	0.05	0.11	0.42	0.68	-0.01	0.07	-0.10	0.92	0.55	0.76	0.72	0.47
EVERFSM	-0.05	0.03	-1.70	0.09	-0.04	0.03	-1.41	0.16	0.04	0.12	0.30	0.76
_cons	-0.79	1.35	-0.59	0.56	-1.81	0.24	-7.48	0.00	-1.26	0.60	-2.10	0.04
Model fit information (for second stage)												
N			14,299		s = 14,299				= 7,646			
Wald chi2(7)			1966.8				1995.71		542.97			
Prob > chi2			0				0.00		0.00			
R-squared			0.222				0.23		= .			
Root MSE			1.144				1.14		1.34			

Appendix 15C: Models excluding non-compliant schools and cases moving schools

Table 15C summarises the models: the effect of the intervention on additional progress in mathematics, algebra, multiplication and mathematics disposition does not change in any significant way as compared to the ITT results.

Table 15C: Model results for primary and secondary outcomes excluding non-compliant intervention schools

	Maths Score		Algebra		Multiplication		Math Disposition	
	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|
Condition	0.215	0.546	0.123	0.271	0.070	0.620	0.0461	0.307
KS2Math	1.198	0.000	0.299	0.000	0.539	0.000	0.0194	0.000
Region (ref: 1)								
Region 2	-1.327	0.017	-0.417	0.017	-0.405	0.067	0.0745	0.288
Region 3	-1.458	0.017	-0.447	0.019	-0.325	0.180	0.113	0.150
Region 4	-0.460	0.444	-0.11	0.562	-0.185	0.438	-0.0106	0.890
Region 5	-0.385	0.497	-0.153	0.391	-0.05	0.824	-0.0188	0.791
EverFSM_all	-1.439	0.000	-0.447	0.000	-0.552	0.000	-0.0656	0.005
Maths Disp1							0.391	0
Constant	-101.197	0.000	-25.281	0.000	-46.046	0.000	-2.052	0
School ICC	0.074		0.064		0.0498		0.031	
Student N	16818		16818		16818		14007	

Modelling with only Intervention

	All available data				Data excluding dropout schools			
	Coef.	**Std. Err.**	**z**	**P>|z|**	**Coef.**	**Std. Err.**	**z**	**P>|z|**
KS2Math	1.21	0.01	124.44	0.00	1.21	0.01	122.37	0.00
Region (ref: 1)								
Region 2	-2.29	0.62	-3.67	0.00	-2.12	0.63	-3.38	0.00
Region 3	-1.97	0.65	-3.05	0.00	-1.58	0.68	-2.33	0.02
Region 4	-1.21	0.67	-1.81	0.07	-1.05	0.67	-1.56	0.12
Region 5	-1.25	0.60	-2.11	0.04	-1.07	0.60	-1.77	0.08
EVERFSM	-1.36	0.15	-9.07	0.00	-1.39	0.15	-9.15	0.00
Fidelity Score	**-0.04**	**0.10**	**-0.42**	**0.67**	**-0.03**	**0.10**	**-0.26**	**0.80**
_cons	-101.74	1.10	-92.68	0.00	-101.56	1.12	-91.06	0.00
School ICC (CI)	0.04 (0.03, 0.06)				0.04 (0.03, 0.06)			
N (students)	8,997				8700			
N (Schools)	62				60			
Wald chi square (p)	16715 (0)				16118.55(0)			
Log likelihood	-28835.38				-27842.83			

Appendix 15D: Models of predicting missingness (at test)

```
. xtmelogit MissingTest compliance ConditionNew KS2Math i.Gender i.Regioncat i.TeachertypeCombinedY12
TransTeachingDP1 MathsDispositionDP1 EVERFSM_ALL_SPR18 AgeatSept16new i.lesson_difficultyDP1 || SchoolID: ,
or


Mixed-effects logistic regression               Number of obs     =     14,304
Group variable: SchoolID                        Number of groups  =        100

                                                Obs per group:
                                                              min =          1
                                                              avg =      143.0
                                                              max =        285

Integration points =   7                        Wald chi2(15)     =     271.95
Log likelihood = -4684.3017                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
             MissingTest | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
              compliance |   .3485527   .1213148    -3.03   0.002     .1761997    .6894958
             ConditionNew |   1.065206   .1904607     0.35   0.724     .7503038    1.512272
                  KS2Math |   .9697057   .0042815    -6.97   0.000     .9613503    .9781336
                2.Gender |   .9535992   .0546093    -0.83   0.407      .852355    1.066869
                         |
                  Region |
                Region 2 |   1.285579   .3592438     0.90   0.369     .7434261    2.223103
                Region 3 |   2.052082   .6163675     2.39   0.017     1.139006    3.697118
                Region 4 |   1.256924   .3780061     0.76   0.447     .6971393    2.266202
                Region 5 |    1.70921   .4711645     1.94   0.052     .9957525    2.933861
                         |
1.TeachertypeCombinedY12 |   .8269455   .0517509    -3.04   0.002     .7314894    .9348581
        TransTeachingDP1 |   .9823855   .0507074    -0.34   0.731     .8878628    1.086971
     MathsDispositionDP1 |   .9502222   .0203535    -2.38   0.017     .9111558    .9909636
       EVERFSM_ALL_SPR18 |   1.918768   .1158941    10.79   0.000      1.70455    2.159909
          AgeatSept16new |   1.183327   .1132088     1.76   0.078     .9810033    1.427379
                         |
    lesson_difficultyDP1 |
                       2 |   .8690813   .0735915    -1.66   0.097     .7361781    1.025978
                       3 |   1.097896     .15331     0.67   0.504      .835025     1.44352
                         |
                   _cons |   .7730586    .953487    -0.21   0.835     .0689198    8.671228
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
SchoolID: Identity           |
                   sd(_cons) |    .817802   .0785475      .6774741    .9871965
------------------------------------------------------------------------------
LR test vs. logistic model: chibar2(01) = 520.53      Prob >= chibar2 = 0.0000
```

Without compliance indicator

```
. xtmelogit MissingTest  ConditionNew KS2Math i.Gender i.Regioncat i.TeachertypeCombinedY12 TransTeachingDP1
MathsDispositionDP1 EVERFSM_ALL_SPR18 AgeatSept16new i.lesson_difficultyDP1 || SchoolID: , or

Mixed-effects logistic regression               Number of obs     =     14,304
Group variable: SchoolID                        Number of groups  =        100

                                                Obs per group:
                                                              min =          1
                                                              avg =      143.0
                                                              max =        285

Integration points =   7                        Wald chi2(14)     =     260.64
Log likelihood = -4688.1503                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
             MissingTest | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
            ConditionNew |   1.164635    .229882     0.77   0.440     .7909976    1.714766
                 KS2Math |    .969741   .0042855    -6.95   0.000     .9613779    .9781769
               2.Gender  |   .9520752   .0545817    -0.86   0.392     .8508883    1.065295
                         |
                  Region |
                Region 2 |   1.222141   .3808596     0.64   0.520      .663527    2.251043
                Region 3 |   2.241916   .7488279     2.42   0.016      1.16495    4.314508
                Region 4 |   1.196205   .4011404     0.53   0.593     .6199546    2.308081
                Region 5 |   1.698545   .5230881     1.72   0.085     .9288361    3.106098
                         |
1.TeachertypeCombinedY12 |   .8218923   .0515751    -3.13   0.002     .7267761    .9294568
        TransTeachingDP1 |   .9834331   .0507931    -0.32   0.746     .8887535    1.088199
     MathsDispositionDP1 |   .9506986   .0203804    -2.36   0.018     .9115814    .9914944
       EVERFSM_ALL_SPR18 |   1.916924   .1159584    10.76   0.000     1.702606    2.158221
          AgeatSept16new |    1.18708   .1136888     1.79   0.073     .9839183    1.432192
                         |
    lesson_difficultyDP1 |
                       2 |   .8717024   .0738706    -1.62   0.105     .7383036    1.029204
                       3 |   1.111752   .1552275     0.76   0.448     .8455893    1.461693
                         |
                   _cons |   .2594416   .3075176    -1.14   0.255     .0254159     2.64834
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
SchoolID: Identity           |
                   sd(_cons) |   .9275272   .0801516      .7830161    1.098709
------------------------------------------------------------------------------
LR test vs. logistic model: chibar2(01) = 929.05      Prob >= chibar2 = 0.0000
```

With compliance2

```
. xtmelogit MissingTest compliance2 ConditionNew KS2Math i.Gender i.Regioncat i.TeachertypeCombinedY12
TransTeachingDP1 MathsDispositionDP1 EVERFSM_ALL_SPR18 AgeatSept16new i.l
> esson_difficultyDP1 || SchoolID: , or

Mixed-effects logistic regression               Number of obs     =     14,304
Group variable: SchoolID                        Number of groups  =        100

                                                Obs per group:
                                                              min =          1
                                                              avg =      143.0
                                                              max =        285

Integration points =   7                        Wald chi2(15)     =     261.77
Log likelihood = -4687.7251                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
             MissingTest | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
             compliance2 |   .7790684   .2078463    -0.94   0.349     .4618331    1.314214
            ConditionNew |   1.050439   .2347817     0.22   0.826     .6778291    1.627876
                 KS2Math |    .969717   .0042849    -6.96   0.000      .961355    .9781518
                2.Gender |   .9525004   .0545927    -0.85   0.396     .8512917    1.065742
                         |
              Regioncat  |
                Region 2 |   1.288067   .4023918     0.81   0.418     .6982702     2.37604
                Region 3 |   2.194406    .724165     2.38   0.017     1.149255    4.190036
                Region 4 |   1.269985   .4277732     0.71   0.478     .6562749    2.457603
                Region 5 |     1.7147   .5209266     1.77   0.076       .94535    3.110165
                         |
1.TeachertypeCombinedY12 |   .8232857   .0516613    -3.10   0.002     .7280104    .9310298
        TransTeachingDP1 |   .9829664   .0507702    -0.33   0.739     .8883296    1.087685
     MathsDispositionDP1 |    .950744   .0203812    -2.36   0.018     .9116251    .9915414
       EVERFSM_ALL_SPR18 |   1.917584   .1159827    10.76   0.000     1.703219    2.158928
          AgeatSept16new |   1.186484   .1136106     1.79   0.074     .9834581    1.431422
                         |
    lesson_difficultyDP1 |
                       2 |    .871509   .0738445    -1.62   0.105     .7381558    1.028953
                       3 |   1.109835   .1549521     0.75   0.455     .8441434    1.459153
                         |
                   _cons |   .3288472   .3982888    -0.92   0.358      .030623    3.531352
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
SchoolID: Identity           |
                   sd(_cons) |   .9126097   .0799113      .7686895    1.083476
------------------------------------------------------------------------------
LR test vs. logistic model: chibar2(01) = 881.35      Prob >= chibar2 = 0.0000
```

Appendix 15E: Multiple Imputation and Models with Imputed datasets

Imputation Model:

```
mi impute chained (logit) EVERFSM_ALL_SPR18 (regress) Newtotalscore NewAlgebraScore NewMultiplicativeScore
TransTeachingDP1 MathsDispositionDP1 TransTeachingDP2 MathsDispositionDP2 OverallTestMeasure Multiplication
Algebra = i.SchoolID ConditionNew i.Regioncat , add(10) rseed(091107)
```

```
------------------------------------------------------------------
                  |               Observations per m
                  |-----------------------------------------------
         Variable |   Complete   Incomplete   Imputed |     Total
------------------+-----------------------------------+----------
    EVERFSM_ALL~18 |      21055          606       606 |     21661
     Newtotalscore |      18052         3609      3609 |     21661
    NewAlgebraSc~e |      18052         3609      3609 |     21661
    NewMultiplic~e |      18052         3609      3609 |     21661
    TransTeachin~1 |      17475         4186      4186 |     21661
    MathsDisposi~1 |      17560         4101      4101 |     21661
    TransTeachin~2 |      17937         3724      3724 |     21661
    MathsDisposi~2 |      17976         3685      3685 |     21661
    OverallTestM~e |      18028         3633      3633 |     21661
    Multiplication |      18017         3644      3644 |     21661
           Algebra |      17828         3833      3833 |     21661
------------------------------------------------------------------
(complete + incomplete = total; imputed is the minimum across m
 of the number of filled-in observations.)
```

ITT Model with Imputed Dataset:

```
mi estimate:  mixed Newtotalscore ConditionNew KS2Math i.Regioncat i.EVERFSM_ALL_SPR18 || SchoolID:, mle
variance

Multiple-imputation estimates                   Imputations       =         10
Mixed-effects ML regression                     Number of obs     =     20,198

Group variable: SchoolID                        Number of groups  =        106
                                                Obs per group:
                                                              min =         48
                                                              avg =      190.5
                                                              max =        400
                                                Average RVI       =     0.2232
                                                Largest FMI       =     0.5262
DF adjustment:   Large sample                   DF:     min       =      35.93
                                                        avg       =   5,173.17
                                                        max       =  17,760.40
Model F test:       Equal FMI                   F(   7, 3386.7)   =    2201.12
                                                Prob > F          =     0.0000

------------------------------------------------------------------------------
      Newtotalscore |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------------+---------------------------------------------------------
       ConditionNew |   .5510859   .3846009     1.43   0.152    -.2034042    1.305576
            KS2Math |   1.000797   .0089191   112.21   0.000      .983202    1.018393
                    |
          Regioncat |
            Region 2  |  -1.477516   .5845016    -2.53   0.011    -2.623232   -.3317999
            Region 3  |  -1.404148   .6293248    -2.23   0.026     -2.63796   -.1703359
            Region 4  |  -.5606396   .6242231    -0.90   0.369    -1.784191    .6629116
            Region 5  |  -.3224734   .5872086    -0.55   0.583     -1.47346    .8285128
                    |
1.EVERFSM_ALL_SPR18 |  -1.773544   .1468692   -12.08   0.000    -2.065574   -1.481514
              _cons |  -80.82691   1.045834   -77.28   0.000    -82.88746   -78.76635
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
SchoolID: Identity           |
                  sd(_cons) |   1.806079   .1485636      1.536492    2.122966
-----------------------------+------------------------------------------------
               sd(Residual) |   7.352597   .0519006      7.248081    7.458621
------------------------------------------------------------------------------
```

Appendix 16: Descriptives and results of ITT with Rasch scores

Histograms from primary and secondary outcomes (Rasch and raw scores)

