APPENDIX H

UNIVERSITY OF MASSACHUSETTS
REDUNDANT ANALYSIS REPORT

Notes and Graphs for the Equating of the 2005 Massachusetts Comprehensive Assessment System (MCAS) Tests in ELA and Mathematics

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Appendix H

MCAS 2005 PARSCALE RUNS

Notes for ELA, Grade 4:

Before the analysis began, the contractor provided the item list file for ELA grade 4. Four items (items 220818, 220850, 220877 and 225669) were labeled as "O", but their maximum points were 4. We assumed they should be constructed response items, which should be labeled as "C".

In the initial calibration, convergence was not achieved due to a scoring item (220781, b=-2.210, a=0.425 and c=0.000).

Originally, we tried to set a prior for the *c* parameter for this scoring item, but it failed to converge when the c prior was set equal to 0.20. After the item's c parameter was fixed to 0.20, it converged. The item parameters for the item changed to b= -1.489, a= 0.494, and c =0.200. These new parameters were used in the a & b plots.

Next, we fixed the equating items by using the 2004 equating item parameters to replace 2005 equating item parameters and ran the final calibration.

In the final calibration, the same scoring item (item 220781) still did not converge. Two approaches were used to address the problem. In the first approach, the prior for the *c* parameter of the item was set to 0.10, and it converged. The new parameters for the item were b=-1.808, a=0.466, and c=0.060. In the second approach, the c parameter for this item was fixed to 0.20, and it converged. The parameters obtained from this approach were b= -1.436, a= 0.498, and c= 0.200. TCCs were plotted using both results, and the two TCCs appeared to be very similar. The final TCC was based on the approach using a prior.

Notes for ELA, Grade 7:

During the initial calibration, we fixed problematic items 13, 19, and 64. They caused non-convergence because of low b-values and unstable c parameter estimates. Convergence was achieved, but items 10 and 35 had c=0.0, which did not seem reasonable.

So, finally we achieved convergence after fixing c=.20 for the following items:

10 (224923, common, b=-0.838, a=0.492)
13 (224937, common, b=-1.322, a=0.533)
19 (224991, common, b=-1.396, a=0.516)
35 (225564, common, b=-1.181, a=0.738)
52 (225663, equating, b=-0.759, a=0.869)
64 (225569, equating, b=-1.526, a=0.547)

In the final calibration, scoring items 224937 and 224991 did not converge. Before converging, the item parameter estimates were as follows: for item 224937, b = -1.322, a = 0.533, and c= 0.200; and for item 224991, b= -1.400, a= 0.516, and c = 0.200. After both items had c fixed to 0.20, we achieved convergence. The final parameters for item 224937 were b= -1.336, a = 0.539, and c= 0.200; and for item 224991 they were b= -1.410, a= 0.522, and c = 0.200. These final parameters were used to obtain the TCC needed in score equating.

Notes for Math, Grade 4:

Before the initial calibration, equating items 222049, 222076, 222140, 221884, 222084 were physically removed from the analysis because either no item parameters were found in the old parameter file or the item came from 2003.

**Later, when we were doing comparisons of final .PAR files, it looked like MP still had these items in the command file and calibrated using them.*

The BLOCKS for these items were removed from the code and the INPUT line was edited to

```
INPUT NID=14, NTOTAL=73, NTEST=1, LENGTH=73, SAMPLE=100;
(14A1,30A1,1x,12A1,1X,2A1,2X,3A1,1X,26A1)
TEST1 TNAME=m04y0, ITEM=(1(1)73), NBLOCK=73;
```

Items 6 (221808, b=-2.945), 9 (221819, b=-3.013), 13 (221837, b=-2.576), and 22 (221906, b=-2.361) had unstable c parameters (c=0.0), so these were fixed to c=0.20. Convergence was then achieved.

Next, we fixed the equating items using the 2004 equating item parameters to replace 2005 equating item parameters before running the final calibration.

We encountered the same issue with the same items from the initial calibration having c=0.0 (unstable) and low b-parameter values, so these items had the c-parameters set to .20. Convergence was then achieved.

The TCCs were plotted, and there looked like a 4 point gap between the 2004 and 2005 TCCs, so we re-ran all the analyses to check. The results were the same for the TCCs, and the solution was accepted.

Notes for Math, Grade 6:

In the initial calibration, two scoring items caused non-convergence. Item 226268 had b= -3.246, a=0.319, and c=0.000; for item 226339, b= -2.211, a=0.442, and c=0.000. We tried to set priors for the *c* parameters of the two items, but the solution failed to converge when c prior = 0.20, or c prior = 0.10. After the c parameters for both items were fixed to 0.20, convergence was achieved. The item parameters for the two items changed as

follows: for item 226268, b=-1.763, a=0.492, and c=0.200; for item 226339, b= -1.536, a=0.529, and c=0.200. These new parameters were used for the a and b plots.

