

## **APPENDIX C**

### **MCAS 2004-2005 EQUATING REPORT**



**MASSACHUSETTS COMPREHENSIVE ASSESSMENT SYSTEM  
2004-2005 EQUATING RESULTS**

The purpose of this document is to summarize the equating results obtained from Measured Progress for MCAS. Typically, Measured Progress has a set of procedures used for purposes of equating. However, as this is a previously existing assessment program, and because of UMass involvement in the analysis, Measured Progress developed a set of Negotiated Procedures that have been specifically designed around the MCAS program. Using these Negotiated Procedures, Measured Progress will present the details of the results in this report. For sake of completeness, three sets of results are presented at the impact level (i.e., aggregate level): (1) results based on typical MP procedures, (2) results based on UMass parameters, and (3) results based on the Negotiated Procedures.

The Negotiated Procedures are ultimately a blend of usual Measured Progress procedures and UMass procedures. Because psychometrics is a delicate balance of art and science, Measured Progress believes that the Negotiated Procedures represent the best combined efforts of Measured Progress and UMass. Moreover, these have produced results that 1) optimize stability in item parameters (i.e., convergence was met within a reasonable number of iterations), 2) optimize item/person fit conditional on examinee ability, and 3) are consistent with procedures that have been previously used.

Although UMass did not conduct their analysis for Science and Technology/Engineering, we used the Negotiated Procedures for that content area in grades 5 and 8 as well. This serves to unify the assessment program.

The results of this report are organized as follows:

- I. Aggregate Results .....Appendix C page 2
  - a. Table C1: MCAS Percentage of Students by Performance Level Categories
  - b. Table C2: MCAS Raw Scores Associated with Cut Points
  - c. MCAS Calibration Overview
  - d. MCAS Psychometric Quality Control Activities
- II. Results for English Language Arts and Mathematics.....Appendix C page 8  
(for each: ELA04, ELA07, MAT04, MAT06, MAT08)
  - a.  $\Delta$  Plot,  $b$  plot
  - b.  $a$  plot, TCCs
  - c. Lookup Table
  - d. UMass-MP Item Parameter Comparison
- III. Results for Science and Technology/Engineering .....Appendix C page 30  
(for each: SCI05, SCI08)
  - a.  $\Delta$  Plot,  $b$  plot
  - b.  $a$  plot, TCCs
  - c. Lookup Table

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## SECTION I AGGREGATE RESULTS

## Appendix C

**Table C1: Preliminary MCAS Percentage of Students by Performance Level Category**

<b>Content Area and Grade</b>	<b>MP: Removal of Items Based on Delta Plot</b>	<b>UMASS: No Removal of Items</b>	<b>UMASS: Removal of Items</b>	<b>MP: Negotiated Procedures</b>	<b>2004</b>	<b>2003</b>	<b>2002</b>
<b>ELA04</b>							
<i>Advanced</i>	7.4	10.0		10.0	11	10	8
<i>Proficient</i>	43.2	40.6		40.6	45	46	46
<i>Needs Improvement</i>	39.4	40.5		40.5	35	34	37
<i>Warning</i>	10.0	9.0		9.0	10	9	10
<b>ELA07</b>							
<i>Advanced</i>	10.0	10.0	10.0	10.0	9	8	9
<i>Proficient</i>	55.1	57.9	57.9	57.9	59	58	55
<i>Needs Improvement</i>	28.1	26.9	26.9	26.9	25	28	28
<i>Warning</i>	6.8	5.2	5.2	5.2	7	7	9
<b>MAT04</b>							
<i>Advanced</i>	14.2	14.2		14.2	14	12	12
<i>Proficient</i>	27.1	27.1		27.1	28	28	27
<i>Needs Improvement</i>	45.1	45.1		45.1	44	44	42
<i>Warning</i>	13.6	13.6		13.6	14	16	19
<b>MAT06</b>							
<i>Advanced</i>	17.5	17.5		17.5	17	16	13
<i>Proficient</i>	29.2	29.2		29.2	26	26	28
<i>Needs Improvement</i>	30.7	30.7		30.7	32	32	29
<i>Warning</i>	22.6	22.6		22.6	25	26	30
<b>MAT08</b>							
<i>Advanced</i>	13.4	13.4		13.4	13	12	11
<i>Proficient</i>	24.0	26.4		26.4	26	25	23
<i>Needs Improvement</i>	30.6	30.6		30.6	32	30	33
<i>Warning</i>	32.0	29.6		29.6	29	33	33
<b>SCI05</b>							
<i>Advanced</i>				15.8	20	19	
<i>Proficient</i>				35.2	35	33	
<i>Needs Improvement</i>				38.0	33	34	
<i>Warning</i>				11.0	13	14	
<b>SCI08</b>							
<i>Advanced</i>				3.7	5	4	
<i>Proficient</i>				29.7	28	28	
<i>Needs Improvement</i>				41.6	35	37	
<i>Warning</i>				25.0	31	30	

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**Table C2: Preliminary MCAS Raw Scores Associated with Cut Points**

*A = Advanced*

*P = Proficient*

*NI = Needs Improvement*

*W = Warning*

Content Area and Grade	UMASS	MP	2004	2003	2002
<b>ELA04</b>					
Max Points	72	72	72	72	72
P:A	63	63	61	64	63
NI:P	53	53	50	52	51
W:NI	36	36	34	37	36
<b>ELA07</b>					
Max Points	72	72	72	72	72
P:A	63	63	62	64	61
NI:P	48	48	46	46	46
W:NI	31	31	31	29	32
<b>MAT04</b>					
Max Points	54	54	54	54	54
P:A	49	49	47	46	45
NI:P	42	42	39	38	36
W:NI	24	24	22	23	21
<b>MAT06</b>					
Max Points	54	54	54	54	54
P:A	46	46	48	44	45
NI:P	36	36	40	36	35
W:NI	24	24	27	25	25
<b>MAT08</b>					
Max Points	54	54	54	54	54
P:A	47	47	46	46	44
NI:P	36	36	36	35	34
W:NI	23	23	23	23	22
<b>SCI05</b>					
Max Points		54	54	54	
P:A		46	47	47	
NI:P		39	41	39	
W:NI		28	31	26	
<b>SCI08</b>					
Max Points		54	53	54	
P:A		48	46	47	
NI:P		37	36	35	
W:NI		24	25	23	

**MCAS**  
**Calibration Overview**

PARSCALE 4.1 was used for all analyses. All command files were set up in such a way that all general settings were identical to 2004. For example, the calibration statement read

CAL GRADED,LOGISTIC,CYCLE=(100,1,1,1,1),TPRIOR,SPRIOR,GPRIOR,RIDGE,

Thus, a GRM was used for the polytomous items, and a 3PL model was used for all MC items. For short-answer items, the lower asymptote of the ICC was set equal to 0.0 (i.e, a 2PL model was used). All items occupied a unique block and equating items were fixed (using the SKIP command) to their 2004 values.

Because of the FCIP method of equating, each grade and content combination had two separate calibration runs. All calibrations in the number of iterations to convergence can be found in Table C3.

**Table C3: Preliminary MCAS Test Calibration  
Number of Cycles to Convergence**

Content Area/Grade	Initial	Final
ELA04	65	20
ELA07	45	6
MAT04	28	24
MAT06	30	21
MAT08	37	21
SCI05	64	9
SCI08	61	11

For a small number of items, the guessing parameter was not fully estimated during one or both of the calibrations. After carefully studying these items Measured Progress staff found that fixing the lower asymptote to 0.20 resulted in stable and reasonable estimates for both the  $a$  and  $b$  parameters (relative to CTT statistics) and resulted in excellent model fit (comparing theoretical ICCs to observed ICCs). Table C4 shows all the items for which this adjustment was applied.

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**Table C4: Preliminary MCAS 2005 Tests  
Items with Fixed c-parameter**

Content Area/Grade	Initial	Final
ELA04	220781	None
ELA07	5	2
MAT04	5	4
MAT06	2	2
MAT08	3	2
SCI05	3	3
SCI08	4	4

Via the use of a delta analysis procedure to evaluate equating items, very few items were removed from the equating analysis. Table C5 shows the equating items that were removed from the analysis.

**Table C5: Preliminary MCAS 2005 Tests  
Items Removed Due to Delta Analysis Results**

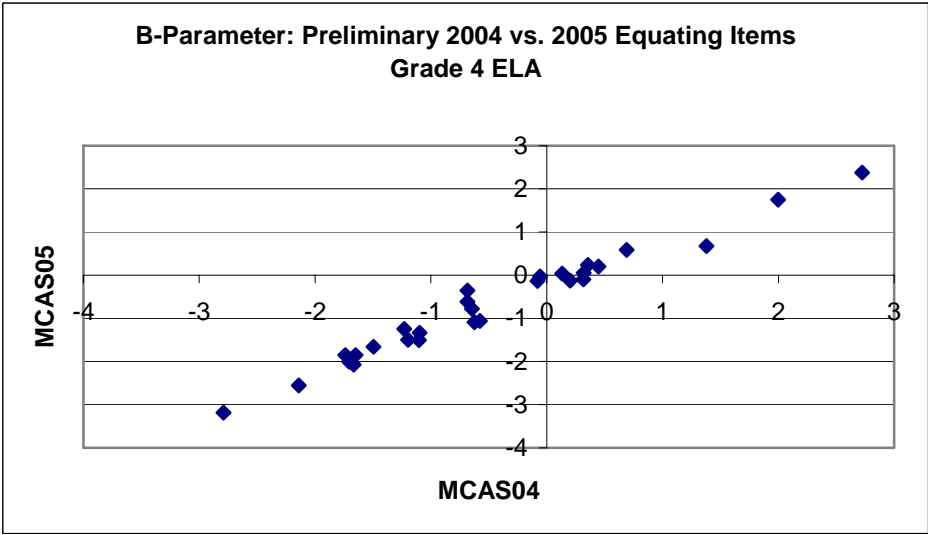
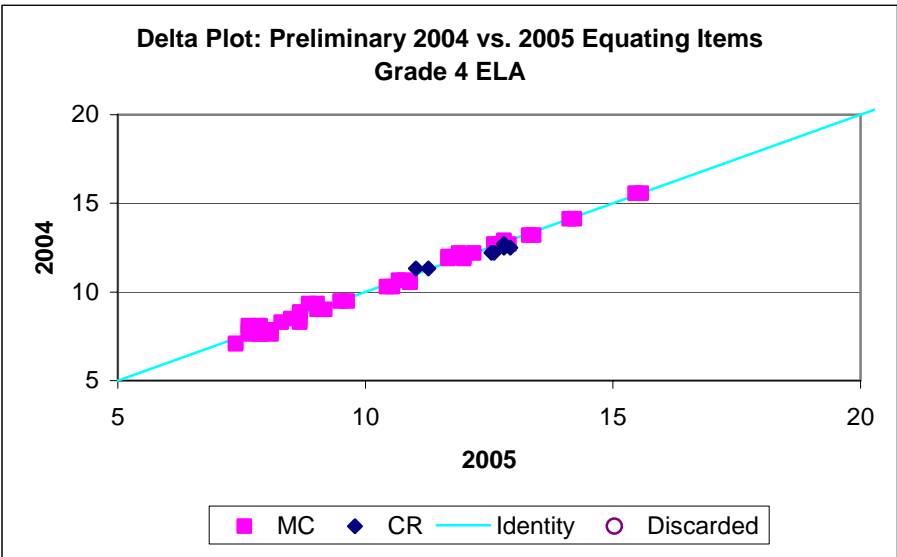
Content Area/Grade	Item Removed
ELA04	NONE
ELA07	1
MAT04	1
MAT06	1
MAT08	1
SCI05	1
SCI08	1