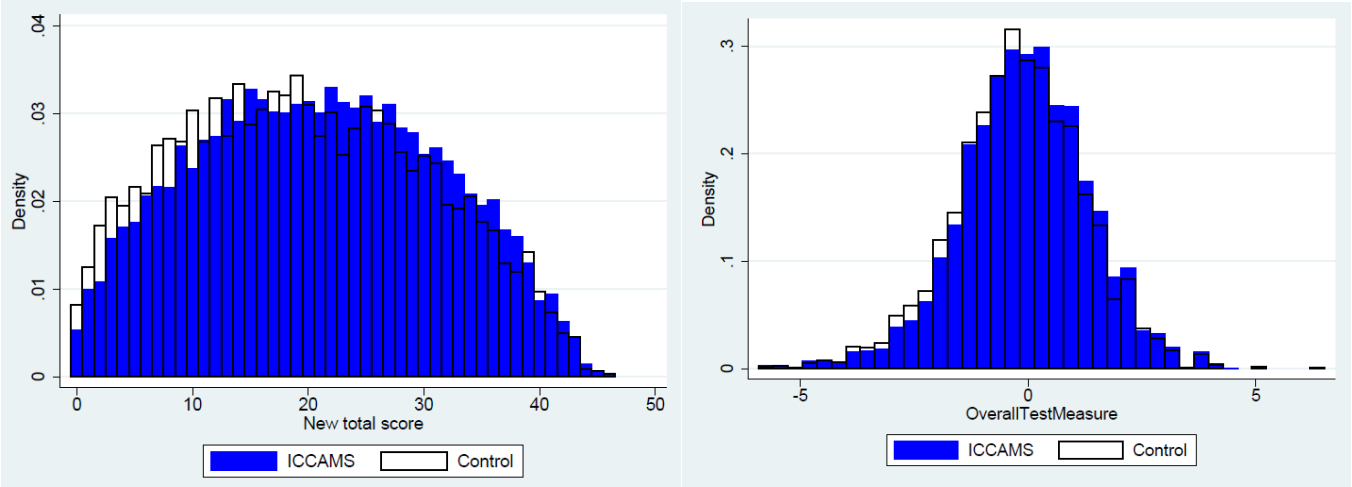


Figure 16.A: Primary outcome (total score on the left, and Rasch logit scores on the right) by condition

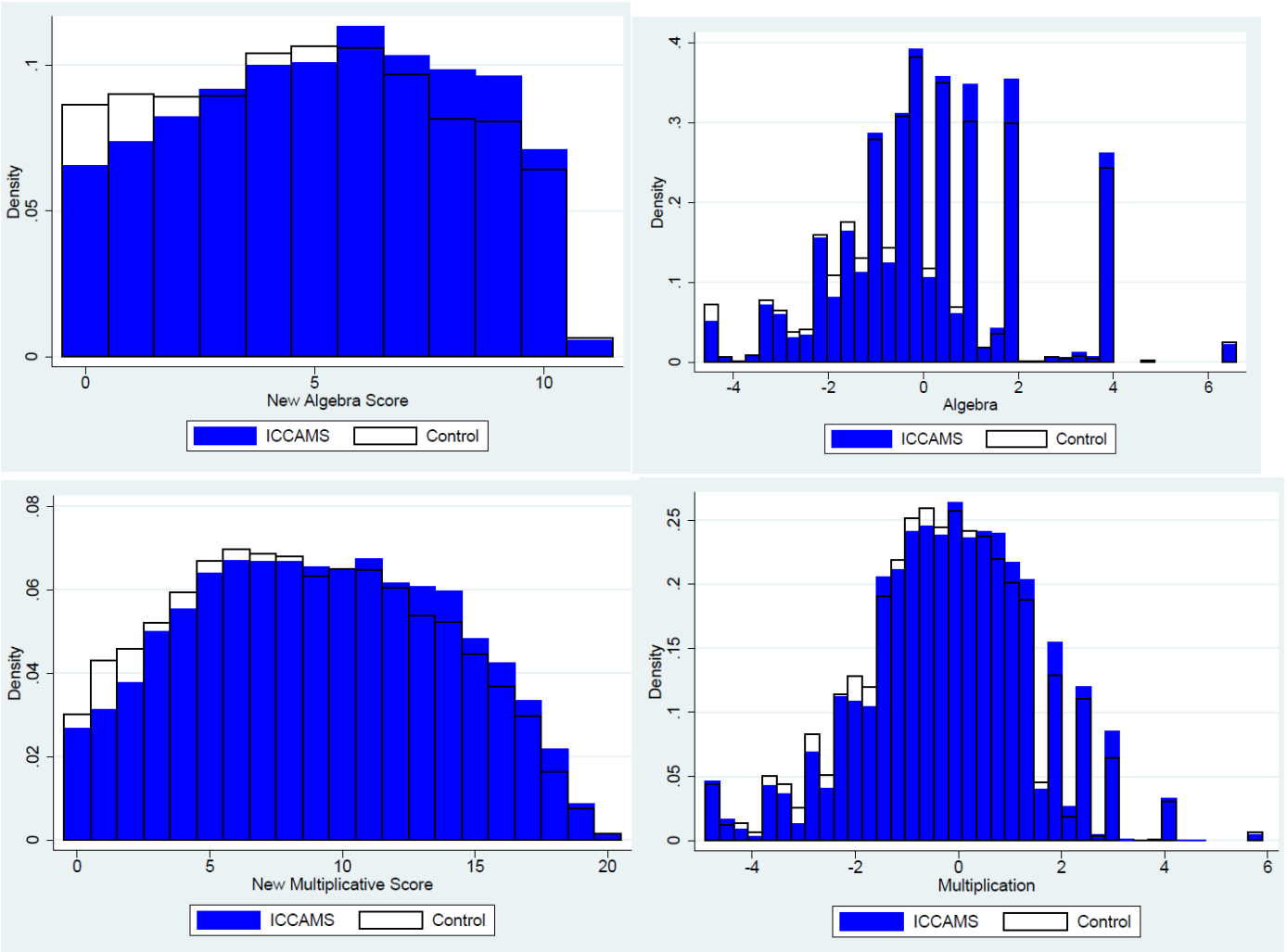


Figure 16.B: Secondary Attainment measures (raw scores on the left, and Rasch scores on the right) by condition

Table 16A. Primary and Secondary Analysis with the Rasch Scores

	Unadjusted means				Effect size (adjusted)		
	Intervention group		Control group				
Outcome	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (model) (intervention; control)	Hedges g (95% CI)	p-value
Y8Test Rasch	9387 (2199)	-0.07 (-0.10, -0.04)	8641 (1429)	-0.19 (-0.22, -0.16)	18028 (17146)	0.01 (-0.1, 0.112)	0.908
Multiplicative Rasch	9381	-0.19 (-0.22, -0.15)	8636	-0.31 (-0.34, -0.27)	18017 (17136)	0.002 (-0.08, 0.09)	0.956
Algebra	9306	0.1 (0.06, 013)	8522	-0.06 (-0.1, -0.02)	17828 (16982)	0.016 (-0.07, 0.107)	0.727

Table 16B. Effect Size calculations for Models with Rasch logits as outcomes (primary and secondary)

					Conditional Full Model		**Null Model (Empty)**	
Outcome	Condition Coefficient	CI-Low	CI-UP	p-value	Variance-School	Variance-student	Variance-School	Variance-student
Overall Rasch score	0.005	-0.082	0.092	0.908	0.046	0.633	0.156	1.900
Algebra-Rasch	0.022	-0.104	0.149	0.727	0.093	1.854	0.259	3.360
Multiplication-Rasch	0.002	-0.086	0.091	0.956	0.045	1.002	0.169	2.524

Appendix 17: Sensitivity Analyses

For sensitivity analysis we have run the models with the condition variable as reported at the end of Year 8 in Appendix 17a (as opposed to randomisation, for the ITT models) as well as with removing the cases with school change (Appendix 17b). We have furhter run the models with the subsample with complete case analysis (Appendix 17c).

Appendix 17A: **ITT models considering condition at the end of evaluation**

	Maths Score		**Algebra**		**Multiplication**		**Math Disposition**	
	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|
Condition (ref:Control)	0.233	0.507	0.115	0.300	0.089	0.523	0.047	0.286
KS2Math	1.200	0.000	0.300	0.000	0.540	0.000	0.019	0
Region (ref: 1)								
Region 2	-1.466	0.007	-0.442	0.010	-0.466	0.032	0.072	0.291
Region 3	-1.652	0.005	-0.511	0.006	-0.384	0.103	0.108	0.15
Region 4	-0.598	0.313	-0.136	0.465	-0.248	0.293	-0.011	0.882
Region 5	-0.517	0.353	-0.178	0.309	-0.107	0.628	-0.023	0.734
EverFSM_all (ref: no)	-1.415	0.000	-0.438	0.000	-0.543	0.000	-0.065	0.005
Maths Disp1							0.397	0
Constant	-101.302	0.000	-25.322	0	-46.0215	0	-1.976	0
School ICC (CI)	0.074 (0.06,0.1)		0.064 (0.05,0.08)		0.05 (0.04,0.07)		0.03 (0.02,0.04)	
N (students)	17,163		17,163		17,163		14,299	
N (Schools)	102		102		102		101	
Wald chi square (p)	30476	0.000	16911.19	0.000	26620.64	0.000	4192.68	0.000
Log likelihood	-55313.2		-36660.8		-42717.5		-21980.8	

Appendix 17B: ITT models without the 75 cases who changed school

Without the 75 cases who changed school

	Maths Score		Algebra		Multiplication	
	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|
Condition (ref:Control)	0.237	0.501	0.116	0.294	0.090	0.518
KS2Math	1.200	0.000	0.300	0.000	0.540	0.000
Region (ref: 1)						
Region 2	-1.467	0.007	-0.442	0.010	-0.467	0.032
Region 3	-1.667	0.005	-0.513	0.006	-0.390	0.098
Region 4	-0.600	0.312	-0.134	0.471	-0.248	0.295
Region 5	-0.525	0.347	-0.178	0.310	-0.112	0.614
EverFSM_all (ref: no)	-1.426	0.000	-0.443	0.000	-0.548	0.000
Maths Disp1						
Constant	-101.287	0.000	-25.308	0.000	-46.015	0.000
School ICC (CI)	0.074 (0.06,0.1)		0.064 (0.05,0.08)		0.05 (0.04,0.07)	
N (students)	17,092		17,092		17,092	
N (Schools)	102		102		102	
Wald chi square (p)	30302.13	0.000	16815.64	0.000	26468.54	0.000
Log likelihood	-55090.793		-36509.985		-42546.7	

Appendix 17C: ITT models considering full data (excluding cases with missing covariates)

```
.   gen miss2 = cond(Newtotalscore !=. & AtrandomisationCondition !=. & KS2Math !=. & Regioncat !=. &
EVERFSM_ALL_SPR18 !=. & NewAlgebraScore !=. & NewMultiplicativeScore !=. & >  MathsDispositionDP1 !=. &
MathsDispositionDP2 !=. , 0, 1)

. tab miss2

      miss2 |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |     14,299       66.01       66.01
          1 |      7,362       33.99      100.00
------------+-----------------------------------
      Total |     21,661      100.00
```

Models for Primary outcome

```
.   mixed Newtotalscore if miss2==0 || AtrandomisationSchoolID:, mle variance

Performing EM optimization:

Performing gradient-based optimization:

Iteration 0:   log likelihood = -53252.413
Iteration 1:   log likelihood = -53252.413

Computing standard errors:

Mixed-effects ML regression                     Number of obs     =     14,299
Group variable: Atrandomisat~D                  Number of groups  =        103

                                                Obs per group:
                                                              min =          2
                                                              avg =      138.8
                                                              max =        304

                                                Wald chi2(0)      =          .
Log likelihood = -53252.413                     Prob > chi2       =          .

------------------------------------------------------------------------------
Newtotalscore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
        _cons |   20.93326    .309151    67.71   0.000     20.32734    21.53918
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   8.797676   1.372512      6.479974    11.94435
-----------------------------+------------------------------------------------
               var(Residual) |    98.7593   1.172227       96.4883    101.0838
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 855.25        Prob >= chibar2 = 0.0000

.
.  estat icc

Intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0817955    .011759      .0615104    .1080003
```

```
. mixed Newtotalscore AtrandomisationCondition KS2Math i.Regioncat i.EVERFSM_ALL_SPR18
if miss2==0 || AtrandomisationSchoolID:, mle variance

Computing standard errors:

Mixed-effects ML regression                     Number of obs     =     14,299
Group variable: Atrandomisat~D                  Number of groups  =        103

                                                Obs per group:
                                                              min =          2
                                                              avg =      138.8
                                                              max =        304

                                                Wald chi2(7)      =   25365.60
Log likelihood =  -45958.09                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
           Newtotalscore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
AtrandomisationCondition |   .1461975   .3603272     0.41   0.685    -.5600308    .8524259
                 KS2Math |   1.207119   .0078058   154.64   0.000      1.19182    1.222418
                         |
              Regioncat |
              Region 2  |  -1.403619    .560563    -2.50   0.012    -2.502302   -.3049354
              Region 3  |  -1.583748   .6114942    -2.59   0.010    -2.782254   -.3852413
              Region 4  |  -.7867681   .6000536    -1.31   0.190    -1.962852    .3893153
              Region 5  |  -.5868649   .5638812    -1.04   0.298    -1.692052    .5183219
                        |
    1.EVERFSM_ALL_SPR18 |  -1.393397   .1223597   -11.39   0.000    -1.633218   -1.153577
                  _cons |  -101.9117   .9246782  -110.21   0.000     -103.724   -100.0994
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   2.967229   .4643192      2.183499    4.032266
-----------------------------+------------------------------------------------
               var(Residual) |   35.61829   .4227632      34.79926    36.45661
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 744.68        Prob >= chibar2 = 0.0000

.
.   estat icc

Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0769001   .0111477      .0577024    .1017949
------------------------------------------------------------------------------
```

Secondary outcome: Algebra raw

```
.   mixed NewAlgebraScore if miss2==0 ||  AtrandomisationSchoolID: , mle variance


Computing standard errors:

Mixed-effects ML regression                     Number of obs     =     14,299
Group variable: Atrandomisat~D                  Number of groups  =        103

                                                Obs per group:
                                                              min =          2
                                                              avg =      138.8
                                                              max =        304

                                                Wald chi2(0)      =          .
Log likelihood =  -35318.41                     Prob > chi2       =          .

------------------------------------------------------------------------------
NewAlgebraScore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
          _cons |   5.236003   .0879457    59.54   0.000     5.063632    5.408373
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   .7115595   .1101922      .5252839     .963892
-----------------------------+------------------------------------------------
               var(Residual) |   8.038956   .0954132      7.854108    8.228154
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 903.19        Prob >= chibar2 = 0.0000

.
.  estat icc

Intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0813163   .0116096      .0612728    .1071679
------------------------------------------------------------------------------

.
.  mixed NewAlgebraScore AtrandomisationCondition KS2Math i.Regioncat i.EVERFSM_ALL_SPR18 if miss2==0||
AtrandomisationSchoolID:, mle variance

Computing standard errors:

Mixed-effects ML regression                     Number of obs     =     14,299
Group variable: Atrandomisat~D                  Number of groups  =        103

                                                Obs per group:
                                                              min =          2
                                                              avg =      138.8
                                                              max =        304

                                                Wald chi2(7)      =   13852.27
Log likelihood = -30476.334                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------------------
         NewAlgebraScore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
AtrandomisationCondition |   .0919563   .1138133     0.81   0.419    -.1311136    .3150263
                 KS2Math |   .3009588   .0026439   113.83   0.000     .2957768    .3061408
                         |
              Regioncat  |
                Region 2 |  -.4318202   .1770481    -2.44   0.015     -.778828   -.0848124
                Region 3 |  -.4670103   .1932581    -2.42   0.016    -.8457892   -.0882313
                Region 4 |  -.1951539   .1897271    -1.03   0.304    -.5670122    .1767043
                Region 5 |  -.2008037   .1780735    -1.13   0.259    -.5498213     .148214
                         |
    1.EVERFSM_ALL_SPR18  |  -.4217069   .0414336   -10.18   0.000    -.5029153   -.3404986
                   _cons |  -25.35556   .3080907   -82.30   0.000    -25.95941   -24.75172
------------------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   .2914983   .0461686      .2137074    .3976056
-----------------------------+------------------------------------------------
```

```
               var(Residual) |   4.089479    .048538      3.995444    4.185727
-----------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 656.89        Prob >= chibar2 = 0.0000

.
.    estat icc

Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0665373    .009872      .0496109    .0886997
------------------------------------------------------------------------------
```

Secondary outcome: Multiplication

```
.   mixed NewMultiplicativeScore if miss2==0 || AtrandomisationSchoolID:, mle variance

Performing EM optimization:

Performing gradient-based optimization:

Iteration 0:   log likelihood = -42143.938
Iteration 1:   log likelihood = -42143.938

Computing standard errors:

Mixed-effects ML regression                     Number of obs     =     14,299
Group variable: Atrandomisat~D                  Number of groups  =        103

                                                Obs per group:
                                                              min =          2
                                                              avg =      138.8
                                                              max =        304

                                                Wald chi2(0)      =          .
Log likelihood = -42143.938                     Prob > chi2       =          .

------------------------------------------------------------------------------
NewMultiplicativeScore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-----------------------+------------------------------------------------------
                 _cons |   9.124085   .1325698    68.82   0.000     8.864253    9.383917
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                   var(_cons) |   1.594381   .2539608      1.166832     2.17859
-----------------------------+------------------------------------------------
               var(Residual) |   20.90392   .2481309       20.4232    21.39594
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 692.68        Prob >= chibar2 = 0.0000

.
.  estat icc

Intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0708667   .0105259      .0528115     .094479
------------------------------------------------------------------------------

.
```

```
.  mixed NewMultiplicativeScore AtrandomisationCondition KS2Math i.Regioncat i.EVERFSM_ALL_SPR18 if miss2==0
|| AtrandomisationSchoolID:, mle variance


Mixed-effects ML regression                     Number of obs     =     14,299
Group variable: Atrandomisat~D                  Number of groups  =        103

                                                Obs per group:
                                                              min =          2
                                                              avg =      138.8
                                                              max =        304

                                                Wald chi2(7)      =   21942.96
Log likelihood = -35496.864                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
  NewMultiplicativeScore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
AtrandomisationCondition |   .0772185   .1445828     0.53   0.593    -.2061587    .3605956
                KS2Math |   .5412115   .0037563   144.08   0.000     .5338494    .5485737
                        |
              Regioncat |
             Region 2    |  -.4568707   .2248781    -2.03   0.042    -.8976237   -.0161177
             Region 3    |   -.354533   .2457723    -1.44   0.149     -.836238    .1271719
             Region 4    |  -.3120789   .2414108    -1.29   0.196    -.7852354    .1610776
             Region 5    |  -.1367988   .2261083    -0.61   0.545    -.5799629    .3063652
                         |
  1.EVERFSM_ALL_SPR18 |  -.5495198   .0588358    -9.34   0.000    -.6648359   -.4342037
                _cons |  -46.12022   .4278114  -107.81   0.000    -46.95872   -45.28173
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   .4565743   .0750932      .3307605    .6302449
-----------------------------+------------------------------------------------
               var(Residual) |   8.266597   .0981217      8.076502    8.461166
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 466.50        Prob >= chibar2 = 0.0000

.   estat icc

Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0523404   .0081868        .03843    .0709145
```

Models for Secondary Outcome: Mathematics disposition

```
.  mixed MathsDispositionDP2 if miss2==0 || AtrandomisationSchoolID:, mle variance


Mixed-effects ML regression                     Number of obs     =     14,299
Group variable: Atrandomisat~D                  Number of groups  =        103

                                                Obs per group:
                                                              min =          2
                                                              avg =      138.8
                                                              max =        304

                                                Wald chi2(0)      =          .
Log likelihood = -23819.546                     Prob > chi2       =          .

------------------------------------------------------------------------------
MathsDispositionDP2 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
--------------------+---------------------------------------------------------------
              _cons |    .210776   .0285058     7.39   0.000     .1549058    .2666463
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   .0683737   .0116368        .04898    .0954462
-----------------------------+------------------------------------------------
               var(Residual) |   1.616916   .0191916      1.579735    1.654972
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 375.48        Prob >= chibar2 = 0.0000

.
.  estat icc
```

```
Intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0405709   .0066479      .0293684    .0558008
------------------------------------------------------------------------------

.
.   mixed MathsDispositionDP2 AtrandomisationCondition KS2Math MathsDispositionDP1 i.Regioncat
i.EVERFSM_ALL_SPR18 if miss2==0 || AtrandomisationSchoolID:, mle variance


Mixed-effects ML regression                     Number of obs     =     14,299
Group variable: Atrandomisat~D                  Number of groups  =        103

                                                Obs per group:
                                                              min =          2
                                                              avg =      138.8
                                                              max =        304

                                                Wald chi2(8)      =    4191.03
Log likelihood = -21983.914                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------------------
     MathsDispositionDP2 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
AtrandomisationCondition |   .0481678   .0436394     1.10   0.270    -.0373639    .1336994
                 KS2Math |   .0186108   .0015164    12.27   0.000     .0156386    .0215829
     MathsDispositionDP1 |   .3972988   .0069371    57.27   0.000     .3837024    .4108952
                         |
              Regioncat |
            Region 2     |    .073559   .0678347     1.08   0.278    -.0593945    .2065126
            Region 3     |   .1077518   .0744452     1.45   0.148    -.0381582    .2536617
            Region 4     |  -.0097583   .0731521    -0.13   0.894    -.1531339    .1336172
            Region 5     |   -.022427   .0681202    -0.33   0.742      -.15594    .1110861
                         |
     1.EVERFSM_ALL_SPR18 |  -.0643928   .0228212    -2.82   0.005    -.1091214   -.0196641
                   _cons |  -1.970291   .1644518   -11.98   0.000    -2.292611   -1.647971
------------------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   .0375889   .0068663      .0262768    .0537708
-----------------------------+------------------------------------------------
               var(Residual) |   1.253241   .0148759      1.224421    1.282739
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 230.75        Prob >= chibar2 = 0.0000

.
.   estat icc

Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |     .02912   .0051822      .0205117     .041189
------------------------------------------------------------------------------
```

Appendix 18: Further models

Table 18A: Primary and Secondary outcome models with Gender and Age covariates (Models M1)

	Maths Score		Algebra		Multiplication		Math Disposition	
	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|
Condition	0.257	0.461	0.136	0.208	0.085	0.546	0.039	0.384
KS2Math	1.203	<0.001	0.303	<0.001	0.539	<0.001	0.018	<0.001
Region (ref: 1)								
Region 2	-1.465	0.007	-0.441	0.008	-0.467	0.032	0.071	0.306
Region 3	-1.648	0.005	-0.507	0.005	-0.385	0.103	0.106	0.163
Region 4	-0.604	0.305	-0.141	0.437	-0.247	0.297	-0.010	0.897
Region 5	-0.550	0.320	-0.208	0.223	-0.101	0.648	-0.016	0.822
EverFSM_all	-1.419	<0.001	-0.442	<0.001	-0.542	<0.001	-0.062	0.007
Gender	0.620	<0.001	0.544	<0.001	-0.117	0.010	-0.175	<0.001
Age(inmonthsattest)	-0.009	0.504	-0.012	0.006	-0.001	0.943	-0.006	0.019
Maths Disp1							0.393	<0.001
Constant	-100.509	<0.001	-23.955	<0.001	-45.843	<0.001	-0.857	0.056
School ICC	0.073		0.062		0.05		0.031	
Sample size	17,162		17,162		17,162		14,299	

Table 18B: Attainment models with Maths disposition at Year 7 (Models M2)

	Maths Score		Algebra		Multiplication	
	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|
Condition	0.193	0.603	0.117	0.304	0.075	0.617
KS2Math	1.176	<0.001	0.296	<0.001	0.525	<0.001
Region (ref: 1)						
Region 2	-1.392	0.016	-0.416	0.019	-0.461	0.047
Region 3	-1.612	0.010	-0.462	0.016	-0.375	0.139
Region 4	-0.575	0.353	-0.137	0.469	-0.236	0.346
Region 5	-0.525	0.366	-0.204	0.251	-0.103	0.659
EverFSM_all	-1.436	<0.001	-0.433	<0.001	-0.565	<0.001
Gender	0.743	<0.001	0.585	<0.001	-0.065	0.185
Age(inmonthsattest)	-0.006	0.691	-0.011	0.018	0.002	0.798
Maths Dispositions @Year 7	0.575	<0.001	0.134	<0.001	0.257	<0.001
Constant	-98.575	<0.001	-23.442	<0.001	-44.894	<0.001
School ICC	0.08		0.068		0.057	
Sample size	14,348		14,348		14,348	

Table 18C: Attainment and Maths disposition plus Teacher type (Models M2a)

	Maths Score		Algebra		Multiplication	
	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|
KS2Math	1.175	<0.001	0.296	<0.001	0.525	<0.001
Condition	0.157	0.678	0.118	0.310	0.047	0.758
Region (ref: 1)						
Region 2	-1.334	0.022	-0.410	0.022	-0.424	0.071
Region 3	-1.519	0.018	-0.420	0.033	-0.364	0.159
Region 4	-0.460	0.466	-0.118	0.540	-0.171	0.502
Region 5	-0.520	0.373	-0.205	0.251	-0.098	0.675
EverFSM_all	-1.433	<0.001	-0.440	<0.001	-0.558	<0.001
Teacher Type(ref:CT)	0.147	0.193	0.087	0.022	-0.016	0.767
Gender	0.750	<0.001	0.593	<0.001	-0.064	0.203
Age(inmonthsattest)	-0.003	0.818	-0.010	0.041	0.002	0.745
Maths Disposition @Year 7	0.569	<0.001	0.133	<0.001	0.252	<0.001
Constant	-98.947	<0.001	-23.659	<0.001	-44.985	<0.001
School ICC	0.083		0.068		0.057	
Sample size	13,993		13,993		13,993	

Table 18D: Teacher type and Transmissionism teaching (Models M3a)

	Maths Score		Algebra		Multiplication		Math Disposition	
	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|
KS2Math	1.207	<0.001	0.303	<0.001	0.541	<0.001	0.021	<0.001
Condition	0.182	0.624	0.137	0.231	0.031	0.833	-0.025	0.549
Region (ref: 1)								
Region 2	-1.434	0.012	-0.452	0.010	-0.437	0.055	0.055	0.384
Region 3	-1.660	0.008	-0.503	0.009	-0.429	0.084	0.047	0.507
Region 4	-0.646	0.300	-0.171	0.372	-0.245	0.324	-0.089	0.194
Region 5	-0.608	0.293	-0.235	0.186	-0.122	0.595	-0.037	0.556
EverFSM_all	-1.386	<0.001	-0.429	<0.001	-0.524	<0.001	-0.069	<0.001
Teacher Type (ref:CT)	0.120	0.257	0.075	0.034	-0.004	0.932	0.017	0.387
Gender	0.641	<0.001	0.554	<0.001	-0.110	0.020	-0.172	<0.001
Age(inmonthsattest)	-0.007	0.619	-0.011	0.019	0.000	0.943	-0.008	0.004
Transm Teaching2	-0.548	<0.001	-0.160	<0.001	-0.218	<0.001	-0.574	<0.001
Maths Disp1							0.346	<0.001
Constant	-101.084	<0.001	-24.135	<0.001	-46.055	<0.001	-0.751	0.08
School ICC	0.081		0.067		0.054			
Sample size	15,870		15,870		15,870		13,920	

Table 18E: Further models with students' perceptions of transmissionism (Models M3)

	Maths Score		Algebra		Multiplication		Math Disposition	
	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|
Condition	0.184	0.598	0.115	0.283	0.054	0.697	-0.020	0.609
KS2Math	1.204	<0.001	0.303	<0.001	0.540	<0.001	0.021	<0.001
Region (ref: 1)								
Region 2	-1.465	0.007	-0.442	0.008	-0.465	0.032	0.054	0.388
Region 3	-1.723	0.003	-0.530	0.003	-0.416	0.076	0.045	0.513
Region 4	-0.688	0.241	-0.167	0.354	-0.279	0.235	-0.101	0.132
Region 5	-0.550	0.319	-0.210	0.216	-0.099	0.655	-0.042	0.501
EverFSM_all	-1.435	<0.001	-0.449	<0.001	-0.547	<0.001	-0.071	0.001
Gender	0.610	<0.001	0.539	<0.001	-0.120	0.008	-0.176	<0.001
Age(inmonthsattest)	-0.011	0.408	-0.013	0.003	-0.001	0.882	-0.008	0.002
TransTeaching2	-0.561	<0.001	-0.163	<0.001	-0.228	<0.001	-0.575	<0.001
Maths Disp1							0.348	<0.001
Constant	-100.0858	<0.001	-23.7796	<0.001	-45.7314	<0.001	-0.675	0.111
School ICC	0.0732482		0.0613477		0.0497523		0.0271311	
Sample size	17,066		17,066		17,066		14,271	

Table 18F: Only Teacher type (no transmissionism) - teacher type (0=cascade, 1=lead) (Models M1a)

	Maths Score		Algebra		Multiplication		Math Disposition	
	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|
KS2Math	1.206	<0.001	0.303	<0.001	0.540	<0.001	0.019	<0.001
Condition	0.259	0.486	0.158	0.166	0.062	0.676	0.036	0.422
Region (ref: 1)								
Region 2	-1.440	0.012	-0.452	0.011	-0.4426	0.054	0.076	0.280
Region 3	-1.585	0.011	-0.480	0.013	-0.401	0.109	0.119	0.122
Region 4	-0.568	0.363	-0.145	0.452	-0.217	0.385	0.000	0.996
Region 5	-0.614	0.289	-0.234	0.191	-0.12943	0.576	-0.009	0.895
EverFSM_all	-1.373	<0.001	-0.4228	<0.001	-0.521	<0.001	-0.062	0.008
TeacherType (ref: CT)	0.118	0.266	0.075	0.036	-0.005	0.926	0.037	0.078
Gender	0.649	<0.001	0.558	<0.001	-0.108	0.022	-0.172	<0.001
Age(inmonthsattest)	-0.005	0.737	-0.010	0.031	0.001	0.881	-0.006	0.032
Maths Disp1							0.390	<0.001
Constant	-101.5172	<0.001	-24.3176	<0.001	-46.1648	<0.001	-0.964	0.034
School ICC	0.0802944		0.0676829		0.0547939		0.0306708	
Sample size	15,955		15,955		15,955		13,948	

Table 18G: Models including Teacher type and perception of transmissionism at both Year 7 and Year 8 (Models M3b)