**MCAS**  
**Psychometric Quality Control Activities**

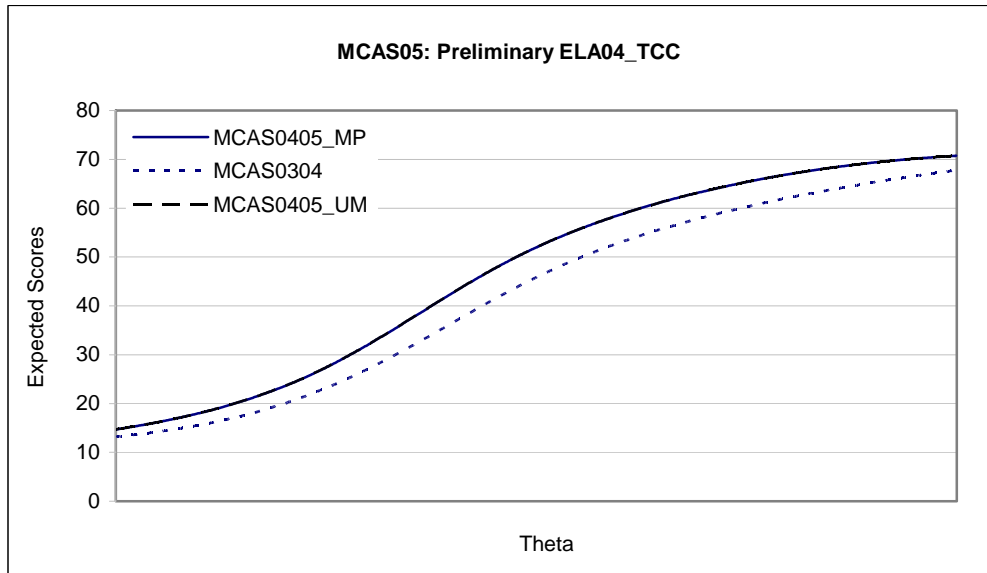
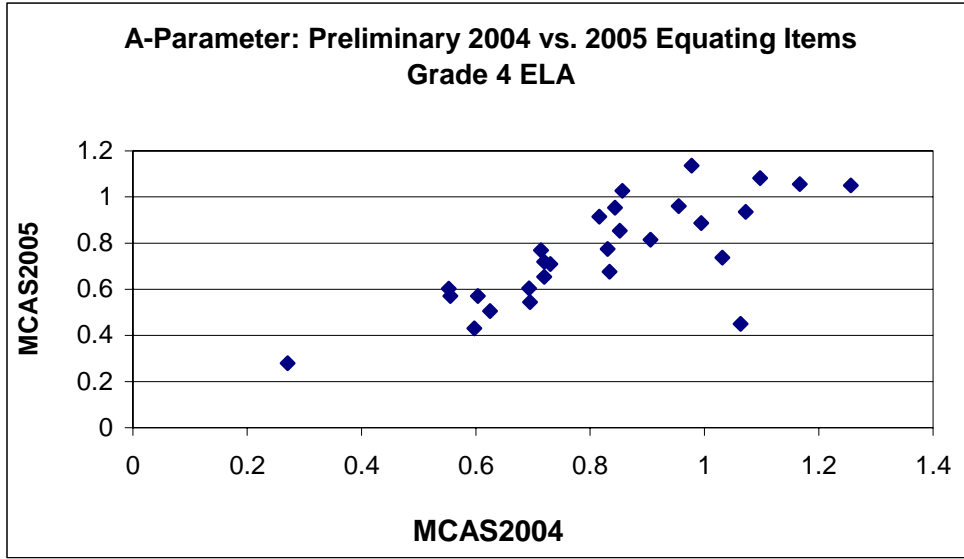
- 1) Copy match of equating items
- 2) Key verification process
- 3) Application to line up equating items with HEM parameter values
- 4) Statistics Check procedure
  - a. Final input files compared back to HEM dataset
  - b. Three-person QC step
- 5) HEM parameter values spot-checked against item content
- 6) Delta analysis
  - a. Crit > 3 removed
  - b. Crit > 2 , Crit < 3 evaluated
- 7) Equating Analysis: 1<sup>st</sup> and 2<sup>nd</sup> calibrations evaluated owing to FCIP
  - a. Reasonableness of item parameters
  - b. Low a, high SE on B, c parameter not fully estimated
  - c. Fit files, after equating runs
  - d. Development of negotiated procedures
  - e. Normal end evaluation; more than 100 executable programs run
  - f. Delta plot
  - g. *a*-plot, *b*-plots
  - h. TCCs
  - i. Proficiency levels
- 8) Watch List: items continuously evaluated
  - a. 8 criteria
  - b. Statistical values
  - c. Content
- 9) Parallel processing of SS calculation

## Appendix C

### SECTION II RESULTS FOR ELA AND MATHEMATICS



# Appendix C



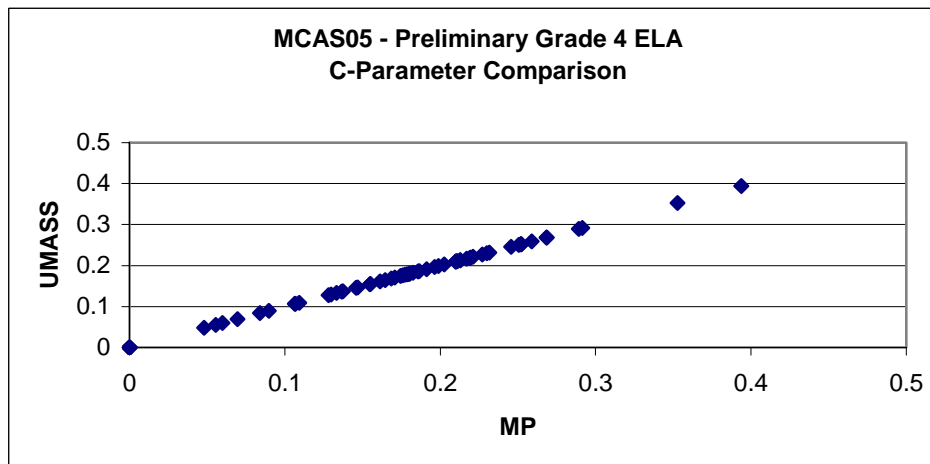
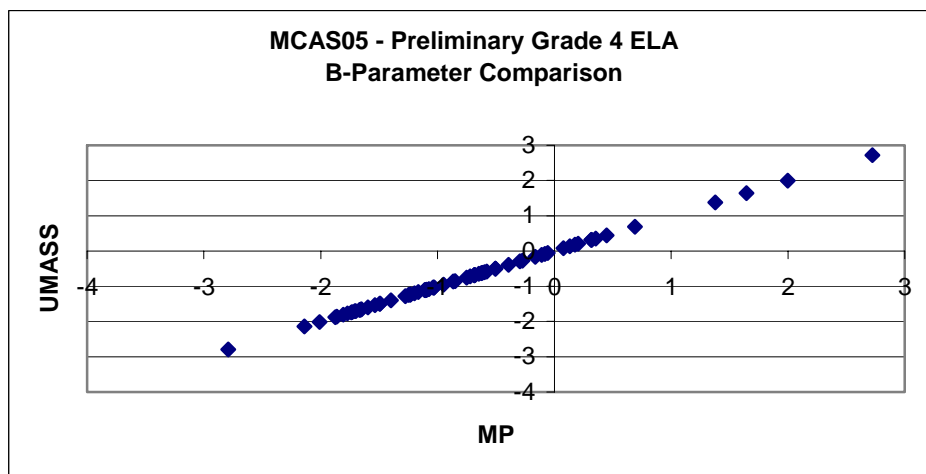
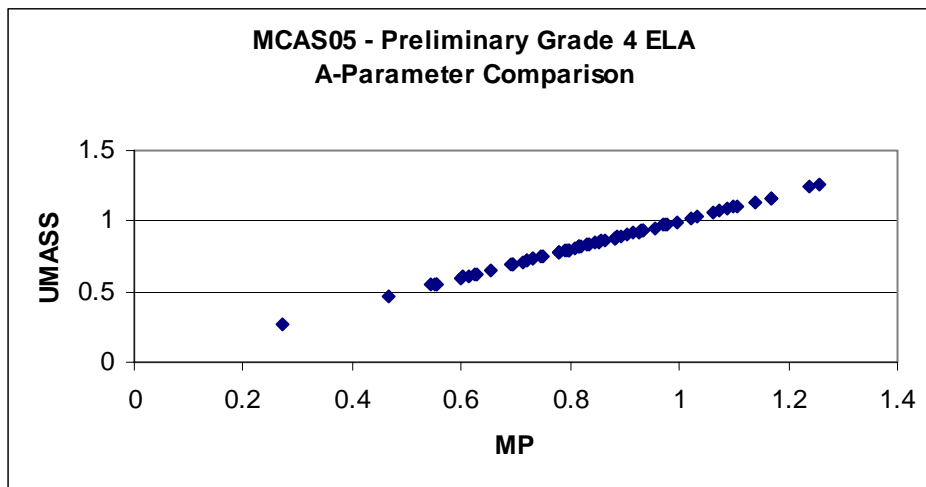
**Table C6: Preliminary MCAS 2005  
Raw Score-to-Scaled-Score Conversion  
Grade 4 English Language Arts**

<b>RAW</b>	<b>MP</b>	<b>UMASS</b>
0	200	200
1	200	200
2	202	202
3	202	202
4	202	202
5	202	202
6	204	204
7	204	204
8	204	204
9	204	204
10	206	206
11	206	206
12	206	206
13	206	206
14	208	208
15	208	208
16	208	208
17	208	208
18	210	210
19	210	210
20	210	210
21	212	212
22	212	212
23	212	212
24	214	214
25	214	214
26	214	214
27	216	216
28	216	216
29	216	216
30	216	216
31	218	218
32	218	218
33	218	218
34	218	218
35	218	218
36	220	220
37	220	220
38	220	220
39	220	220
40	222	222
41	224	224
42	224	224
43	226	226
44	228	228
45	228	228
46	230	230
47	232	232
48	232	232
49	234	234
50	236	236
51	238	238
52	238	238
53	240	240