	Maths Score		Algebra		Multiplication		Math Disposition	
	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|
Condition	0.040	0.913	0.087	0.439	0.000	0.999	-0.036	0.378
KS2Math	1.208	<0.001	0.303	<0.001	0.540	<0.001	0.020	<0.001
Region (ref: 1)								
Region 2	-1.286	0.023	-0.401	0.022	-0.401	0.078	0.066	0.293
Region 3	-1.466	0.018	-0.418	0.029	-0.334	0.183	0.065	0.348
Region 4	-0.661	0.279	-0.177	0.346	-0.248	0.312	-0.085	0.207
Region 5	-0.570	0.313	-0.221	0.205	-0.115	0.612	-0.025	0.686
EverFSM_all	-1.416	<0.001	-0.437	<0.001	-0.547	<0.001	-0.068	0.002
Teacher Type (ref:CT)	0.156	0.17	0.090	0.019	-0.011	0.844	0.022	0.278
Gender	0.655	<0.001	0.572	<0.001	-0.103	0.039	-0.165	<0.001
Age(inmonthsattest)	-0.005	0.713	-0.011	0.029	0.002	0.800	-0.007	0.009
TransTeaching2	-0.710	<0.001	-0.205	<0.001	-0.273	<0.001	-0.604	<0.001
TransTeaching 1	0.390	<0.001	0.097	0.002	0.160	<0.001	0.164	<0.001
Maths Disp1							0.365	<0.001
Constant	-101.380	<0.001	-24.164	<0.001	-46.162	<0.001	-0.721	0.093
School ICC	0.077		0.065		0.052		0.0268	
Sample size	13,859		13,859		13,859		13,844	

Table 18H: Three-level (student-teacher-school) models (Models M4a teacher-level)

	Maths Score		Algebra		Multiplication		Math Disposition	
	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|
Condition	-0.143	0.739	0.116	0.397	-0.156	0.378	-0.012	0.820
KS2Math	1.064	<0.001	0.265	<0.001	0.485	<0.001	0.025	<0.001
Region (ref: 1)								
Region 2	-0.877	0.210	-0.370	0.097	-0.151	0.600	0.068	0.421
Region 3	-1.052	0.189	-0.303	0.233	-0.178	0.589	0.079	0.424
Region 4	-0.313	0.670	-0.159	0.498	-0.014	0.964	-0.046	0.604
Region 5	-0.201	0.778	-0.126	0.578	0.032	0.914	0.024	0.778
EverFSM_all	-1.191	<0.001	-0.370	<0.001	-0.450	<0.001	-0.090	0.006
Teacher Type	-0.170	0.416	0.019	0.786	-0.157	0.110	0.005	0.876
Gender	0.419	0.002	0.496	<0.001	-0.206	0.002	-0.151	<0.001
Age(inmonthsattest)	-0.043	0.028	-0.020	0.002	-0.013	0.174	-0.006	0.107
TransTeaching2	-0.374	0.001	-0.125	0.001	-0.112	0.034	-0.599	<0.001
FAPractice(T1Y8)*	-0.334	0.305	-0.128	0.206	-0.156	0.269	0.038	0.252
TransTeach(T1Y8)*	-1.032	0.007	-0.350	0.004	-0.439	0.009	0.080	0.045
Maths Disp1							0.346	<0.001
Constant	-81.04713	<0.001	-18.848	<0.001	-38.325	<0.001	-1.439	0.025
School ICC	0.043		0.041		0.027		0.029	
Year8T1/School ICC	0.164		0.138		0.125		0.036	
Sample size	7,367		7,367		7,367		6,466	

*Note these variables are teacher perceptions from Teacher surveys as compared to TrasmTeaching which is measured from student surveys

Table 18I: Three-level (student-class-school) models (Models M4a class-level)

	Maths Score		Algebra		Multiplication		Math Disposition	
	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|
Condition	-0.005	0.991	0.146	0.304	-0.086	0.629	-0.010	0.852
KS2Math	0.959	<0.001	0.238	<0.001	0.445	<0.001	0.025	<0.001
Region (ref: 1)								
Region 2	-0.643	0.381	-0.306	0.19	-0.028	0.923	0.068	0.420
Region 3	-0.838	0.320	-0.255	0.343	-0.066	0.846	0.077	0.440
Region 4	-0.186	0.809	-0.122	0.618	0.082	0.790	-0.046	0.604
Region 5	-0.100	0.893	-0.092	0.697	0.091	0.759	0.025	0.774
EverFSM_all	-1.100	<0.001	-0.347	<0.001	-0.413	<0.001	-0.090	0.006
Teacher Type (ref: CT)	-0.083	0.688	0.028	0.681	-0.126	0.197	0.007	0.827
Gender	0.337	0.012	0.471	<0.001	-0.234	<0.001	-0.151	<0.001
Age(inmonthsattest)	-0.042	0.028	-0.020	0.002	-0.013	0.179	-0.006	0.106
TransTeaching2	-0.446	<0.001	-0.148	<0.001	-0.139	0.008	-0.599	<0.001
FAPractice(T1Y8)	-0.236	0.423	-0.134	0.154	-0.090	0.493	0.037	0.256
TransTeach(T1Y8)	-0.652	0.056	-0.277	0.011	-0.252	0.098	0.079	0.044
Maths Disp1							0.346	<0.001
Constant	-70.861	<0.001	-16.209	<0.001	-34.4581	<0.001	-1.426	0.026
School ICC	0.039		0.0407		0.022		0.030	
Class/School ICC	0.236		0.193		0.177		0.037	
Sample size	7,364		7,364		7,364		6,463	

Table 18J: Three-level (student-class-school) models, without teacher type (Models M4)

	Maths Score		Algebra		Multiplication		Math Disposition	
	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|	coefficient	P>|z|
Condition	-0.013	0.976	0.149	0.294			-0.009	0.865
KS2Math	0.960	<0.001	0.238	<0.001			0.025	<0.001
Region (ref: 1)								
Region 2	-0.641	0.382	-0.307	0.189			0.068	0.423
Region 3	-0.834	0.323	-0.257	0.340			0.076	0.444
Region 4	-0.188	0.806	-0.122	0.621			-0.046	0.606
Region 5	-0.092	0.901	-0.095	0.689			0.024	0.781
EverFSM_all	-1.099	<0.001	-0.347	<0.001			-0.090	0.005
Gender	0.336	0.013	0.472	<0.001			-0.151	<0.001
Age(inmonthsattest)	-0.042	0.027	-0.020	0.002			-0.006	0.106
TransTeaching2	-0.446	<0.001	-0.148	<0.001			-0.599	<0.001
FAPractice(T1Y8)	-0.235	0.427	-0.135	0.152			0.037	0.260
TransTeach(T1Y8)	-0.649	0.058	-0.278	0.011			0.078	0.045
Maths Disp1							0.346	<0.001
Constant	-70.88366	<0.001	-16.1987	<0.001			-1.422	0.027
School ICC	0.0394455		0.040647				0.0303966	
Class/School ICC	0.2358554		0.193117				0.0367719	
Sample size	7,364		7,364		7,364		6,463	

Appendix 19: Models with only intervention teachers (including fidelity)

Fidelity models

```
mixed Newtotalscore KS2Math i.Regioncat c.FidelityScore##i.TeachertypeCombinedY12 i.EVERFSM_ALL_SPR18
i.Gender Ageinmonthsattestnew TransTeachingDP2 TransTeachingDP1|| SchoolID:, mle variance


Mixed-effects ML regression                     Number of obs     =      7,346
Group variable: SchoolID                        Number of groups  =         48

                                                Obs per group:
                                                              min =         46
                                                              avg =      153.0
                                                              max =        298

                                                Wald chi2(13)     =   13599.04
Log likelihood = -23470.978                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
                        Newtotalscore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
--------------------------------------+---------------------------------------------------------------
                              KS2Math |   1.224361   .0109758   111.55   0.000     1.202849    1.245873
                                      |
                            Regioncat |
                             Region 2 |  -2.116856   .6479683    -3.27   0.001    -3.386851   -.8468619
                             Region 3 |  -1.904378   .6970447    -2.73   0.006    -3.270561   -.5381957
                             Region 4 |  -1.186666   .6929139    -1.71   0.087    -2.544752    .1714201
                             Region 5 |   -1.19409   .6184763    -1.93   0.054    -2.406281    .0181018
                                      |
                       FidelityScore |  -.0928087   .1098735    -0.84   0.398    -.3081568    .1225393
             1.TeachertypeCombinedY12 |   .2979167   .1505609     1.98   0.048     .0028228    .5930107
                                      |
TeachertypeCombinedY12#c.FidelityScore |
                                    1 |  -.0046252    .073258    -0.06   0.950    -.1482083    .1389578
                                      |
                  1.EVERFSM_ALL_SPR18 |  -1.317045   .1681651    -7.83   0.000    -1.646643   -.9874478
                            2.Gender |   .6226199   .1395684     4.46   0.000     .3490709     .896169
                   Ageinmonthsattestnew |  -.0175099   .0198508    -0.88   0.378    -.0564168    .021397
                       TransTeachingDP2 |  -.6732331   .1132887    -5.94   0.000    -.8952749   -.4511913
                       TransTeachingDP1 |   .4161871   .1247635     3.34   0.001     .1716551    .660719
                                  _cons |  -100.5997   3.302279   -30.46   0.000    -107.0721   -94.12738
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
SchoolID: Identity           |
                  var(_cons) |   1.551867   .3748855      .9665604    2.491608
-----------------------------+------------------------------------------------
               var(Residual) |   34.43723   .5701397      33.33771    35.57301
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 193.42        Prob >= chibar2 = 0.0000


Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
                    SchoolID |   .0431205   .0100002      .0272598    .0675684
------------------------------------------------------------------------------


.
```

```
mixed Newtotalscore KS2Math i.Regioncat i.TeachertypeCombinedY12 i.EVERFSM_ALL_SPR18  i.Gender
Ageinmonthsattestnew TransTeachingDP2 TransTeachingDP1|| SchoolID:, mle variance


Mixed-effects ML regression                     Number of obs     =     13,859
Group variable: SchoolID                        Number of groups  =         98

                                                Obs per group:
                                                              min =          1
                                                              avg =      141.4
                                                              max =        298

                                                Wald chi2(11)     =   24803.63
Log likelihood = -44481.761                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
           Newtotalscore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
                 KS2Math |   1.208225   .0079696   151.60   0.000     1.192605    1.223846
                         |
              Regioncat |
              Region 2  |   -1.28495   .5657634    -2.27   0.023    -2.393825   -.1760736
              Region 3  |   -1.46814   .6209172    -2.36   0.018    -2.685115   -.2511646
               Region 4 |   -.6596622   .6102429    -1.08   0.280    -1.855716    .5363919
               Region 5 |  -.5707888   .5651596    -1.01   0.313    -1.678481    .5369036
                        |
1.TeachertypeCombinedY12 |   .1561484    .113614     1.37   0.169    -.0665309    .3788278
     1.EVERFSM_ALL_SPR18 |  -1.416019   .1238459   -11.43   0.000    -1.658752   -1.173285
                2.Gender |   .6548633   .1040356     6.29   0.000     .4509573    .8587693
    Ageinmonthsattestnew |  -.0053704   .0145871    -0.37   0.713    -.0339605    .0232197
        TransTeachingDP2 |  -.7103581   .0820974    -8.65   0.000    -.8712661   -.5494502
        TransTeachingDP1 |    .390476   .0927277     4.21   0.000     .2087331    .5722189
                   _cons |  -101.3602   2.436105   -41.61   0.000    -106.1348   -96.58547
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
SchoolID: Identity           |
                  var(_cons) |   2.945554   .4691711      2.155692    4.024828
-----------------------------+------------------------------------------------
               var(Residual) |   35.29962   .4255768      34.47528    36.14367
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 717.11        Prob >= chibar2 = 0.0000

.
.   estat icc

Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
                    SchoolID |   .0770177   .0113629      .0574936    .1024512
------------------------------------------------------------------------------
```