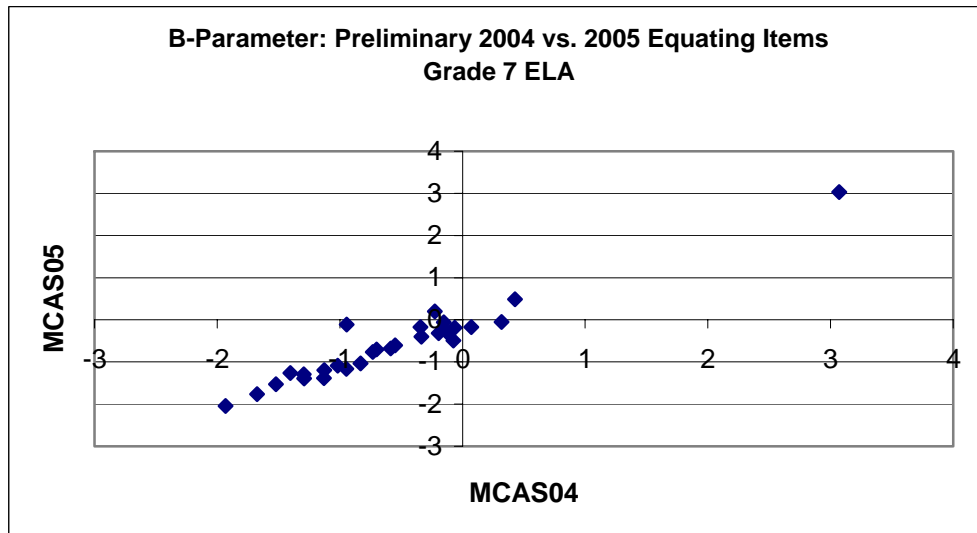
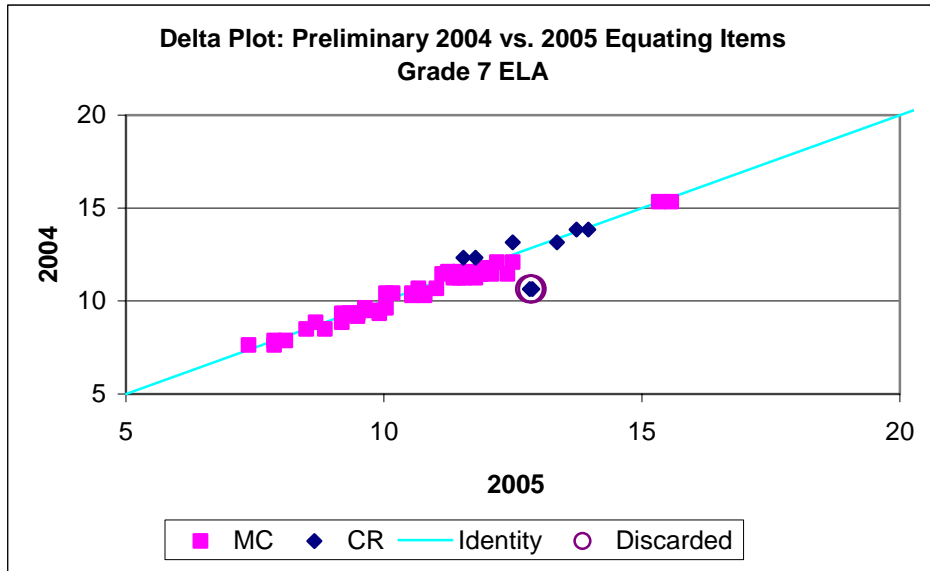
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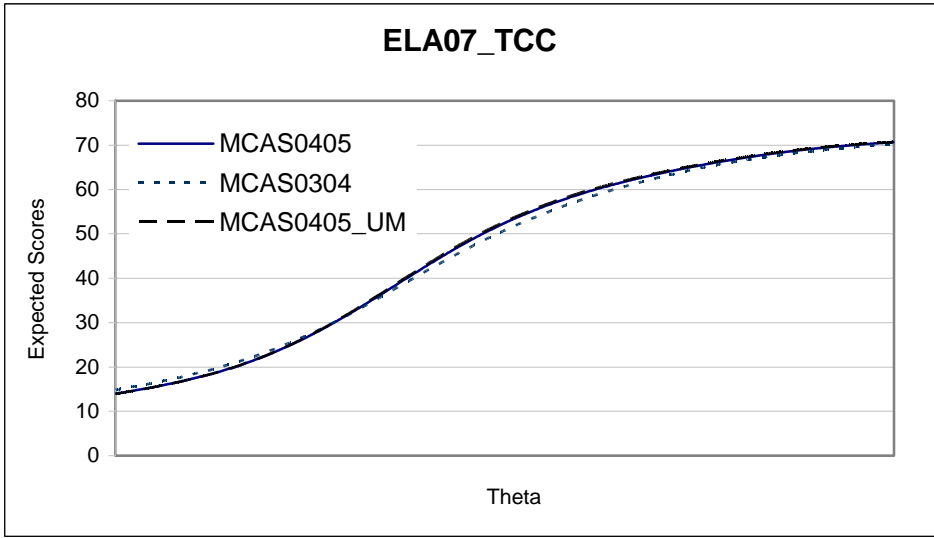
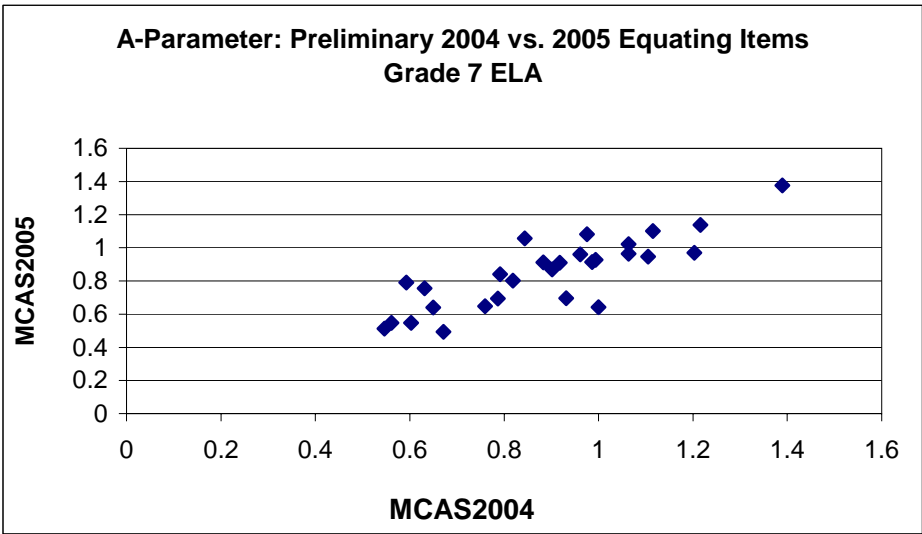
**Table C6: Preliminary MCAS 2005  
Raw Score-to-Scaled-Score Conversion  
Grade 4 English Language Arts (cont.)**

<b>RAW</b>	<b>MP</b>	<b>UMASS</b>
54	242	242
55	244	244
56	246	246
57	246	246
58	248	248
59	250	250
60	252	252
61	254	254
62	256	256
63	260	260
64	262	262
65	264	264
66	268	268
67	272	272
68	276	276
69	280	280
70	280	280
71	280	280
72	280	280



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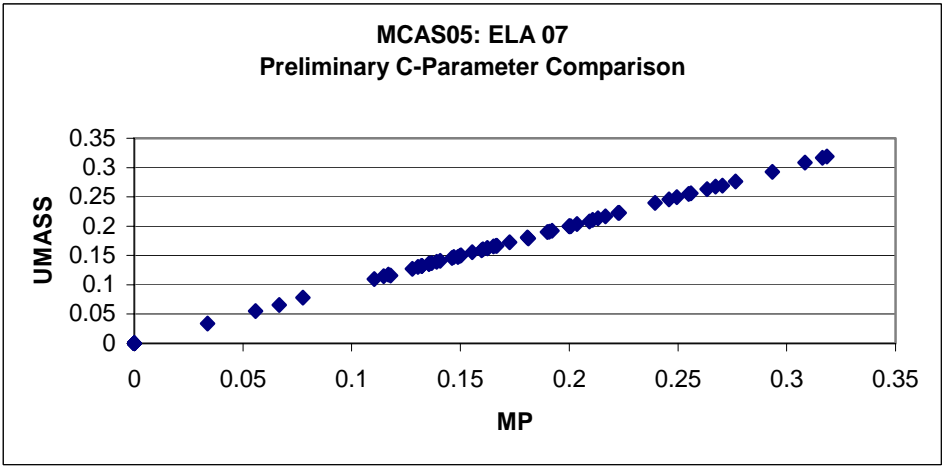
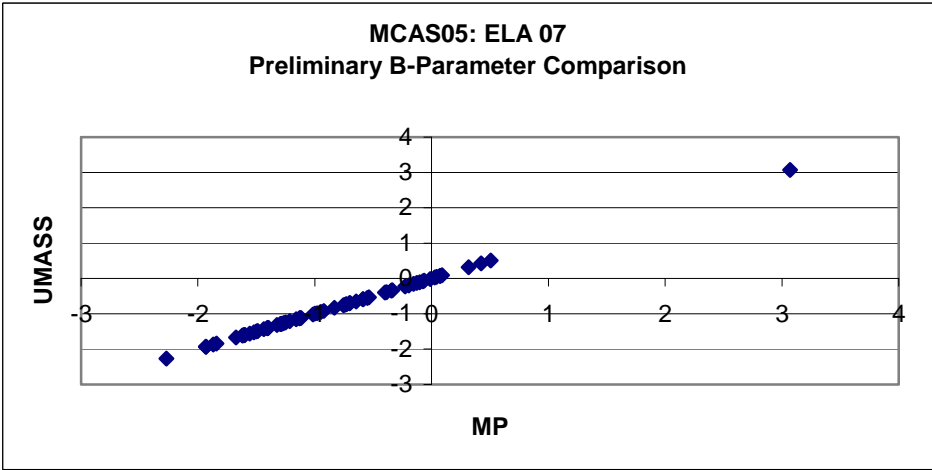
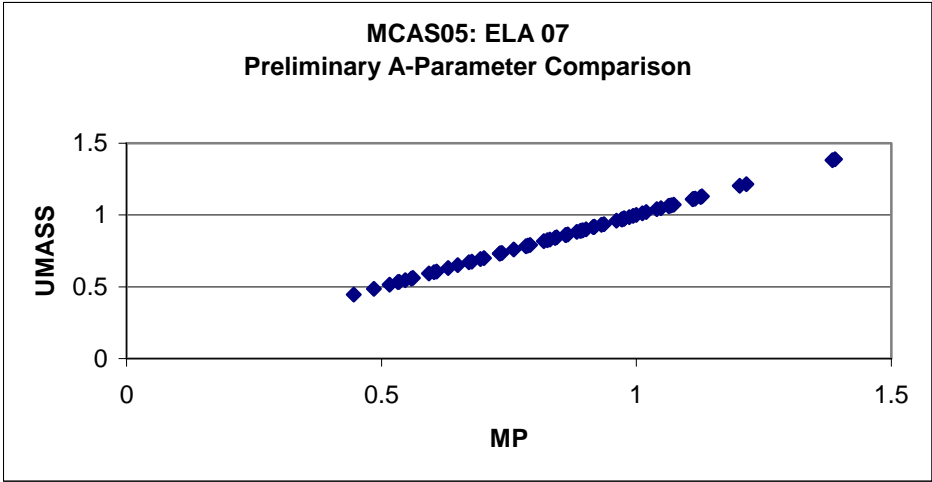
## Appendix C

**Table C7: Preliminary MCAS 2005  
Raw Score-to-Scaled-Score Conversion  
English Language Arts Grade 7**

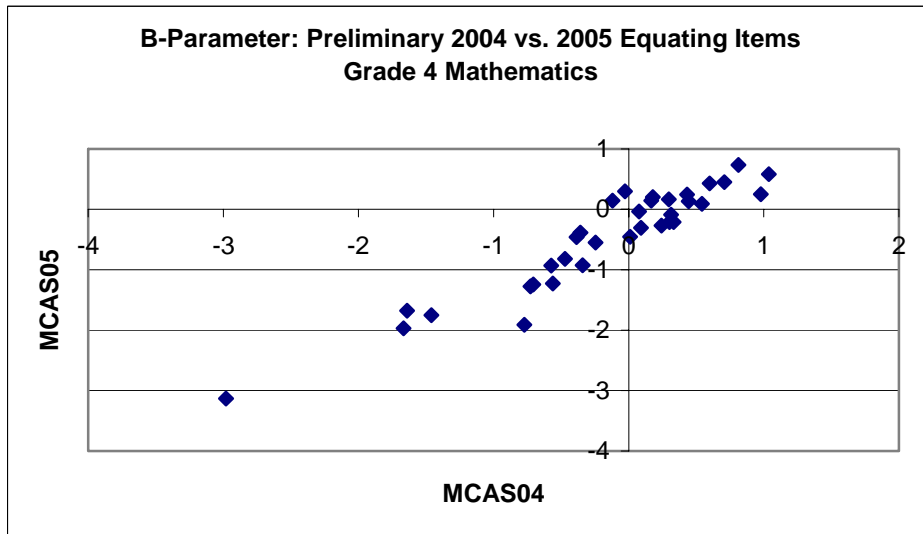
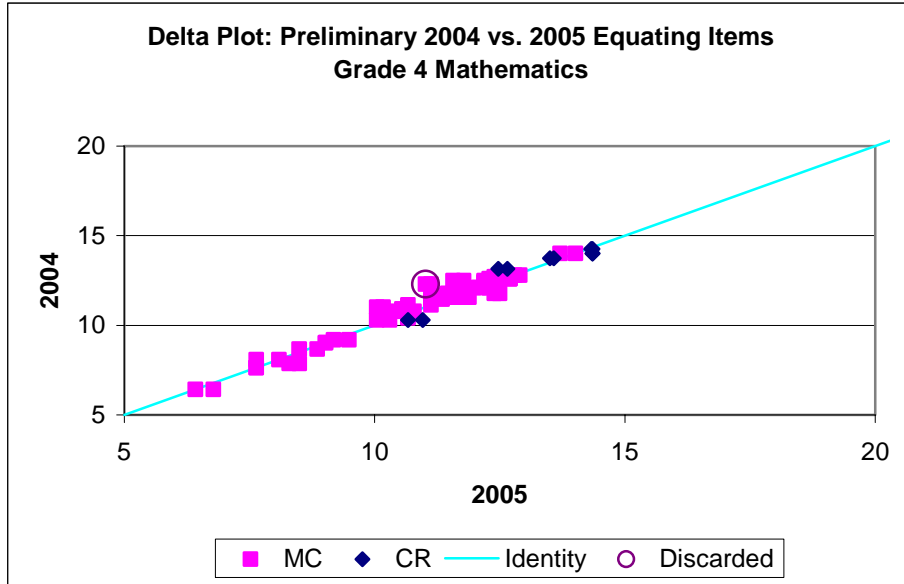
RAW	MP	UMASS
0	200	200
1	200	200
2	202	202
3	202	202
4	202	202
5	204	204
6	204	204
7	204	204
8	204	204
9	206	206
10	206	206
11	206	206
12	208	208
13	208	208
14	208	208
15	210	210
16	210	210
17	210	210
18	210	210
19	212	212
20	212	212
21	214	214
22	214	214
23	214	214
24	216	216
25	216	216
26	216	216
27	218	218
28	218	218
29	218	218
30	218	218
31	220	220
32	220	220
33	220	220
34	222	222
35	222	222
36	224	224
37	226	226
38	226	226
39	228	228
40	230	228
41	230	230
42	232	232
43	234	232
44	234	234
45	236	236
46	238	236
47	238	238
48	240	240
49	240	240
50	242	242
51	242	242
52	244	244

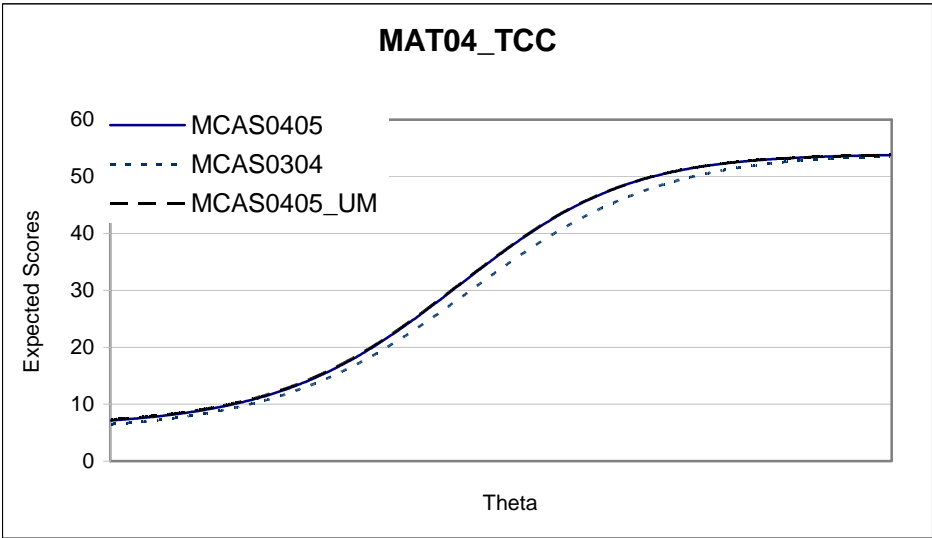
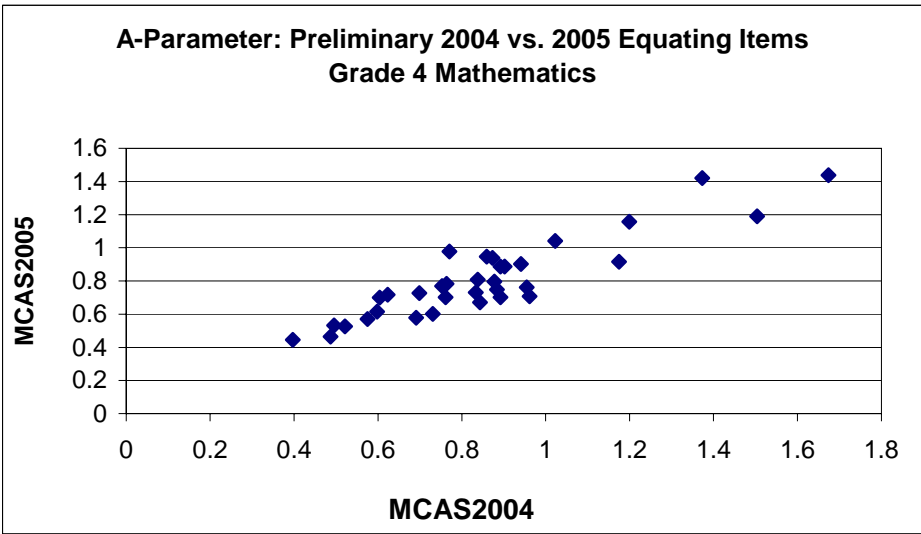
**Table C7: Preliminary MCAS 2005  
Raw Score-to-Scaled-Score Conversion  
English Language Arts Grade 7 (cont.)**

RAW	MP	UMASS
53	244	244
54	246	246
55	248	246
56	248	248
57	250	250
58	252	250
59	252	252
60	254	254
61	256	256
62	258	258
63	260	260
64	262	262
65	266	266
66	268	268
67	272	272
68	276	276
69	280	280
70	280	280
71	280	280
72	280	280



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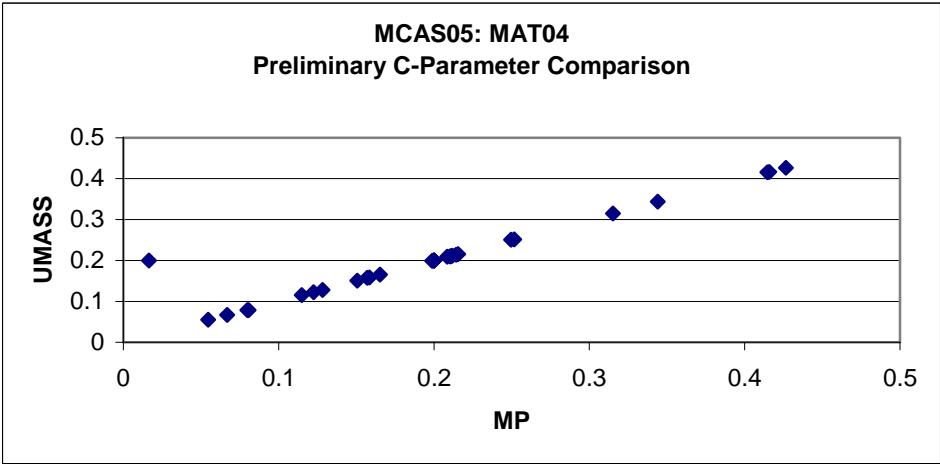
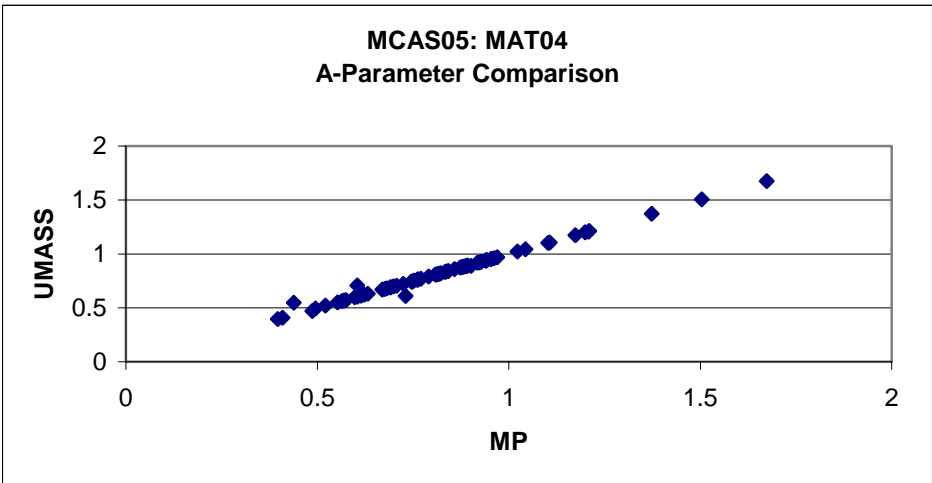