2 and 3-level models with fidelity

```
.    mixed Newtotalscore i.Regioncat c.FidelityScore##c.KS2Math i.TeachertypeCombinedY12 i.EVERFSM_ALL_SPR18
i.Gender Ageinmonthsattestnew TransTeachingDP2 TransTeachingDP1|| SchoolID:, mle variance


Computing standard errors:

Mixed-effects ML regression                     Number of obs     =      7,346
Group variable: SchoolID                        Number of groups  =         48

                                                Obs per group:
                                                              min =         46
                                                              avg =      153.0
                                                              max =        298

                                                Wald chi2(13)     =   13604.72
Log likelihood = -23469.946                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
             Newtotalscore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
---------------------------+--------------------------------------------------------------------
                Regioncat |
                  Region 2 |  -2.107166   .6487807    -3.25   0.001    -3.378753   -.8355796
                  Region 3 |  -1.939032   .6979194    -2.78   0.005    -3.306929   -.5711353
                  Region 4 |  -1.185996   .6937262    -1.71   0.087    -2.545674    .1736827
                  Region 5 |  -1.207279   .6193028    -1.95   0.051     -2.42109    .0065326
                           |
             FidelityScore |   .6890448   .5550147     1.24   0.214    -.3987641    1.776854
                   KS2Math |   1.225862   .0110234   111.21   0.000     1.204257    1.247468
                           |
c.FidelityScore#c.KS2Math |  -.0076232   .0053005    -1.44   0.150    -.0180121    .0027656
                           |
 1.TeachertypeCombinedY12 |    .293353   .1490604     1.97   0.049        .0012    .5855061
      1.EVERFSM_ALL_SPR18 |  -1.318203   .1680613    -7.84   0.000    -1.647597   -.9888085
                  2.Gender |    .625035   .1395527     4.48   0.000     .3515167    .8985532
     Ageinmonthsattestnew |  -.0173042   .0198475    -0.87   0.383    -.0562046    .0215962
         TransTeachingDP2 |  -.6748015   .1132778    -5.96   0.000    -.8968218   -.4527811
         TransTeachingDP1 |   .4178594   .1247145     3.35   0.001     .1734235    .6622953
                    _cons |  -100.7864   3.304288   -30.50   0.000    -107.2626   -94.31008
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
SchoolID: Identity           |
                  var(_cons) |   1.556389   .3754503      .9700216    2.497209
-----------------------------+------------------------------------------------
               var(Residual) |   34.42694   .5699655      33.32775    35.56237
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 194.42        Prob >= chibar2 = 0.0000

.   estat icc

Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
                    SchoolID |   .0432531   .0100154      .0273628    .0677286
```

```
. mixed Newtotalscore KS2Math i.Regioncat EVERFSM_ALL_SPR18   i.Gender Ageinmonthsat Sept16new
TransTeachingDP2 T1Y8_TransTeaching T1Y8_FAPractice T1Y8_ICCAMSConfidence Fidelity
> Score  if Dropout ==0 || AtrandomisationSchoolID: || ClassIDY8: , mle variance


Mixed-effects ML regression                     Number of obs     =      3,626

------------------------------------------------------------------
                |     No. of       Observations per Group
 Group Variable |     Groups    Minimum    Average    Maximum
----------------+-------------------------------------------------
   Atrandomis~D |         41         22       88.4        253
      ClassIDY8 |        208          1       17.4         32
------------------------------------------------------------------

                                                Wald chi2(13)     =    1844.54
Log likelihood = -11444.075                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
         Newtotalscore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-----------------------+------------------------------------------------------------------
               KS2Math |   .8976818    .021579    41.60   0.000     .8553877    .9399759
                       |
             Regioncat |
              Region 2 |  -1.052018   1.166142    -0.90   0.367    -3.337615    1.233579
              Region 3 |  -.3778511   1.267658    -0.30   0.766    -2.862416    2.106714
              Region 4 |  -.9379579   1.200475    -0.78   0.435    -3.290845     1.41493
              Region 5 |   .1460855   1.106179     0.13   0.895    -2.021985    2.314156
                       |
     EVERFSM_ALL_SPR18 |  -1.145776   .2218686    -5.16   0.000    -1.580631   -.7109215
               2.Gender |   .1871942   .1869519     1.00   0.317    -.1792248    .5536131
Ageinmonthsat Sept16new |  -.0539052   .0264611    -2.04   0.042    -.1057679   -.0020425
      TransTeachingDP2 |  -.2352735   .1584831    -1.48   0.138    -.5458946    .0753476
    T1Y8_TransTeaching |  -1.012314   .5900493    -1.72   0.086    -2.168789    .1441616
       T1Y8_FAPractice |  -.2939681   .4874268    -0.60   0.546    -1.249307    .6613709
 T1Y8_ICCAMSConfidence |   .1040918   .1196988     0.87   0.385    -.1305135    .3386971
         FidelityScore |  -.0793659   .1838713    -0.43   0.666    -.4397471    .2810153
                 _cons |   -63.8737    4.25589   -15.01   0.000    -72.21509   -55.53231
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   1.602917   1.049301       .444322    5.782612
-----------------------------+------------------------------------------------
ClassIDY8: Identity          |
                  var(_cons) |   9.417806   1.508561      6.880227     12.8913
-----------------------------+------------------------------------------------
               var(Residual) |   29.10692    .708162      27.75152    30.52852
------------------------------------------------------------------------------
LR test vs. linear model: chi2(2) = 465.76                Prob > chi2 = 0.0000

Note: LR test is conservative and provided only for reference.
```

```
. mixed Newtotalscore c.KS2Math##c.FidelityScore i.Regioncat EVERFSM_ALL_SPR18   i.Gender
AgeinmonthsatSept16new TransTeachingDP2 T1Y8_TransTeaching T1Y8_FAPractice T1Y8_ICCAMS
> Confidence   if Dropout ==0 || AtrandomisationSchoolID: || ClassIDY8: , mle var


Mixed-effects ML regression                     Number of obs     =      3,626

------------------------------------------------------------------
                |     No. of       Observations per Group
 Group Variable |     Groups    Minimum    Average    Maximum
----------------+-------------------------------------------------
   Atrandomis~D |         41         22       88.4        253
      ClassIDY8 |        208          1       17.4         32
------------------------------------------------------------------

                                                Wald chi2(14)     =    1842.19
Log likelihood = -11443.866                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
            Newtotalscore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
--------------------------+---------------------------------------------------------------
                  KS2Math |   .9004697   .0221308    40.69   0.000     .8570942    .9438452
           FidelityScore |   .6659662   1.164192     0.57   0.567    -1.615808     2.94774
                         |
c.KS2Math#c.FidelityScore |  -.0073063   .0112624    -0.65   0.517    -.0293801    .0147675
                         |
                Regioncat |
                Region 2  |    -1.0527   1.164442    -0.90   0.366    -3.334964    1.229564
                Region 3  |  -.4089369    1.26681    -0.32   0.747    -2.891839    2.073965
                Region 4  |  -.9417989   1.198676    -0.79   0.432     -3.29116    1.407562
                Region 5  |   .1161559   1.105667     0.11   0.916    -2.050912    2.283224
                         |
        EVERFSM_ALL_SPR18 |  -1.144646   .2218446    -5.16   0.000    -1.579453   -.7098383
                2.Gender |   .1893131   .1869654     1.01   0.311    -.1771323    .5557585
   AgeinmonthsatSept16new |  -.0541296     .02646    -2.05   0.041    -.1059902   -.0022689
         TransTeachingDP2 |  -.2365649   .1584819    -1.49   0.136    -.5471838    .0740539
       T1Y8_TransTeaching |  -.9955414   .5910136    -1.68   0.092    -2.153907    .1628239
          T1Y8_FAPractice |  -.2723873   .4889162    -0.56   0.577    -1.230645    .6858709
    T1Y8_ICCAMSConfidence |   .1018291   .1198207     0.85   0.395    -.1330152    .3366734
                    _cons |  -64.12724   4.278089   -14.99   0.000    -72.51215   -55.74234
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   1.577969   1.046735      .4299912    5.790781
-----------------------------+------------------------------------------------
ClassIDY8: Identity          |
                  var(_cons) |   9.469168   1.513652      6.922241     12.9532
-----------------------------+------------------------------------------------
               var(Residual) |   29.09875   .7078739       27.7439    30.51977
------------------------------------------------------------------------------
LR test vs. linear model: chi2(2) = 462.07                Prob > chi2 = 0.0000

Note: LR test is conservative and provided only for reference.
```

```
. mixed Newtotalscore c.KS2Math##c.FidelityScore i.Regioncat EVERFSM_ALL_SPR18   i.Gender
AgeinmonthsatSept16new TransTeachingDP2 T1Y8_TransTeaching T1Y8_FAPractice T1Y8_ICCAMS
> Confidence   if Dropout ==0 || AtrandomisationSchoolID: || Y8T1: , mle var

Computing standard errors:

Mixed-effects ML regression                     Number of obs     =      3,628

------------------------------------------------------------
                |     No. of       Observations per Group
 Group Variable |     Groups    Minimum    Average    Maximum
----------------+-------------------------------------------
   Atrandomis~D |         41         22       88.5        253
          Y8T1 |        137          2       26.5        127
------------------------------------------------------------

                                                Wald chi2(14)     =    2999.09
Log likelihood = -11494.614                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
           Newtotalscore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
                 KS2Math |   1.032636   .0198172    52.11   0.000      .993795    1.071477
           FidelityScore |   1.387208   1.060671     1.31   0.191    -.6916694    3.466086
                         |
c.KS2Math#c.FidelityScore |  -.0136082   .0102276    -1.33   0.183    -.0336539    .0064376
                         |
               Regioncat |
                Region 2 |  -1.578145   1.088909    -1.45   0.147    -3.712367    .5560776
                Region 3 |  -.9342235   1.155576    -0.81   0.419     -3.19911    1.330663
                Region 4 |  -1.187142   1.103585    -1.08   0.282    -3.350129    .9758447
                Region 5 |  -.1696085   1.035149    -0.16   0.870    -2.198463    1.859246
                         |
       EVERFSM_ALL_SPR18 |  -1.209673     .22601    -5.35   0.000    -1.652645   -.7667019
                 2.Gender |   .3075088   .1899979     1.62   0.106    -.0648803    .6798978
  AgeinmonthsatSept16new |  -.0586519   .0270271    -2.17   0.030    -.1116241   -.0056798
       TransTeachingDP2 |   -.149605   .1601488    -0.93   0.350    -.4634909    .1642809
     T1Y8_TransTeaching |  -.5938593   .6451795    -0.92   0.357    -1.858388    .6706692
        T1Y8_FAPractice |   .1650111   .5301084     0.31   0.756    -.8739822    1.204004
   T1Y8_ICCAMSConfidence |   .1734862   .1463789     1.19   0.236    -.1134112    .4603836
                   _cons |  -76.82707   4.245955   -18.09   0.000    -85.14899   -68.50515
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   1.121721   1.001938      .1947955    6.459378
-----------------------------+------------------------------------------------
Y8T1: Identity               |
                  var(_cons) |   6.520301   1.277289      4.441423    9.572229
-----------------------------+------------------------------------------------
               var(Residual) |   30.75689   .7383516      29.34326    32.23862
------------------------------------------------------------------------------
LR test vs. linear model: chi2(2) = 372.82                Prob > chi2 = 0.0000

Note: LR test is conservative and provided only for reference.

. estat icc

Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0292123   .0258033      .0050322    .1518481
Y8T1|AtrandomisationSchoolID |   .1990166   .0254371      .1537866    .2535632
------------------------------------------------------------------------------
```

```
. mixed NewAlgebraScore c.KS2Math##c.FidelityScore i.Regioncat EVERFSM_ALL_SPR18   i.Gender
AgeinmonthsatSept16new TransTeachingDP2 T1Y8_TransTeaching T1Y8_FAPractice T1Y8_ICCA
> MSConfidence   if Dropout ==0 || AtrandomisationSchoolID: || Y8T1: , mle var


Computing standard errors:

Mixed-effects ML regression                     Number of obs     =      3,628

------------------------------------------------------------------
                |     No. of       Observations per Group
 Group Variable |     Groups    Minimum    Average    Maximum
----------------+-------------------------------------------------
   Atrandomis~D |         41         22       88.5        253
          Y8T1 |        137          2       26.5        127
------------------------------------------------------------------

                                                Wald chi2(14)     =    1704.19
Log likelihood = -7616.8948                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
          NewAlgebraScore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
--------------------------+---------------------------------------------------
                  KS2Math |   .2593345   .0066813    38.81   0.000     .2462393    .2724297
            FidelityScore |   .4364765   .3561034     1.23   0.220    -.2614732    1.134426
                          |
c.KS2Math#c.FidelityScore |  -.0045012   .0034427    -1.31   0.191    -.0112488    .0022463
                          |
                Regioncat |
                Region 2  |  -.6016829   .3198901    -1.88   0.060    -1.228656    .0252901
                Region 3  |  -.3239964   .3379181    -0.96   0.338    -.9863038    .3383109
                Region 4  |  -.2950524   .3236785    -0.91   0.362    -.9294507    .3393458
                Region 5  |  -.1611892   .3036762    -0.53   0.596    -.7563837    .4340053
                          |
        EVERFSM_ALL_SPR18 |   -.348197   .0777847    -4.48   0.000    -.5006521   -.1957418
                2.Gender  |    .481526   .0654794     7.35   0.000     .3531888    .6098632
   AgeinmonthsatSept16new |  -.0197428   .0093198    -2.12   0.034    -.0380093   -.0014762
         TransTeachingDP2 |  -.0864352   .0550896    -1.57   0.117    -.1944087    .0215384
      T1Y8_TransTeaching  |  -.2793193    .194774    -1.43   0.152    -.6610693    .1024308
         T1Y8_FAPractice  |  -.0670523   .1601101    -0.42   0.675    -.3808624    .2467578
    T1Y8_ICCAMSConfidence |   .0609941    .044233     1.38   0.168    -.0257009    .1476891
                    _cons |  -18.60574   1.448362   -12.85   0.000    -21.44448   -15.76701
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |    .080878   .0871739      .0097806    .6687955
-----------------------------+------------------------------------------------
Y8T1: Identity               |
                  var(_cons) |   .5695476    .120387      .3763649    .8618883
-----------------------------+------------------------------------------------
               var(Residual) |   3.664225   .0880444      3.495661    3.840916
------------------------------------------------------------------------------
LR test vs. linear model: chi2(2) = 232.90                Prob > chi2 = 0.0000

Note: LR test is conservative and provided only for reference.

. estat icc

Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |    .018745   .0200848      .0022421    .1397062
Y8T1|AtrandomisationSchoolID |   .1507482    .021893      .1126539    .1988376
------------------------------------------------------------------------------
```

```
. mixed NewMultiplicativeScore c.KS2Math##c.FidelityScore i.Regioncat EVERFSM_ALL_SPR18   i.Gender
AgeinmonthsatSept16new TransTeachingDP2 T1Y8_TransTeaching T1Y8_FAPractice T1
> Y8_ICCAMSConfidence   if Dropout ==0 || AtrandomisationSchoolID: || Y8T1: , mle var


Mixed-effects ML regression                     Number of obs     =      3,628

------------------------------------------------------------------
                |     No. of       Observations per Group
 Group Variable |     Groups    Minimum    Average    Maximum
----------------+-------------------------------------------------
   Atrandomis~D |         41         22       88.5        253
          Y8T1 |        137          2       26.5        127
------------------------------------------------------------------

                                                Wald chi2(14)     =    2768.99
Log likelihood = -8890.6298                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------------------
   NewMultiplicativeScore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
--------------------------+---------------------------------------------------------------
                  KS2Math |   .4751713   .0095283    49.87   0.000     .4564962    .4938464
            FidelityScore |    .488835   .5081901     0.96   0.336    -.5071992    1.484869
                          |
c.KS2Math#c.FidelityScore |  -.0046803   .0049114    -0.95   0.341    -.0143066     .004946
                          |
                Regioncat |
                Region 2  |  -.3645571    .466086    -0.78   0.434    -1.278069    .5489547
                Region 3  |   -.140328   .4923232    -0.29   0.776    -1.105264    .8246078
                Region 4  |  -.3806613   .4716041    -0.81   0.420    -1.304988    .5436658
                Region 5  |   .0942523   .4424707     0.21   0.831    -.7729742    .9614789
                          |
        EVERFSM_ALL_SPR18 |  -.4003613    .110459    -3.62   0.000    -.6168569   -.1838657
                2.Gender  |  -.2434007   .0929623    -2.62   0.009    -.4256034    -.061198
   AgeinmonthsatSept16new |  -.0149865     .01323    -1.13   0.257    -.0409168    .0109438
         TransTeachingDP2 |   .0176749   .0782412     0.23   0.821    -.1356751    .1710249
      T1Y8_TransTeaching  |  -.2753712   .2834876    -0.97   0.331    -.8309967    .2802542
         T1Y8_FAPractice  |   .0996885   .2330096     0.43   0.669    -.3570019    .5563789
    T1Y8_ICCAMSConfidence |   .0413585   .0643729     0.64   0.521      -.08481    .1675271
                    _cons |  -37.66348   2.059848   -18.28   0.000    -41.70071   -33.62625
------------------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   .1729958   .1718826      .0246781    1.212718
-----------------------------+------------------------------------------------
Y8T1: Identity               |
                  var(_cons) |   1.221465   .2465574      .8223611    1.814259
-----------------------------+------------------------------------------------
               var(Residual) |    7.38099   .1772136      7.041703    7.736624
------------------------------------------------------------------------------
LR test vs. linear model: chi2(2) = 273.88                Prob > chi2 = 0.0000

Note: LR test is conservative and provided only for reference.

. estat icc

Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0197136   .0194612      .0027861    .1264463
Y8T1|AtrandomisationSchoolID |   .1589047   .0221544      .1201213    .2072605
------------------------------------------------------------------------------
```

```
. mixed  MathsDispositionDP2 MathsDispositionDP1 c.KS2Math##c.FidelityScore i.Regioncat EVERFSM_ALL_SPR18
i.Gender AgeinmonthsatSept16new TransTeachingDP2 T1Y8_TransTeaching
> T1Y8_FAPractice T1Y8_ICCAMSConfidence   if Dropout ==0 || AtrandomisationSchoolID: || Y8T1: , mle var


Mixed-effects ML regression                     Number of obs     =      3,275

------------------------------------------------------------------
                |     No. of       Observations per Group
 Group Variable |     Groups    Minimum    Average    Maximum
----------------+-------------------------------------------------
   Atrandomis~D |         41         11       79.9        228
          Y8T1 |        134          1       24.4        121
------------------------------------------------------------------

                                                Wald chi2(15)     =    1385.32
Log likelihood = -4831.7688                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------------------
      MathsDispositionDP2 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
--------------------------+---------------------------------------------------------------
      MathsDispositionDP1 |   .3661212   .0136975    26.73   0.000     .3392746    .3929677
                  KS2Math |   .0167964   .0034617     4.85   0.000     .0100116    .0235813
            FidelityScore |  -.0785664   .1790918    -0.44   0.661    -.4295799     .272447
                          |
c.KS2Math#c.FidelityScore |   .0006176   .0017311     0.36   0.721    -.0027754    .0040106
                          |
                Regioncat |
               Region 2   |  -.0347494   .1173761    -0.30   0.767    -.2648024    .1953036
               Region 3   |  -.0086498   .1288759    -0.07   0.946    -.2612419    .2439424
               Region 4   |  -.0834855    .117871    -0.71   0.479    -.3145084    .1475373
               Region 5   |  -.0530815   .1099834    -0.48   0.629     -.268645     .162482
                          |
        EVERFSM_ALL_SPR18 |  -.1061427   .0447945    -2.37   0.018    -.1939383    -.018347
                2.Gender  |  -.2285809   .0373989    -6.11   0.000    -.3018814   -.1552803
   AgeinmonthsatSept16new |  -.0079208   .0053114    -1.49   0.136    -.0183309    .0024894
        TransTeachingDP2  |  -.5567082   .0312078   -17.84   0.000    -.6178743   -.4955421
      T1Y8_TransTeaching  |   .0771347   .0636104     1.21   0.225    -.0475394    .2018088
         T1Y8_FAPractice  |   .0430222   .0514669     0.84   0.403    -.0578511    .1438955
    T1Y8_ICCAMSConfidence |   .0005499    .014086     0.04   0.969    -.0270582    .0281581
                    _cons |  -.3706256    .796439    -0.47   0.642    -1.931617    1.190366
------------------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   .0194598   .0106307      .0066701    .0567729
-----------------------------+------------------------------------------------
Y8T1: Identity               |
                  var(_cons) |   .0211758   .0105062      .0080079    .0559961
-----------------------------+------------------------------------------------
               var(Residual) |    1.09393   .0276231      1.041108    1.149432
------------------------------------------------------------------------------
LR test vs. linear model: chi2(2) = 33.24                 Prob > chi2 = 0.0000

Note: LR test is conservative and provided only for reference.


Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0171517   .0092745      .0059013    .0487979
Y8T1|AtrandomisationSchoolID |    .035816   .0105472      .0200062    .0633122
------------------------------------------------------------------------------
```

```
. mixed  MathsDispositionDP2 MathsDispositionDP1 c.KS2Math##c.FidelityScore i.Regioncat EVERFSM_ALL_SPR18
i.Gender AgeinmonthsatSept16new TransTeachingDP2 T1Y8_TransTeaching
> T1Y8_FAPractice T1Y8_ICCAMSConfidence   if Dropout ==0 || AtrandomisationSchoolID: || ClassIDY8: , mle var


Mixed-effects ML regression                     Number of obs     =      3,273

------------------------------------------------------------------
                |     No. of       Observations per Group
 Group Variable |     Groups    Minimum    Average    Maximum
----------------+-------------------------------------------------
   Atrandomis~D |         41         11       79.8        228
      ClassIDY8 |        203          1       16.1         32
------------------------------------------------------------------

                                                Wald chi2(15)     =    1388.41
Log likelihood = -4829.0498                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------------------
      MathsDispositionDP2 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
--------------------------+---------------------------------------------------------------
      MathsDispositionDP1 |   .3664656   .0137038    26.74   0.000     .3396067    .3933245
                  KS2Math |   .0166191   .0034905     4.76   0.000     .0097778    .0234604
            FidelityScore |   -.104093   .1799467    -0.58   0.563     -.456782     .248596
                          |
c.KS2Math#c.FidelityScore |   .0008643   .0017408     0.50   0.620    -.0025476    .0042762
                          |
                Regioncat |
                Region 2  |  -.0267865   .1163663    -0.23   0.818    -.2548602    .2012872
                Region 3  |  -.0116033   .1292713    -0.09   0.928    -.2649704    .2417637
                Region 4  |  -.0853731   .1177752    -0.72   0.469    -.3162081     .145462
                Region 5  |  -.0555839   .1094589    -0.51   0.612    -.2701194    .1589517
                          |
        EVERFSM_ALL_SPR18 |   -.107526   .0448316    -2.40   0.016    -.1953943   -.0196578
                2.Gender  |  -.2276213   .0374515    -6.08   0.000    -.3010249   -.1542176
   AgeinmonthsatSept16new |  -.0080629   .0053147    -1.52   0.129    -.0184795    .0023538
         TransTeachingDP2 |  -.5565007    .031216   -17.83   0.000    -.6176829   -.4953186
      T1Y8_TransTeaching  |    .071451   .0598645     1.19   0.233    -.0458813    .1887832
         T1Y8_FAPractice  |   .0370736   .0486891     0.76   0.446    -.0583552    .1325023
    T1Y8_ICCAMSConfidence |  -.0018897   .0130188    -0.15   0.885    -.0274061    .0236268
                    _cons |  -.3267496   .7970213    -0.41   0.682    -1.888883    1.235383
------------------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   .0218085   .0105525       .008448    .0562985
-----------------------------+------------------------------------------------
ClassIDY8: Identity          |
                  var(_cons) |   .0180425   .0098279      .0062036    .0524749
-----------------------------+------------------------------------------------
               var(Residual) |   1.093752   .0278011      1.040598    1.149621
------------------------------------------------------------------------------
LR test vs. linear model: chi2(2) = 31.27                 Prob > chi2 = 0.0000

Note: LR test is conservative and provided only for reference.

. estat icc

Residual intraclass correlation

Level 2: ClassIDY8|AtrandomisationSchoolID

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0192382   .0091897      .0074948    .0484835
                     Level 2 |   .0351543   .0108101      .0191357     .063711
```

```
. mixed NewMultiplicativeScore c.KS2Math##c.FidelityScore i.Regioncat EVERFSM_ALL_SPR18   i.Gender
AgeinmonthsatSept16new TransTeachingDP2 T1Y8_TransTeaching T1Y8_FAPractice T1
> Y8_ICCAMSConfidence   if Dropout ==0 || AtrandomisationSchoolID: || ClassIDY8: , mle var


Computing standard errors:

Mixed-effects ML regression                     Number of obs     =      3,626

------------------------------------------------------------------
                |     No. of       Observations per Group
 Group Variable |     Groups    Minimum    Average    Maximum
----------------+-------------------------------------------------
   Atrandomis~D |         41         22       88.4        253
      ClassIDY8 |        208          1       17.4         32
------------------------------------------------------------------

                                                Wald chi2(14)     =    1830.19
Log likelihood = -8857.7641                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
   NewMultiplicativeScore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
--------------------------+---------------------------------------------------
                  KS2Math |   .4267236   .0105638    40.39   0.000      .406019    .4474282
            FidelityScore |   .4519735   .5546302     0.81   0.415    -.6350818    1.539029
                          |
c.KS2Math#c.FidelityScore |  -.0044584     .00538    -0.83   0.407    -.0150031    .0060862
                          |
                Regioncat |
                Region 2  |  -.1972475   .4801595    -0.41   0.681    -1.138343    .7438477
                Region 3  |   .1094183   .5197665     0.21   0.833    -.9093053    1.128142
                Region 4  |  -.2412458   .4937547    -0.49   0.625    -1.208987    .7264956
                Region 5  |   .2025718    .454823     0.45   0.656    -.6888649    1.094009
                          |
        EVERFSM_ALL_SPR18 |   -.369813   .1091318    -3.39   0.001    -.5837074   -.1559186
                2.Gender  |  -.2928917   .0920902    -3.18   0.001    -.4733851   -.1123982
   AgeinmonthsatSept16new |  -.0138415   .0130434    -1.06   0.289     -.039406     .011723
         TransTeachingDP2 |  -.0211195   .0778792    -0.27   0.786    -.1737599     .131521
      T1Y8_TransTeaching  |  -.3291461   .2618756    -1.26   0.209    -.8424129    .1841207
        T1Y8_FAPractice   |  -.0178364   .2170255    -0.08   0.934    -.4431986    .4075257
    T1Y8_ICCAMSConfidence |   .0480743   .0540629     0.89   0.374    -.0578871    .1540357
                  _cons   |   -32.9683   2.077491   -15.87   0.000    -37.04011   -28.89649
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   .2178497   .1749407      .0451454    1.051237
-----------------------------+------------------------------------------------
ClassIDY8: Identity          |
                  var(_cons) |   1.684341   .2863644      1.207014    2.350432
-----------------------------+------------------------------------------------
               var(Residual) |   7.090382   .1725063       6.76021    7.436679
------------------------------------------------------------------------------
LR test vs. linear model: chi2(2) = 329.02                Prob > chi2 = 0.0000

Note: LR test is conservative and provided only for reference.

. estat icc

Residual intraclass correlation

Level 2: ClassIDY8|AtrandomisationSchoolID

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0242255    .019251      .0050065    .1091306
                     Level 2 |   .2115291    .025495       .165849    .2657822
```

```
. mixed NewAlgebraScore c.KS2Math##c.FidelityScore i.Regioncat EVERFSM_ALL_SPR18   i.Gender
AgeinmonthsatSept16new TransTeachingDP2 T1Y8_TransTeaching T1Y8_FAPractice T1Y8_ICCA
> MSConfidence   if Dropout ==0 || AtrandomisationSchoolID: || ClassIDY8: , mle var


Computing standard errors:

Mixed-effects ML regression                     Number of obs     =      3,626

------------------------------------------------------------
                |     No. of       Observations per Group
 Group Variable |     Groups    Minimum    Average    Maximum
----------------+-------------------------------------------
   Atrandomis~D |         41         22       88.4        253
      ClassIDY8 |        208          1       17.4         32
------------------------------------------------------------

                                                Wald chi2(14)     =    1041.13
Log likelihood =   -7580.73                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
          NewAlgebraScore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
--------------------------+---------------------------------------------------
                  KS2Math |   .2226909   .0074345    29.95   0.000     .2081195    .2372622
            FidelityScore |   .1350436   .3904066     0.35   0.729    -.6301392    .9002264
                          |
c.KS2Math#c.FidelityScore |  -.0018171   .0037858    -0.48   0.631     -.009237    .0056029
                          |
                Regioncat |
                Region 2  |  -.4703315   .3439048    -1.37   0.171    -1.144373    .2037096
                Region 3  |  -.1319466   .3729561    -0.35   0.723     -.862927    .5990339
                Region 4  |  -.2436629   .3537744    -0.69   0.491    -.9370481    .4497222
                Region 5  |  -.0327509   .3261089    -0.10   0.920    -.6719126    .6064107
                          |
        EVERFSM_ALL_SPR18 |  -.3316355    .076732    -4.32   0.000    -.4820274   -.1812436
                2.Gender  |   .4474136   .0647388     6.91   0.000     .3205278    .5742993
   AgeinmonthsatSept16new |  -.0184571   .0091691    -2.01   0.044    -.0364282   -.0004861
         TransTeachingDP2 |  -.1130137   .0547564    -2.06   0.039    -.2203343    -.005693
      T1Y8_TransTeaching  |  -.3471999     .18505    -1.88   0.061    -.7098912    .0154915
          T1Y8_FAPractice |  -.1648639   .1533387    -1.08   0.282    -.4654022    .1356744
    T1Y8_ICCAMSConfidence |   .0669622   .0381845     1.75   0.079    -.0078781    .1418025
                    _cons |   -15.1245   1.461789   -10.35   0.000    -17.98955   -12.25944
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   .1197891   .0892851      .0277954    .5162524
-----------------------------+------------------------------------------------
ClassIDY8: Identity          |
                  var(_cons) |   .8378149    .144418      .5976164    1.174556
-----------------------------+------------------------------------------------
               var(Residual) |   3.503399   .0853623      3.340024    3.674765
------------------------------------------------------------------------------
LR test vs. linear model: chi2(2) = 296.55                Prob > chi2 = 0.0000

Note: LR test is conservative and provided only for reference.

. estat icc

Residual intraclass correlation

Level 2: ClassIDY8|AtrandomisationSchoolID

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0268525   .0197617      .0062284    .1083247
                     Level 2 |   .2146612   .0262772      .1676243     .270606
------------------------------------------------------------------------------
```