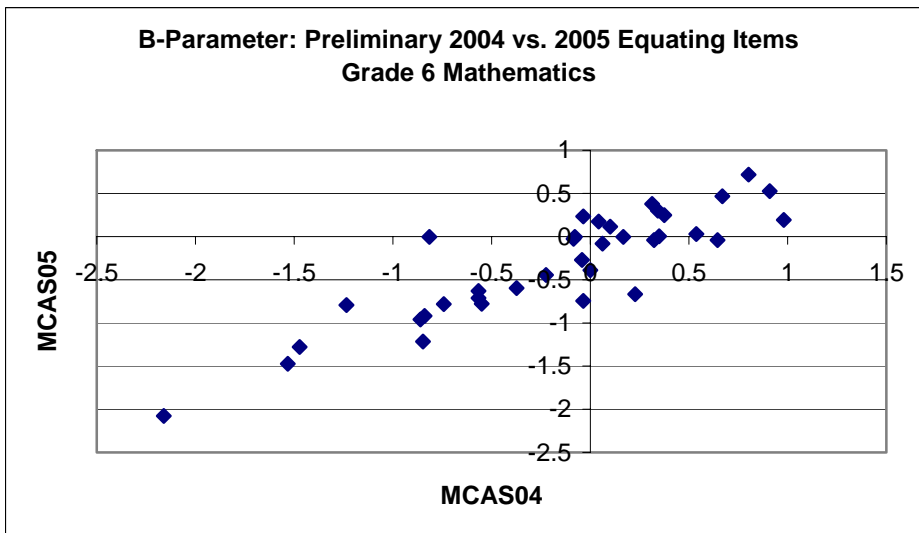
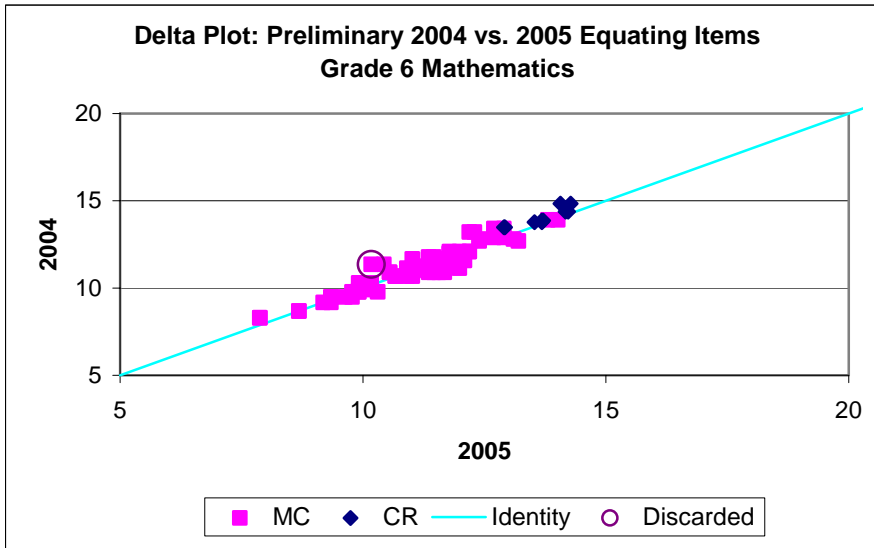
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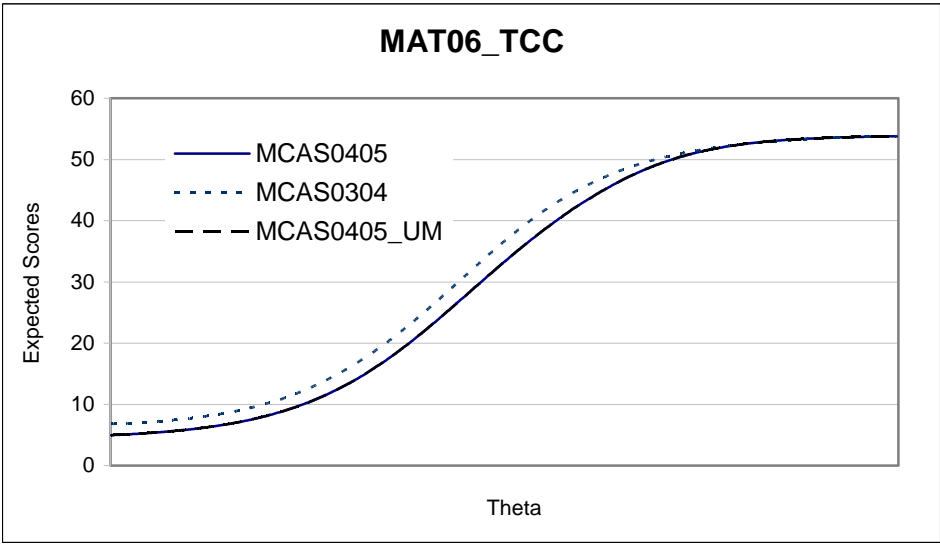
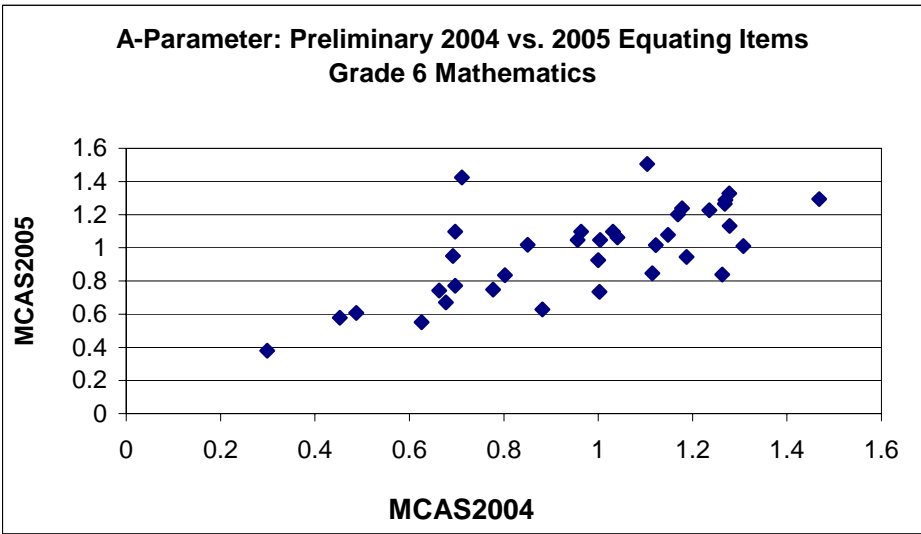
**Table C8: MCAS 2005  
Preliminary Raw Score-to-Scaled-Score Conversion  
Mathematics Grade 4**

RAW	MP	UMASS
0	200	200
1	200	200
2	202	202
3	202	202
4	204	204
5	204	204
6	204	204
7	206	206
8	206	206
9	208	208
10	208	208
11	210	210
12	212	212
13	212	212
14	214	214
15	214	214
16	214	214
17	216	216
18	216	216
19	216	216
20	218	218
21	218	218
22	218	218
23	218	218
24	220	220
25	220	220
26	220	220
27	222	222
28	224	224
29	224	224
30	226	226
31	226	226
32	228	228
33	230	228
34	230	230
35	232	232
36	232	232
37	234	234
38	236	234
39	236	236
40	238	238
41	238	238
42	240	240
43	242	242
44	246	246
45	248	248
46	250	250
47	254	254
48	258	256
49	260	260
50	262	262
51	266	266
52	270	270
53	276	276
54	280	280



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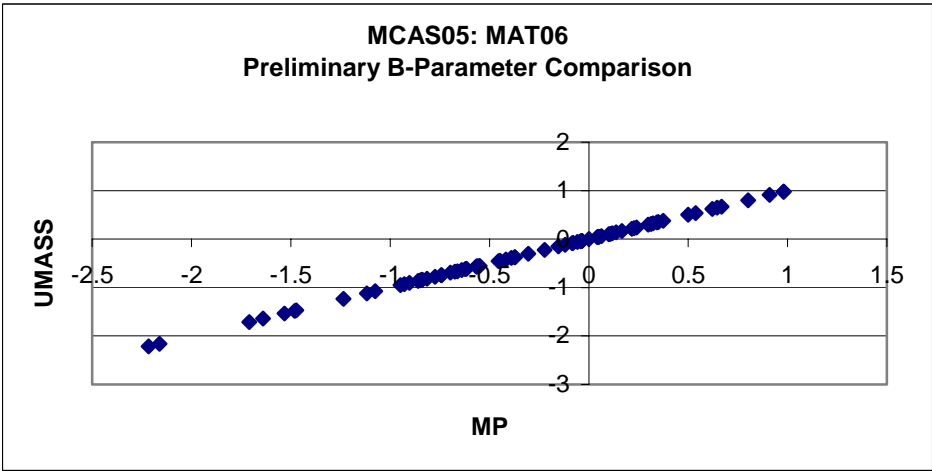
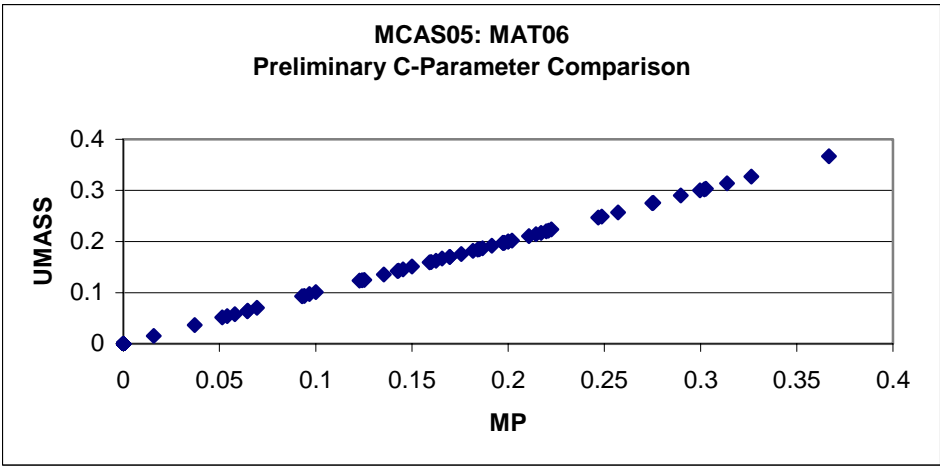
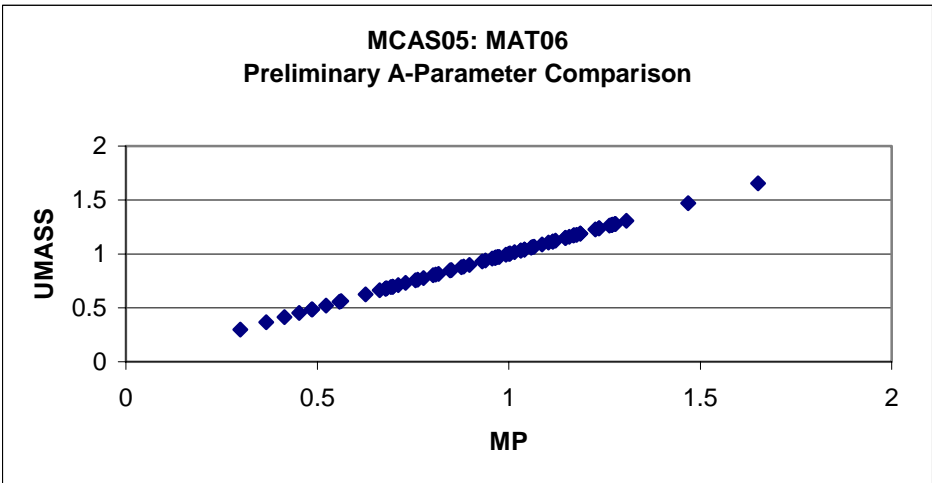




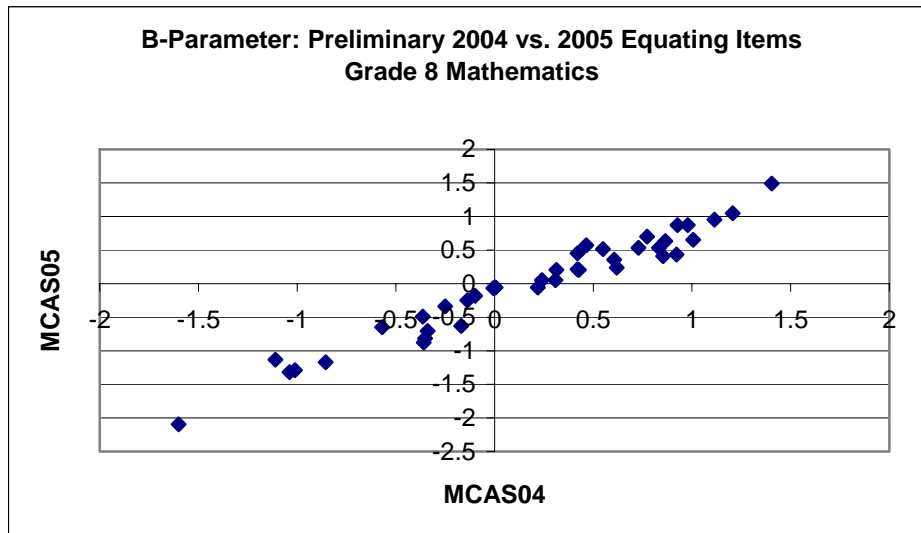
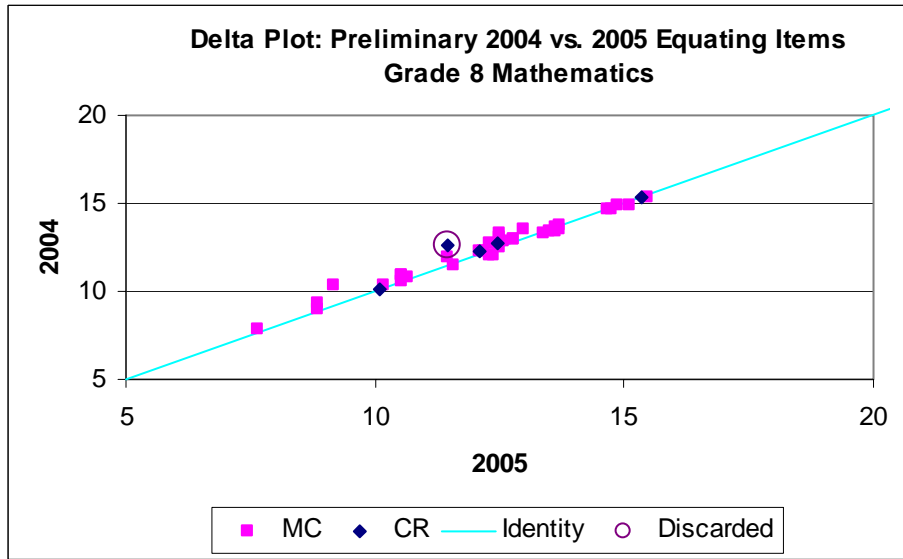
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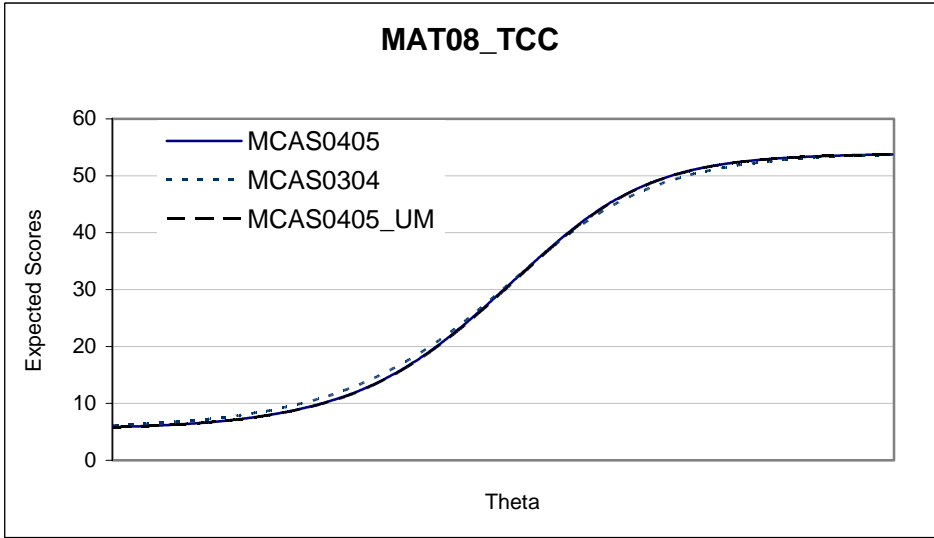
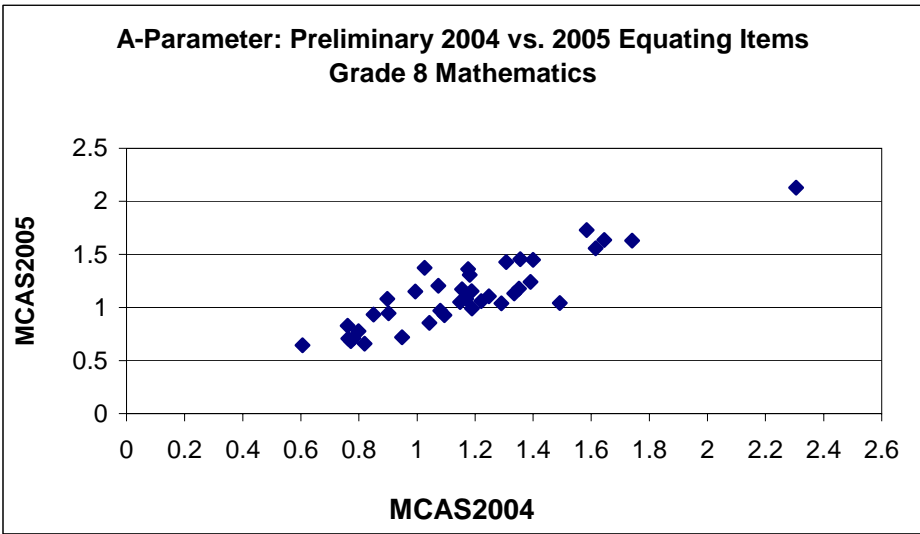
**Table C9: MCAS 2005  
Preliminary Raw Score-to-Scaled-Score Conversion  
Mathematics Grade 6**

<b>RAW</b>	<b>MP</b>	<b>UMASS</b>
0	200	200
1	200	200
2	202	202
3	202	202
4	204	204
5	204	204
6	204	204
7	206	206
8	208	208
9	210	210
10	210	210
11	212	212
12	212	212
13	214	214
14	214	214
15	214	214
16	216	216
17	216	216
18	216	216
19	216	216
20	218	218
21	218	218
22	218	218
23	218	218
24	220	220
25	220	220
26	220	220
27	222	222
28	224	224
29	226	226
30	228	228
31	230	230
32	232	232
33	234	234
34	236	236
35	238	238
36	240	240
37	242	242
38	242	242
39	244	244
40	246	246
41	248	248
42	250	250
43	252	252
44	256	256
45	258	258
46	260	260
47	262	262
48	262	262
49	264	264
50	266	266
51	268	268
52	272	272
53	276	276
54	280	280