Appendix 20: Models for Subgroup Analysis

Appendix 20A: Models for subgroup analysis outputs for primary and secondary outcomes

mixed Newtotalscore AtrandomisationCondition KS2Math i.Regioncat if EVERFSM_ALL_SPR18 == 1 || AtrandomisationSchoolID:, mle variance

```
Performing EM optimization:

Performing gradient-based optimization:

Iteration 0:   log likelihood = -15730.153
Iteration 1:   log likelihood = -15730.153

Computing standard errors:

Mixed-effects ML regression                     Number of obs     =      4,783
Group variable: Atrandomisat~D                  Number of groups  =        105

                                                Obs per group:
                                                              min =          1
                                                              avg =       45.6
                                                              max =        144

                                                Wald chi2(6)      =    5908.99
Log likelihood = -15730.153                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
           Newtotalscore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
AtrandomisationCondition |    .412066   .3324623     1.24   0.215    -.2395482     1.06368
                 KS2Math |   1.063759   .0138621    76.74   0.000      1.03659    1.090928
                         |
               Regioncat |
               Region 2  |  -1.399941   .5205499    -2.69   0.007      -2.4202   -.3796823
               Region 3  |  -1.513749   .5554818    -2.73   0.006    -2.602474   -.4250252
               Region 4  |  -.8167167   .5679539    -1.44   0.150    -1.929886    .2964525
               Region 5  |  -.6034853    .544944    -1.11   0.268    -1.671556    .4645854
                         |
                   _cons |  -89.32022    1.44324   -61.89   0.000    -92.14892   -86.49152
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   1.740534   .3891445      1.122982     2.69769
-----------------------------+------------------------------------------------
               var(Residual) |   41.16895   .8507832      39.53477    42.87069
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 88.03         Prob >= chibar2 = 0.0000

.
.   estat icc

Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0405629   .0087809      .0264494    .0617298
```

mixed NewAlgebraScore AtrandomisationCondition KS2Math i.Regioncat if EVERFSM_ALL_SPR18 == 1 || AtrandomisationSchoolID:, mle variance

```
Performing EM optimization:

Performing gradient-based optimization:

Iteration 0:   log likelihood =  -10453.71
Iteration 1:   log likelihood =  -10453.71

Computing standard errors:

Mixed-effects ML regression                     Number of obs     =      4,783
Group variable: Atrandomisat~D                  Number of groups  =        105

                                                Obs per group:
                                                              min =          1
                                                              avg =       45.6
                                                              max =        144

                                                Wald chi2(6)      =    3403.66
Log likelihood =  -10453.71                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
         NewAlgebraScore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
AtrandomisationCondition |   .1598781   .1158092     1.38   0.167    -.0671037    .3868598
                 KS2Math |   .2679002   .0045996    58.24   0.000     .2588852    .2769152
                         |
               Regioncat |
                Region 2 |  -.3623016   .1811752    -2.00   0.046    -.7173985   -.0072048
                Region 3 |  -.3746898   .1935277    -1.94   0.053    -.7539971    .0046174
                Region 4 |  -.0483847   .1975391    -0.24   0.807    -.4355543    .3387849
                Region 5 |  -.1250059   .1892777    -0.66   0.509    -.4959833    .2459715
                         |
                   _cons |  -22.67184   .4810122   -47.13   0.000     -23.6146   -21.72907
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   .2223066   .0479876      .1456163    .3393864
-----------------------------+------------------------------------------------
               var(Residual) |   4.523598   .0935151      4.343976    4.710649
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 101.68        Prob >= chibar2 = 0.0000

.
.   estat icc

Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0468418   .0097299      .0310644    .0700529
------------------------------------------------------------------------------
```