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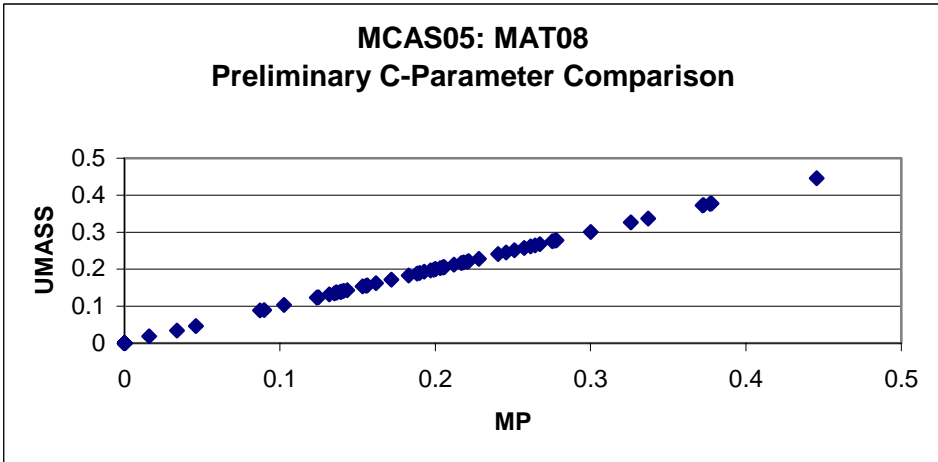
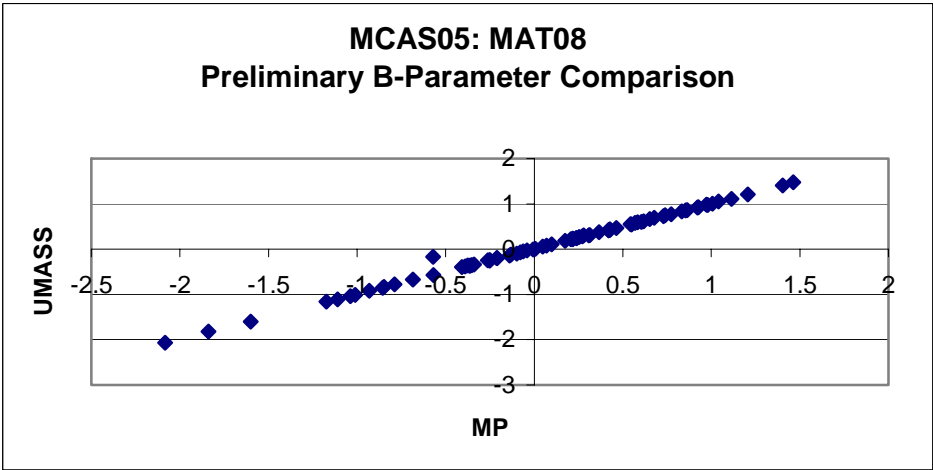
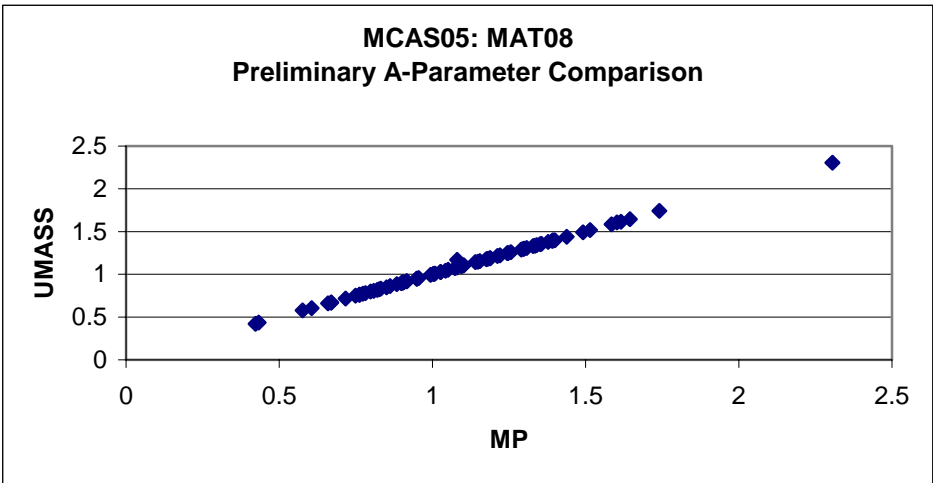




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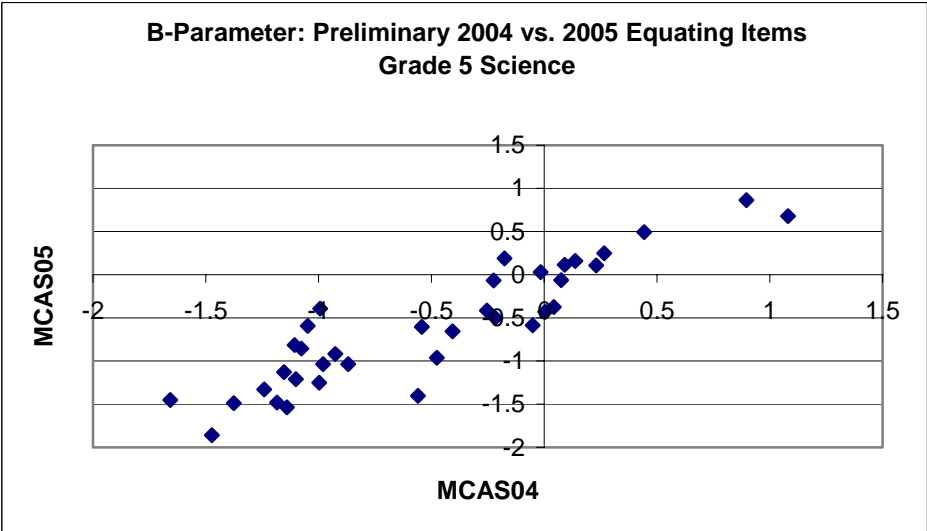
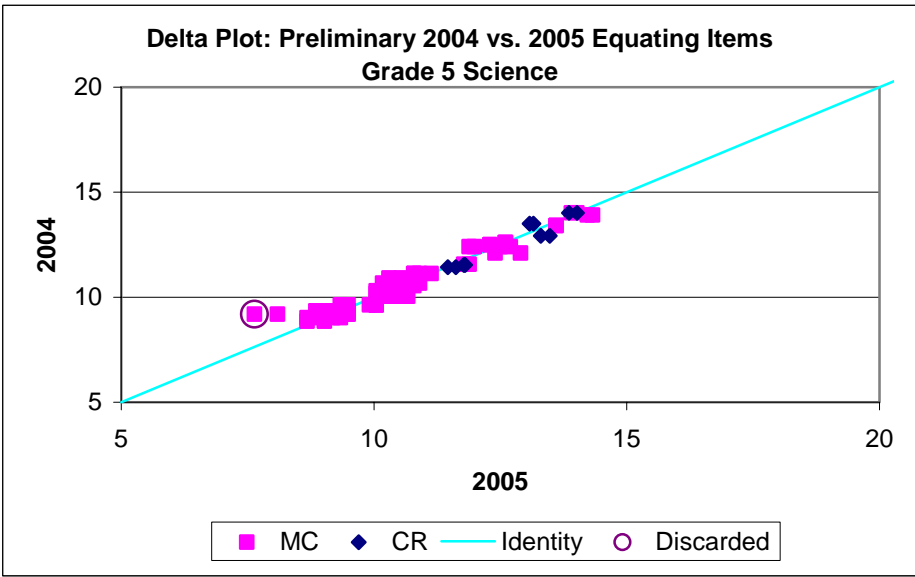
**Table C10: MCAS 2005  
Preliminary Raw Score-to-Scaled-Score Conversion  
Mathematics Grade 8**

RAW	MP	UMASS
0	200	200
1	200	200
2	202	202
3	202	202
4	204	204
5	204	204
6	204	204
7	206	206
8	208	208
9	210	210
10	212	212
11	212	212
12	214	214
13	214	214
14	214	214
15	216	216
16	216	216
17	216	216
18	218	218
19	218	218
20	218	218
21	218	218
22	218	218
23	220	220
24	220	220
25	220	220
26	222	222
27	224	224
28	226	226
29	228	228
30	228	230
31	230	230
32	232	232
33	234	234
34	236	236
35	238	238
36	240	240
37	240	242
38	242	242
39	244	244
40	246	246
41	248	248
42	250	250
43	250	252
44	252	254
45	254	256
46	258	258
47	260	260
48	262	262
49	262	264
50	264	266
51	268	268
52	272	272
53	278	278
54	280	280

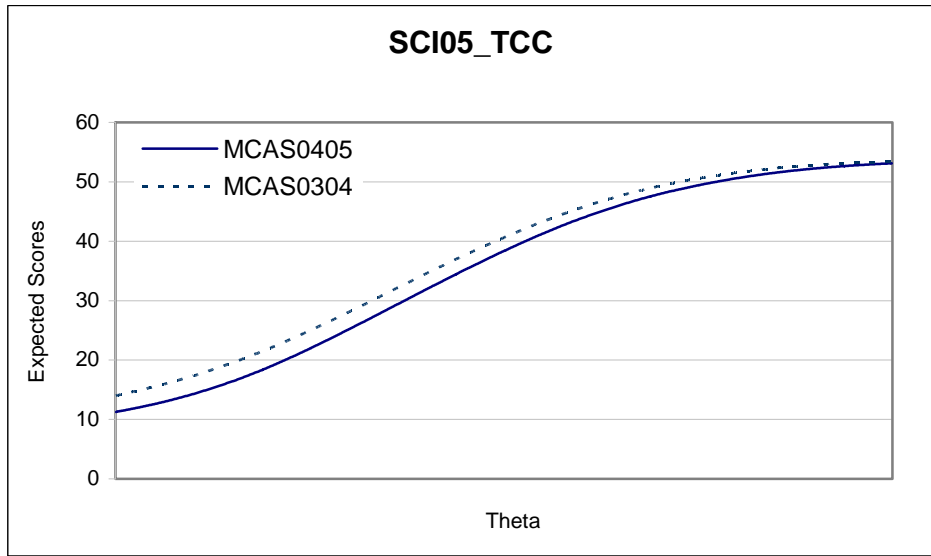
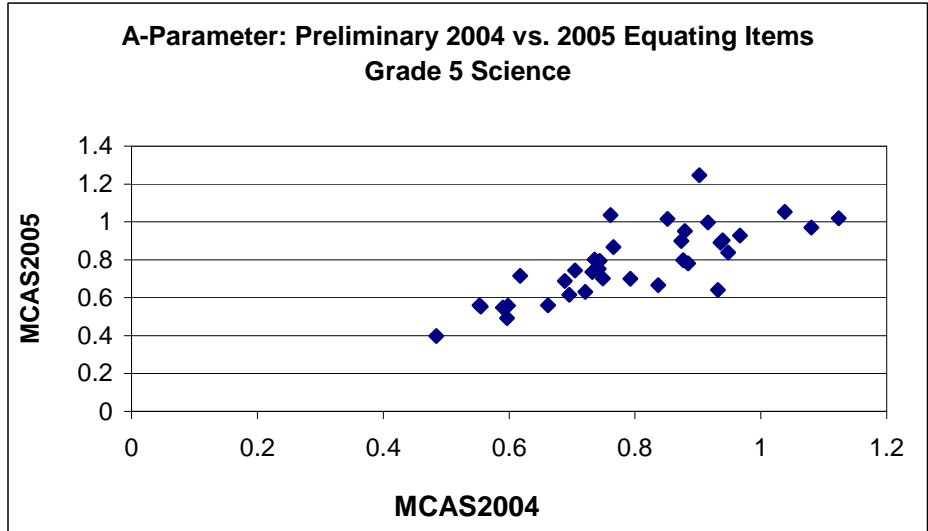