. mixed NewMultiplicativeScore AtrandomisationCondition KS2Math i.Regioncat if EVERFSM_ALL_SPR18 == 1 || AtrandomisationSchoolID:, mle variance

```
Performing EM optimization:

Performing gradient-based optimization:

Iteration 0:   log likelihood = -12168.194
Iteration 1:   log likelihood = -12168.194

Computing standard errors:

Mixed-effects ML regression                     Number of obs     =      4,783
Group variable: Atrandomisat~D                  Number of groups  =        105

                                                Obs per group:
                                                              min =          1
                                                              avg =       45.6
                                                              max =        144

                                                Wald chi2(6)      =    5562.04
Log likelihood = -12168.194                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
  NewMultiplicativeScore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
AtrandomisationCondition |   .2237621   .1372194     1.63   0.103     -.045183    .4927072
                 KS2Math |   .4886678   .0065796    74.27   0.000     .4757719    .5015637
                         |
               Regioncat |
               Region 2  |  -.4511982   .2155418    -2.09   0.036    -.8736524   -.0287439
               Region 3  |  -.3441017   .2292157    -1.50   0.133    -.7933562    .1051528
               Region 4  |  -.4159439   .2356412    -1.77   0.078    -.8777922    .0459045
               Region 5  |  -.1870171   .2271133    -0.82   0.410    -.6321511    .2581168
                         |
                   _cons |  -41.54546   .6777323   -61.30   0.000    -42.87379   -40.21712
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   .2440371   .0632307      .1468612    .4055128
-----------------------------+------------------------------------------------
               var(Residual) |   9.337824   .1927913      8.967503    9.723437
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 47.62         Prob >= chibar2 = 0.0000

. estat icc

Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0254687   .0064816      .0154232    .0417794
```

. mixed MathsDispositionDP2 MathsDispositionDP1 AtrandomisationCondition KS2Math i.Regioncat if EVERFSM_ALL_SPR18 == 1 || AtrandomisationSchoolID:, mle variance

```
Performing EM optimization:

Performing gradient-based optimization:

Iteration 0:   log likelihood = -5769.8151
Iteration 1:   log likelihood = -5769.8151

Computing standard errors:

Mixed-effects ML regression                     Number of obs     =      3,608
Group variable: Atrandomisat~D                  Number of groups  =        103

                                                Obs per group:
                                                              min =          1
                                                              avg =       35.0
                                                              max =        111

                                                Wald chi2(7)      =     834.71
Log likelihood = -5769.8151                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
     MathsDispositionDP2 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
     MathsDispositionDP1 |   .3555446   .0135786    26.18   0.000     .3289309    .3821582
AtrandomisationCondition |   .0911728    .062245     1.46   0.143     -.030825    .2131707
                 KS2Math |   .0147331   .0030646     4.81   0.000     .0087266    .0207395
                         |
               Regioncat |
               Region 2  |   .0432391   .0982382     0.44   0.660    -.1493043    .2357825
               Region 3  |   .1401491   .1055249     1.33   0.184    -.0666759     .346974
               Region 4  |  -.1152594   .1066336    -1.08   0.280    -.3242574    .0937386
               Region 5  |  -.1019583   .1017589    -1.00   0.316     -.301402    .0974854
                         |
                   _cons |  -1.611968   .3140421    -5.13   0.000    -2.227479   -.9964567
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   .0502037   .0127812      .0304811    .0826876
-----------------------------+------------------------------------------------
               var(Residual) |   1.403191   .0334484      1.339141    1.470304
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 52.20         Prob >= chibar2 = 0.0000

. estat icc

Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.     [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0345424   .0085782      .0211536    .0559212
------------------------------------------------------------------------------
```

Appendix 20B: Models with interaction of condition with FSM

. mixed Newtotalscore KS2Math i.Regioncat AtrandomisationCondition##i.EVERFSM_ALL_SPR18 || AtrandomisationSchoolID:, mle variance

```
Computing standard errors:

Mixed-effects ML regression                     Number of obs     =     17,163
Group variable: Atrandomisat~D                  Number of groups  =        105

                                                Obs per group:
                                                              min =          2
                                                              avg =      163.5
                                                              max =        350

                                                Wald chi2(8)      =   30494.12
Log likelihood = -55313.695                     Prob > chi2       =     0.0000
```

Newtotalscore	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
KS2Math	1.199848	.007089	169.25	0.000	1.185954	1.213742
Regioncat						
Region 2	-1.514292	.5444227	-2.78	0.005	-2.581341	-.4472429
Region 3	-1.704964	.5887496	-2.90	0.004	-2.858892	-.551036
Region 4	-.7205751	.5873141	-1.23	0.220	-1.87169	.4305394
Region 5	-.5725756	.5526382	-1.04	0.300	-1.655727	.5105754
1.AtrandomisationCondition	.213169	.355401	0.60	0.549	-.4834042	.9097422
1.EVERFSM_ALL_SPR18	-1.449361	.1569075	-9.24	0.000	-1.756894	-1.141828
AtrandomisationCondition#EVERFSM_ALL_SPR18						
1 1	.0651921	.2163111	0.30	0.763	-.3587699	.489154
_cons	-101.2533	.855492	-118.36	0.000	-102.9301	-99.5766

Random-effects Parameters	Estimate	Std. Err.	[95% Conf.	Interval]
Atrandomis~D: Identity				
var(_cons)	2.880254	.4408593	2.133751	3.887926
var(Residual)	36.31803	.3932485	35.55539	37.09702

```
LR test vs. linear model: chibar2(01) = 890.82        Prob >= chibar2 = 0.0000

. estat icc

Residual intraclass correlation
```

Level	ICC	Std. Err.	[95% Conf.	Interval]
AtrandomisationSchoolID	.0734791	.0104521	.055444	.0967797

mixed NewAlgebraScore KS2Math i.Regioncat i.EVERFSM_ALL_SPR18##AtrandomisationCondition || AtrandomisationSchoolID:, mle variance

```
Performing EM optimization:

Performing gradient-based optimization:

Iteration 0:   log likelihood =  -36660.58
Iteration 1:   log likelihood =  -36660.58

Computing standard errors:

Mixed-effects ML regression                     Number of obs     =     17,163
Group variable: Atrandomisat~D                  Number of groups  =        105

                                                Obs per group:
                                                              min =          2
                                                              avg =      163.5
                                                              max =        350

                                                Wald chi2(8)      =   16922.85
Log likelihood =  -36660.58                     Prob > chi2       =     0.0000
```

NewAlgebraScore	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
KS2Math	.3001008	.0023914	125.49	0.000	.2954137	.3047878
Regioncat						
Region 2	-.4626816	.1713481	-2.70	0.007	-.7985178	-.1268454
Region 3	-.5322548	.1853423	-2.87	0.004	-.8955191	-.1689905
Region 4	-.1738615	.1850179	-0.94	0.347	-.5364899	.1887669
Region 5	-.1952526	.173946	-1.12	0.262	-.5361805	.1456752
1.EVERFSM_ALL_SPR18	-.4484209	.0529041	-8.48	0.000	-.5521111	-.3447307
1.AtrandomisationCondition	.1139032	.1121259	1.02	0.310	-.1058595	.3336658
EVERFSM_ALL_SPR18#AtrandomisationCondition						
1 1	.0173474	.0729389	0.24	0.812	-.1256101	.160305
_cons	-25.30282	.2833633	-89.29	0.000	-25.8582	-24.74744

Random-effects Parameters	Estimate	Std. Err.	[95% Conf.	Interval]
Atrandomis~D: Identity				
var(_cons)	.2815653	.0436144	.2078396	.3814433
var(Residual)	4.135074	.0447738	4.048243	4.223767

```
LR test vs. linear model: chibar2(01) = 771.78        Prob >= chibar2 = 0.0000

. estat icc

Residual intraclass correlation
```

Level	ICC	Std. Err.	[95% Conf.	Interval]
AtrandomisationSchoolID	.063751	.0092734	.0478155	.084526

```
. mixed NewMultiplicativeScore  KS2Math i.Regioncat
i.EVERFSM_ALL_SPR18##AtrandomisationCondition || AtrandomisationSchoolID:, mle variance

Performing EM optimization:

Performing gradient-based optimization:

Iteration 0:   log likelihood = -42719.177
Iteration 1:   log likelihood = -42719.177

Computing standard errors:

Mixed-effects ML regression                     Number of obs     =     17,163
Group variable: Atrandomisat~D                  Number of groups  =        105

                                                Obs per group:
                                                              min =          2
                                                              avg =      163.5
                                                              max =        350

                                                Wald chi2(8)      =   26632.24
Log likelihood = -42719.177                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
                     NewMultiplicativeScore |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
--------------------------------------------+---------------------------------
                                   KS2Math |   .5398177   .0034044   158.57   0.000     .5331453    .5464901
                                           |
                                Regioncat |
                                  Region 2 |  -.4833595    .216211    -2.24   0.025    -.9071252   -.0595938
                                  Region 3 |  -.4001398   .2339933    -1.71   0.087    -.8587583    .0584786
                                  Region 4 |  -.2866793   .2338383    -1.23   0.220     -.744994    .1716354
                                  Region 5 |  -.1216516   .2194987    -0.55   0.579    -.5518612     .308558
                                           |
                       1.EVERFSM_ALL_SPR18 |  -.5925813   .0752336    -7.88   0.000    -.7400365   -.4451261
                  1.AtrandomisationCondition |   .0669209    .142195     0.47   0.638    -.2117762     .345618
                                           |
EVERFSM_ALL_SPR18#AtrandomisationCondition |
                                       1 1 |   .0954296   .1037415     0.92   0.358       -.1079    .2987591
                                           |
                                     _cons |  -46.00351   .3924232  -117.23   0.000    -46.77265   -45.23438
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                   var(_cons) |   .4360118   .0697296      .3186904    .5965235
-----------------------------+------------------------------------------------
                var(Residual) |   8.389317     .09084       8.21315    8.569263
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 559.66        Prob >= chibar2 = 0.0000

. estat icc

Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0494046   .0075334      .0365641    .0664434
------------------------------------------------------------------------------
```

. mixed OverallTestMeasure KS2Math i.Regioncat i.EVERFSM_ALL_SPR18##AtrandomisationCondition || AtrandomisationSchoolID:, mle variance

```
Performing EM optimization:

Performing gradient-based optimization:

Iteration 0:   log likelihood = -20540.307
Iteration 1:   log likelihood = -20540.307

Computing standard errors:

Mixed-effects ML regression                     Number of obs     =     17,146
Group variable: Atrandomisat~D                  Number of groups  =        105

                                                Obs per group:
                                                              min =          2
                                                              avg =      163.3
                                                              max =        350

                                                Wald chi2(8)      =   31301.30
Log likelihood = -20540.307                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
                     OverallTestMeasure |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
----------------------------------------+-------------------------------------
                              KS2Math |   .1611947   .0009367   172.08   0.000     .1593587    .1630307
                                      |
                            Regioncat |
                            Region 2  |  -.2003068   .0691022    -2.90   0.004    -.3357447   -.0648689
                            Region 3  |  -.1379162   .0747329    -1.85   0.065    -.2843899    .0085575
                            Region 4  |  -.1246546   .0745807    -1.67   0.095    -.2708301     .021521
                            Region 5  |  -.0654928   .0701439    -0.93   0.350    -.2029724    .0719868
                                      |
                  1.EVERFSM_ALL_SPR18 |  -.1621865   .0207355    -7.82   0.000    -.2028273   -.1215458
             1.AtrandomisationCondition |  -.0003164   .0451686    -0.01   0.994    -.0888452    .0882125
                                      |
EVERFSM_ALL_SPR18#AtrandomisationCondition |
                                1 1   |   .0185822   .0285746     0.65   0.515     -.037423    .0745874
                                      |
                                _cons |  -16.47395   .1118212  -147.32   0.000    -16.69312   -16.25479
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   .0460585    .007139      .0339918    .0624087
-----------------------------+------------------------------------------------
               var(Residual) |   .6331922   .0068598       .619889    .6467809
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 807.79        Prob >= chibar2 = 0.0000

.
.
. estat icc

Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |   .0678078   .0098274      .0509033     .089795
------------------------------------------------------------------------------
```

. mixed Algebra KS2Math i.Regioncat i.EVERFSM_ALL_SPR18##AtrandomisationCondition || AtrandomisationSchoolID:, mle variance

```
Performing EM optimization:

Performing gradient-based optimization:

Iteration 0:   log likelihood = -29449.136
Iteration 1:   log likelihood = -29449.136

Computing standard errors:

Mixed-effects ML regression                     Number of obs     =     16,982
Group variable: Atrandomisat~D                  Number of groups  =        105

                                                Obs per group:
                                                              min =          2
                                                              avg =      161.7
                                                              max =        342

                                                Wald chi2(8)      =   13307.60
Log likelihood = -29449.136                     Prob > chi2       =     0.0000
```

Algebra	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
KS2Math	.1806402	.0016176	111.67	0.000	.1774698	.1838106
Regioncat						
Region 2	-.3069816	.0999517	-3.07	0.002	-.5028833	-.11108
Region 3	-.2271154	.1082115	-2.10	0.036	-.4392061	-.0150248
Region 4	-.1704653	.1081015	-1.58	0.115	-.3823404	.0414097
Region 5	-.108329	.1014547	-1.07	0.286	-.3071765	.0905185
1.EVERFSM_ALL_SPR18	-.2422915	.0357089	-6.79	0.000	-.3122796	-.1723034
1.AtrandomisationCondition	.0118578	.0657893	0.18	0.857	-.117087	.1408025
EVERFSM_ALL_SPR18#AtrandomisationCondition						
1 1	.0365786	.0491568	0.74	0.457	-.0597669	.1329242
_cons	-18.26414	.1855383	-98.44	0.000	-18.62778	-17.90049

Random-effects Parameters	Estimate	Std. Err.	[95% Conf.	Interval]
Atrandomis~D: Identity				
var(_cons)	.0926253	.0149139	.0675576	.1269944
var(Residual)	1.853931	.0201819	1.814794	1.893912

```
LR test vs. linear model: chibar2(01) = 531.32        Prob >= chibar2 = 0.0000

. estat icc

Residual intraclass correlation
```

Level	ICC	Std. Err.	[95% Conf.	Interval]
AtrandomisationSchoolID	.0475842	.0073193	.0351264	.0641663

. mixed MathsDispositionDP2 KS2Math MathsDispositionDP1 i.Regioncat i.EVERFSM_ALL_SPR18##AtrandomisationCondition || AtrandomisationSchoolID:, mle variance

```
Performing EM optimization:

Performing gradient-based optimization:

Iteration 0:   log likelihood = -21983.776
Iteration 1:   log likelihood = -21983.776

Computing standard errors:

Mixed-effects ML regression                     Number of obs     =     14,299
Group variable: Atrandomisat~D                  Number of groups  =        103

                                                Obs per group:
                                                              min =          2
                                                              avg =      138.8
                                                              max =        304

                                                Wald chi2(9)      =    4191.49
Log likelihood = -21983.776                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
                MathsDispositionDP2 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
------------------------------------+-----------------------------------------
                            KS2Math |   .0186354   .0015172    12.28   0.000     .0156619     .021609
                MathsDispositionDP1 |    .397221   .0069387    57.25   0.000     .3836213    .4108207
                                    |
                          Regioncat |
                           Region 2 |   .0729119    .067764     1.08   0.282     -.059903    .2057269
                           Region 3 |   .1076651    .074357     1.45   0.148    -.0380719    .2534021
                           Region 4 |  -.0102884   .0730728    -0.14   0.888    -.1535084    .1329316
                           Region 5 |   -.023018   .0680464    -0.34   0.735    -.1563865    .1103505
                                    |
            1.EVERFSM_ALL_SPR18 |  -.0770102   .0331055    -2.33   0.020    -.1418959   -.0121245
1.AtrandomisationCondition |   .0418167   .0452226     0.92   0.355    -.0468179    .1304513
                                    |
EVERFSM_ALL_SPR18#AtrandomisationCondition |
                                 1 1  |   .0237268   .0450465     0.53   0.598    -.0645627    .1120163
                                    |
                              _cons |  -1.969011   .1644436   -11.97   0.000    -2.291315   -1.646707
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   .0374745   .0068523      .0261874    .0536267
-----------------------------+------------------------------------------------
               var(Residual) |   1.253238    .014876      1.224418    1.282736
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 229.83        Prob >= chibar2 = 0.0000

. estat icc

Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |    .029034   .0051726      .0204433    .0410833
------------------------------------------------------------------------------
```