## Appendix C

### SECTION III RESULTS FOR SCIENCE AND TECHNOLOGY/ENGINEERING



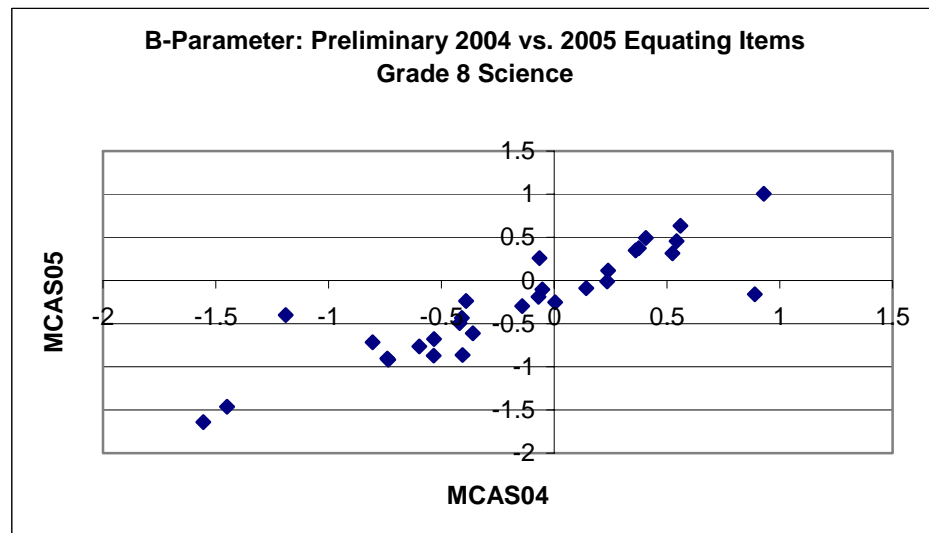
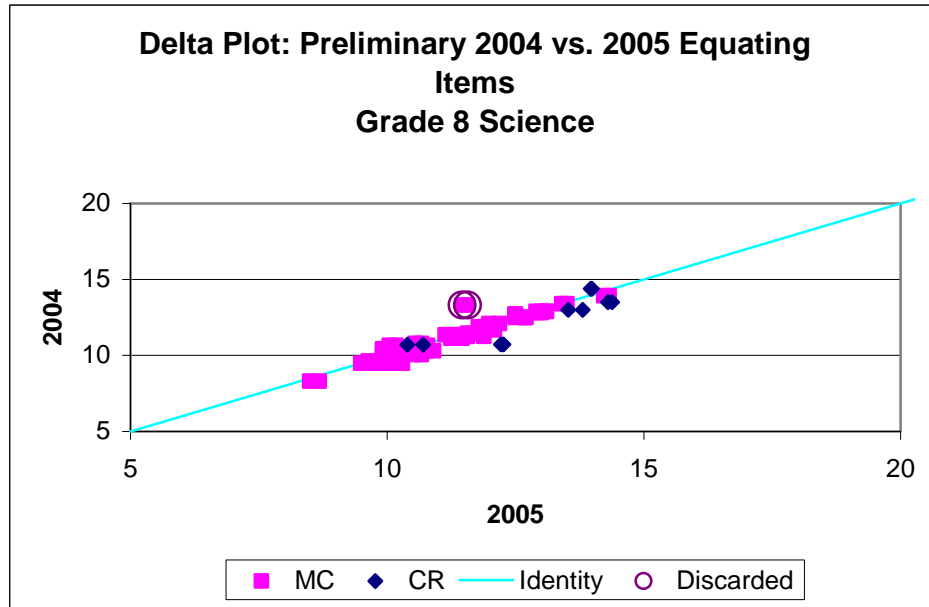
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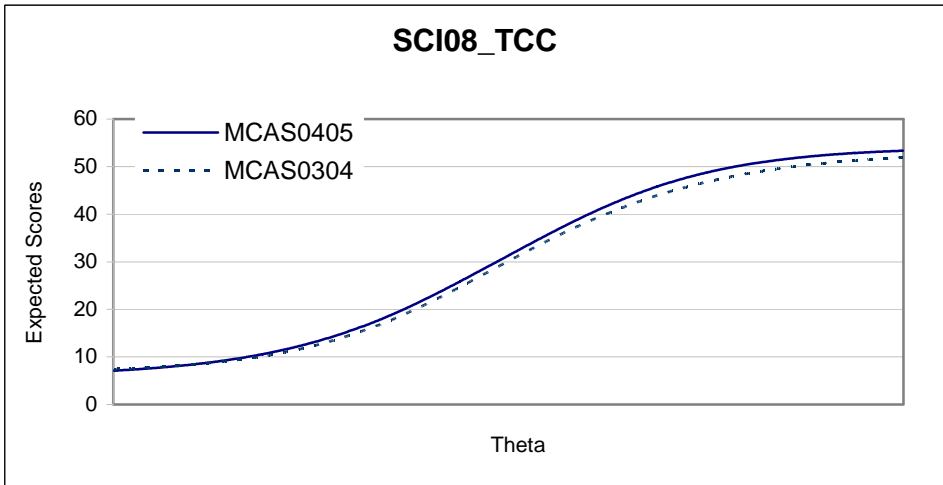
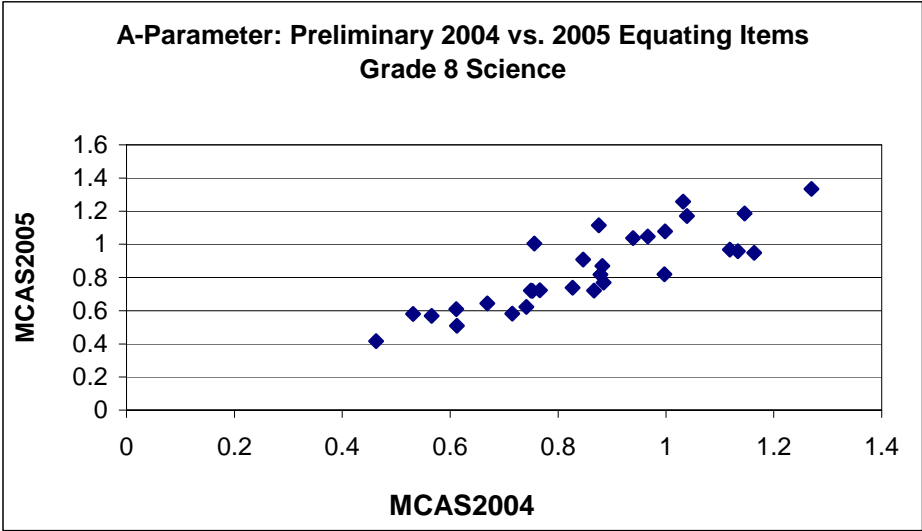


**Table C11: MCAS 2005  
Preliminary Raw Score-to-Scaled-Score Conversion  
Science and Technology/Engineering Grade 5**

RAW	MP
0	200
1	200
2	202
3	202
4	202
5	204
6	204
7	204
8	206
9	206
10	206
11	208
12	208
13	208
14	210
15	210
16	212
17	212
18	212
19	214
20	214
21	214
22	216
23	216
24	216
25	218
26	218
27	218
28	220
29	220
30	222
31	224
32	226
33	228
34	230
35	232
36	234
37	236
38	238
39	240
40	242
41	246
42	248
43	252
44	254
45	258
46	262
47	264
48	266
49	268
50	272
51	276
52	280
53	280
54	280

# Appendix C





## Appendix C

**Table C12: MCAS 2005  
Preliminary Raw Score-to-Scaled-Score Conversion  
Science and Technology/Engineering Grade 8**

<b>RAW</b>	<b>SS</b>
0	200
1	200
2	202
3	202
4	204
5	204
6	204
7	206
8	206
9	208
10	208
11	210
12	212
13	212
14	214
15	214
16	214
17	216
18	216
19	216
20	218
21	218
22	218
23	218
24	220
25	220
26	220
27	222
28	224
29	226
30	228
31	230
32	230
33	232
34	234
35	236
36	238
37	240
38	242
39	242
40	244
41	246
42	248
43	250
44	250
45	252
46	254
47	258
48	260
49	264
50	268
51	272
52	280
53	280
54	280

**Table C13: MCAS 2005  
Preliminary Raw-Score-to-Scaled-Score Conversion  
Grade 10**

Total Score	English Language Arts			Mathematics		
	Scaled Score	Low Bound	High Bound	Scaled Score	Low Bound	High Bound
72	280	270	280			
71	280	270	280			
70	280	270	280			
69	280	270	280			
68	276	269	280			
67	272	266	277.8			
66	268	263.4	274.1			
65	266	261.1	271.1			
64	264	259	268.4			
63	262	257.1	266.1			
62	260	253.2	265.9			
61	256	250.8	262.9			
60	254	248.7	260.2	280	270.0	280.0
59	252	246.7	257.7	276	269.2	280.0
58	250	244.9	255.4	272	267.3	275.3
57	248	243.1	253.3	270	265.8	272.4
56	246	241.4	251.3	268	264.7	270.5
55	244	239.8	249.4	266	263.3	268.4
54	242	237.6	246.8	266	263.3	268.4
53	242	237.6	246.8	264	261.8	266.3
52	240	234	245.7	264	261.8	266.3
51	238	232.2	243.7	262	259.9	264.3
50	236	230.4	241.7	262	259.9	264.3
49	234	228.6	239.9	262	259.9	264.3
48	232	226.9	238	260	255.3	262.3
47	230	224.3	235.4	260	255.3	262.3
46	230	224.3	235.4	260	255.3	262.3
45	228	221.7	232.9	258	252.0	261.2
44	226	220	231.2	256	250.4	260.6
43	224	218.3	229.6	254	248.1	259.4
42	222	216.5	228	254	248.1	259.4
41	220	217.6	221.9	252	245.8	257.2
40	220	217.6	221.9	250	244.3	255.7
39	220	217.6	221.9	248	242.1	253.4
38	220	217.6	221.9	248	242.1	253.4
37	218	217	219.1	246	239.8	251.2
36	218	217	219.1	244	238.3	249.8
35	218	217	219.1	242	236.0	247.6
34	218	217	219.1	242	236.0	247.6
33	218	217	219.1	240	233.6	245.4
32	218	217	219.1	238	232.0	244.0
31	218	217	219.1	236	230.4	242.5
30	216	214.7	217.4	234	227.9	240.2
29	216	214.7	217.4	234	227.9	240.2
28	216	214.7	217.4	232	225.3	237.9
27	216	214.7	217.4	230	223.5	236.3
26	214	212.6	216	228	221.7	234.7
25	214	212.6	216	226	220.0	233.0
24	214	212.6	216	224	219.7	231.2

## Appendix C

**Table C13: MCAS 2005  
Preliminary Raw-Score-to-Scaled-Score Conversion  
Grade 10 (cont.)**

Total Score	English Language Arts			Mathematics		
	Scaled Score	Low Bound	High Bound	Scaled Score	Low Bound	High Bound
23	212	209.6	214.5	222	219.5	229.4
22	212	209.6	214.5	220	218.7	224.5
21	212	209.6	214.5	220	218.7	224.5
20	210	205.8	213.4	220	218.7	224.5
19	210	205.8	213.4	220	218.7	224.5
18	208	202.7	213.5	218	216.9	219.2
17	208	202.7	213.5	218	216.9	219.2
16	208	202.7	213.5	218	216.9	219.2
15	208	202.7	213.5	218	216.9	219.2
14	206	200.4	212.2	218	216.9	219.2
13	206	200.4	212.2	216	214.5	217.7
12	206	200.4	212.2	216	214.5	217.7
11	206	200.4	212.2	214	212.5	216.9
10	204	200	213.2	212	209.7	216.2
9	204	200	213.2	208	200.0	217.8
8	204	200	213.2	208	200.0	217.8
7	204	200	213.2	206	200.0	216.0
6	202	200	212.2	206	200.0	216.0
5	202	200	212.2	204	200.0	214.1
4	202	200	212.2	204	200.0	214.1
3	202	200	212.2	202	200.0	212.3
2	200	200	210.5	202	200.0	212.3
1	200	200	210.5	200	200.0	210.5
0	200	200	210.5	200	200.0	210.5