. mixed MathsDispositionDP2 KS2Math MathsDispositionDP1 i.Regioncat i.EVERFSM_ALL_SPR18##AtrandomisationCondition || AtrandomisationSchoolID:, mle variance

```
Performing EM optimization:

Performing gradient-based optimization:

Iteration 0:   log likelihood = -21983.776
Iteration 1:   log likelihood = -21983.776

Computing standard errors:

Mixed-effects ML regression                     Number of obs     =     14,299
Group variable: Atrandomisat~D                  Number of groups  =        103

                                                Obs per group:
                                                              min =          2
                                                              avg =      138.8
                                                              max =        304

                                                Wald chi2(9)      =    4191.49
Log likelihood = -21983.776                     Prob > chi2       =     0.0000

------------------------------------------------------------------------------
                MathsDispositionDP2 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
------------------------------------+-----------------------------------------
                            KS2Math |   .0186354   .0015172    12.28   0.000     .0156619     .021609
                MathsDispositionDP1 |    .397221   .0069387    57.25   0.000     .3836213    .4108207
                                    |
                          Regioncat |
                            Region 2  |   .0729119    .067764     1.08   0.282     -.059903    .2057269
                            Region 3  |   .1076651    .074357     1.45   0.148    -.0380719    .2534021
                            Region 4  |  -.0102884   .0730728    -0.14   0.888    -.1535084    .1329316
                            Region 5  |   -.023018   .0680464    -0.34   0.735    -.1563865    .1103505
                                    |
                1.EVERFSM_ALL_SPR18 |  -.0770102   .0331055    -2.33   0.020    -.1418959   -.0121245
          1.AtrandomisationCondition |   .0418167   .0452226     0.92   0.355    -.0468179    .1304513
                                    |
EVERFSM_ALL_SPR18#AtrandomisationCondition |
                                1 1 |   .0237268   .0450465     0.53   0.598    -.0645627    .1120163
                                    |
                              _cons |  -1.969011   .1644436   -11.97   0.000    -2.291315   -1.646707
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
Atrandomis~D: Identity       |
                  var(_cons) |   .0374745   .0068523      .0261874    .0536267
-----------------------------+------------------------------------------------
               var(Residual) |   1.253238    .014876      1.224418    1.282736
------------------------------------------------------------------------------
LR test vs. linear model: chibar2(01) = 229.83        Prob >= chibar2 = 0.0000

. estat icc

Residual intraclass correlation

------------------------------------------------------------------------------
                       Level |        ICC   Std. Err.      [95% Conf. Interval]
-----------------------------+------------------------------------------------
     AtrandomisationSchoolID |    .029034   .0051726      .0204433    .0410833
------------------------------------------------------------------------------
```

Appendix 21: Regression models with teacher and school level data

Modelling average maths dispositions based on teacher survey data

```
. reg AverageofMathsDispositionDP2 AverageofMathsDispositionDP1 i.teachertype condition teach_years FAPractYear8 Tra
> nsYear8
```

Source	SS	df	MS	Number of obs	=	626
				F(6, 619)	=	63.14
Model	50.3412702	6	8.39021169	Prob > F	=	0.0000
Residual	82.2543194	619	.132882584	R-squared	=	0.3797
				Adj R-squared	=	0.3736
Total	132.59559	625	.212152943	Root MSE	=	.36453

AverageofMathsDispositionDP2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
AverageofMathsDispositionDP1	.4904596	.0255293	19.21	0.000	.4403251	.5405941
teachertype						
LT	.010036	.0322608	0.31	0.756	-.0533179	.0733898
condition	.0569446	.0293831	1.94	0.053	-.0007581	.1146474
teach_years	.0011363	.0018697	0.61	0.544	-.0025355	.0048081
FAPractYear8	.0053325	.0294903	0.18	0.857	-.0525808	.0632457
TransYear8	-.00326	.0357434	-0.09	0.927	-.0734531	.066933
_cons	-.1140694	.032751	-3.48	0.001	-.178386	-.0497529

```
. reg AverageofMathsDispositionDP2 AverageofMathsDispositionDP1 i.teachertype
```

Source	SS	df	MS	Number of obs	=	754
				F(2, 751)	=	226.25
Model	57.1038066	2	28.5519033	Prob > F	=	0.0000
Residual	94.7726444	751	.126195266	R-squared	=	0.3760
				Adj R-squared	=	0.3743
Total	151.876451	753	.201695154	Root MSE	=	.35524

AverageofMathsDispositionDP2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
AverageofMathsDispositionDP1	.4849176	.0228483	21.22	0.000	.4400635	.5297717
teachertype						
LT	.0447752	.028311	1.58	0.114	-.0108029	.1003533
_cons	-.0777984	.0188333	-4.13	0.000	-.1147706	-.0408263

Modelling fidelity at school level

```
reg FidelityScore i.region

      Source |       SS           df       MS      Number of obs   =        53
-------------+----------------------------------   F(4, 48)        =      3.12
       Model |  50.3243497         4  12.5810874   Prob > F        =    0.0232
    Residual |  193.562952        48   4.0325615   R-squared       =    0.2063
-------------+----------------------------------   Adj R-squared   =    0.1402
       Total |  243.887302        52  4.69014042   Root MSE        =    2.0081

------------------------------------------------------------------------------
 FidelityScore |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
---------------+--------------------------------------------------------------
        region |
     Region 2  |   2.641833   .8598273     3.07   0.003     .9130347    4.370632
     Region 3  |   .9871111   .9226692     1.07   0.290    -.8680397    2.842262
     Region 4  |       2.49   .8980603     2.77   0.008     .6843287    4.295671
     Region 5  |   1.390167   .8598273     1.62   0.112    -.3386319    3.118965
               |
         _cons |     -1.436   .6350245    -2.26   0.028    -2.712802   -.1591976
------------------------------------------------------------------------------

. reg FidelityScore i.region AverageofTransYear7 AverageofFAPract_Year7
AverageofICCAMSConfidence

      Source |       SS           df       MS      Number of obs   =        44
-------------+----------------------------------   F(7, 36)        =      2.37
       Model |  57.3716367         7   8.1959481   Prob > F        =    0.0422
    Residual |  124.410763        36  3.45585454   R-squared       =    0.3156
-------------+----------------------------------   Adj R-squared   =    0.1825
       Total |    181.7824        43  4.22749767   Root MSE        =     1.859

------------------------------------------------------------------------------------------
            FidelityScore |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------------------+---------------------------------------------------------------
                   region |
                 Region 2 |   2.131856    .927931     2.30   0.028     .2499249    4.013787
                 Region 3 |   .5245079   1.035684     0.51   0.616    -1.575957    2.624973
                 Region 4 |   1.824697   .9555352     1.91   0.064    -.1132186    3.762612
                 Region 5 |    .818137   .9010008     0.91   0.370    -1.009177    2.6454
                          |
     AverageofTransYear7 |   .7738637   1.863844     0.42   0.680    -3.006188    4.553916
   AverageofFAPract_Year7 |   1.397442   1.344372     1.04   0.306     -1.32907    4.123954
AverageofICCAMSConfidence |   .2981008    .296039     1.01   0.321    -.3022941    .8984957
                    _cons |  -1.522735   .8454949    -1.80   0.080    -3.237478     .192008
------------------------------------------------------------------------------------------
```

Appendix 22: Teacher Survey Sample and Measures Description by Region

Table 22A: Available teacher survey responses, by region [all sample]

	DP1				DP2				
Regions	Not Assigned	CT	LT	DP1 Total	Not Assigned	CT	LT	DP2 Total	Total
		2	2	4					4
Region 1		62	24	86	7	40	18	65	151
Region 2	2	108	37	147	16	71	26	113	260
Region 3	4	85	18	107	1	50	13	64	171
Region 4	3	78	31	112	2	54	24	80	192
Region 5	1	103	36	140	2	75	25	102	242
Total	**10**	**438**	**148**	**596**	**28**	**290**	**106**	**424**	**1020**

Table 22B: Available teacher survey responses, by region [Intervention Schools]

	DP1			DP1	DP2		DP2	
Row Labels	Not Assigned	CT	LT	Total	CT	LT	Total	Total
			1	1				1
Region 1		28	13	41	18	11	29	70
Region 2		46	21	67	29	17	46	113
Region 3		30	11	41	24	6	30	71
Region 4		45	19	64	30	15	45	109
Region 5	1	62	19	82	37	17	54	136
Total	**1**	**211**	**84**	**296**	**138**	**66**	**204**	**500**

Table 22C: Available teacher survey responses, by region [Control Schools]

	DP1			DP1	DP2			DP2	Total
Row Labels	Not assigned	CT	LT	Total	Not assigned	CT	LT	Total	
		2	1	3					3
Region 1		34	11	45	7	22	7	36	81
Region 2	2	62	16	80	16	42	9	67	147
Region 3	4	55	7	66	1	26	7	34	100
Region 4	3	33	12	48	2	24	9	35	83
Region 5		41	17	58	2	38	8	48	106
Total	**9**	**227**	**64**	**300**	**28**	**152**	**40**	**220**	**520**

Table 22D: Total reported cases of teachers on available school lists

	DP1 CT		DP1 LT		DP 2 CT		DP2 LT		DP 2 NA		Total DP1		Total DP2		
Region	C	I	C	I	C	I	C	I	C	I	CT	LT	CT	LT	NA
Region 1	56	36	17	22	55	26	11	12		9	92	39	81	23	9
Region 2	63	63	21	24	62	58	12	20	7		126	45	120	32	7
Region 3	52	34	12	12	45	40	11	10	0		86	24	85	21	0
Region 4	32	44	13	18	37	47	10	15		2	76	31	84	25	2
Region 5	44	75	21	24	41	82	12	16	4		119	45	123	28	4
Total	247	252	84	100	240	253	56	73	11	11	499	184	493	129	22

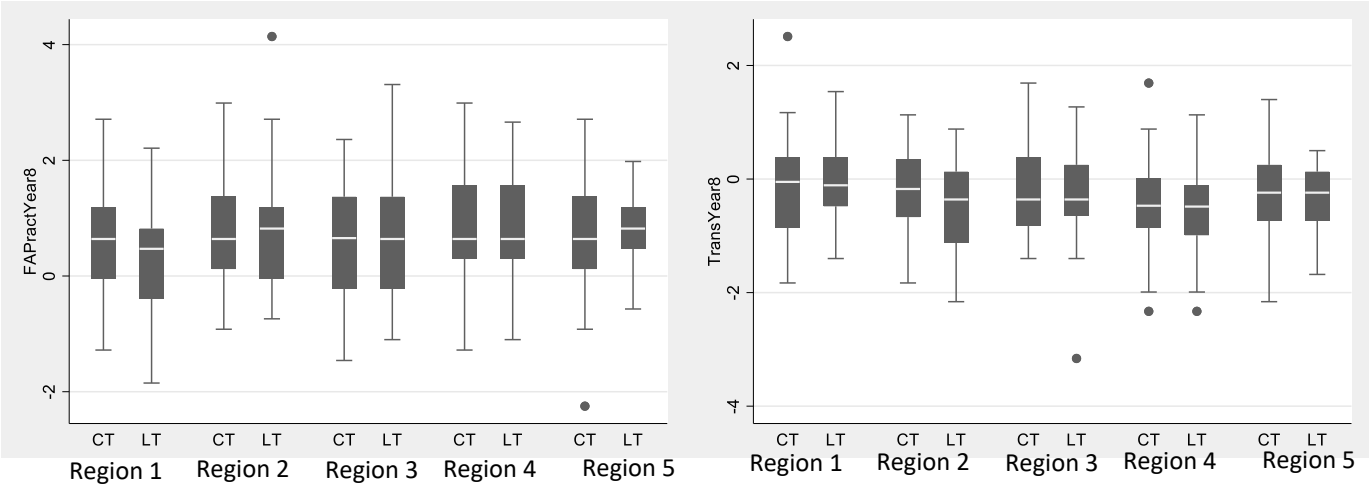


Figure 22A: Boxplots of teachers' perception of teaching with FA (left) and transmissionism teaching (right) at Year 8, by teacher type and region

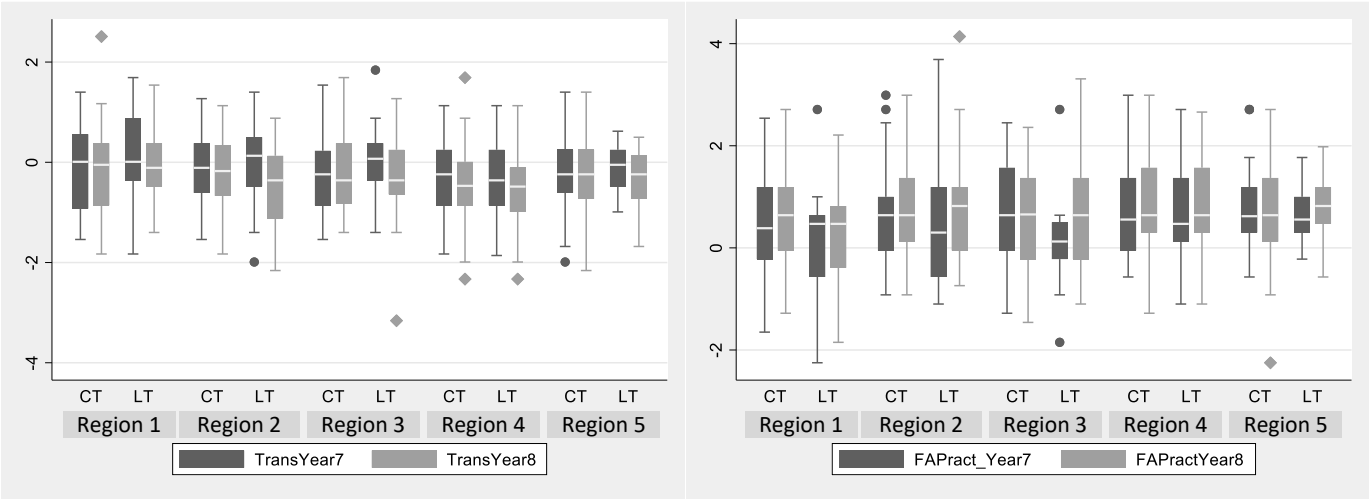


Figure 22B: Comparative boxplots of teachers' perceptions of teaching with FA (right) and transmissionism teaching (left) at Year 7 and 8, by teacher type and region

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