Next, we fixed the equating item parameters using the 2004 equating item parameters to replace 2005 equating item parameters before running the final calibration.

In the final calibration, scoring items 226268 and 226339 were still problematic and convergence was not achieved. We tried to set priors for the *c* parameters of the two items, but the solution again failed to converge when c prior = 0.20 or when c prior =0.10. Finally, when the c parameters for both items were fixed to 0.20, convergence was achieved. The final item parameters for these two items were as follows: item 226268, b= -1.711, a=0.485, and c=0.200; for item 226339, b=-1.480, a= 0.523, and c=0.200. These were the values used to plot the TCCs.

Notes for Math, Grade 8:

Because it was the version used in previous years, we started the runs using PARCALE 3.5 (DOS) before switching to PARSCALE 4.1 (windows).

It did not run, so we changed the cycles from CYCLES(100,2,2,2,2) to CYCLES(100,1,1,1,1).

We then ran the initial calibration and fixed problematic items 8 (226370), 20 (226449), and 28 (226497) to c=0.20 because of unstable c parameter estimates (c=0.0) and low b-parameter values. Convergence was then achieved.

Next we ran the final calibration, fixing the c parameters for items 8 (226370) and 28 (226497) to c=0.20, again because of low b-parameter values and c=0.0. Convergence was finally achieved, and the TCCs were plotted.

Comparing MP & UMass Parameter Estimates for ELA, Grades 4, 7; Math, Grades 4, 6, and 8:

We compared the UMASS .par files with the MP .par files to check for discrepancies in the item parameters. These were the initial solution files provided by MP. Checking for differences in the a, b, and c parameters, we found that there were differences as large as 2 points on the theta scale for a few items. These items turned out to be the items that had unstable c parameters. UMASS fixed the c parameters for these items at .20, while MP tended to let them float. Later, we received new .par files from MP that more closely matched ours.

Notes for ELA, Grade 10:

For the pre-equating of this test, we implemented the following procedure: We ran an initial calibration to obtain a .par file that was used as a template for the .ifl file that was

to be used in the final calibration. Two methods were employed in the final calibration to place the writing prompts on the same scale as 2004. In the first method, only the common items were used in the analysis, with their 2004 item parameter values retrieved from the item bank. A final run was performed, skipping the common items. In the second method, both the common and equating items were read in, with their item parameter values obtained from the 2004 item bank. Another final calibration was performed, skipping the common and equating items. The TCCs were plotted for both solutions, the results compared, and no practically significant differences were found.

For the post-equating (FCIP), we implemented the following procedure: First, we ran an initial calibration to get initial parameter estimates for all items. We had trouble achieving convergence because of item 15 (3104364), so we needed to set the priors for this item equal to the 2004 values from the item bank. Convergence was achieved, but because three items had c=0.0, we fixed these to c=0.20. Parameter values for all items were then obtained.

Next, we took the parameter estimates file and, for the equating items, replaced the a, b, and c values with the values found in the 2004 item bank received from CTB. This file was used to help fix the values in the final calibration.

Next, we ran the final calibration, skipping the equating items, to place the scoring items on the same scale, but again had trouble getting it to converge. We had the same problem with item 15, so we used the same strategy as the initial calibration. Again, we fixed the item parameters for item 15 equal to the 2004 values from the item bank. Also, three items 16 (3104363), 25 (3107206), and 31 (3066727) had to have c set to .20 because of the zero c parameter problem. Finally, convergence was achieved.

Finally, we plotted the TCC. For 2004 common items, values came from the 2004 .par file sent to us by CTB. We checked some items, and matched the values found in the 2004 item bank. For 2005, we used the item parameters for the common items from the final Parscale run.

In summary, for grade 10 ELA we took the item parameters for the equating items from the 2004 item bank

Notes for Math, Grade 10:

For the pre-equating of the 2005 test, we implemented the following procedure: The 2004 .par file was received from the contractor. A .par file for 2005 was created and populated with the item parameter values for the common items from the item bank. If there were multiple listings for an item, only the latest (2004) item parameter values were used. The TCCs were plotted and a conversion table obtained.

For the post-equating solution (FCIP), we first ran an initial calibration to get initial parameter estimates for all items, and we achieved convergence with no problematic items.

Next, we took this parameter estimates file and, for the equating items, replaced the a, b, and c values with the values found in the 2004 item bank received from CTB. This file was used to help fix the values in the final calibration.

We ran the final calibration, skipping the equating items, to place the scoring items on the same scale. We had trouble achieving convergence because of item 15 (3101585), so we fixed the c parameter at .20 and achieved convergence.

Finally, we plotted the TCC. For 2004 common items, values came from the 2004 .par file sent to us by CTB. We checked some items, and they matched the values found in the 2004 item bank. For 2005, we used the item parameters for the common items from the final PARSCALE run.

Figure 1. MCAS ELA Grade 4 Delta-Plot: 2004 vs. 2005

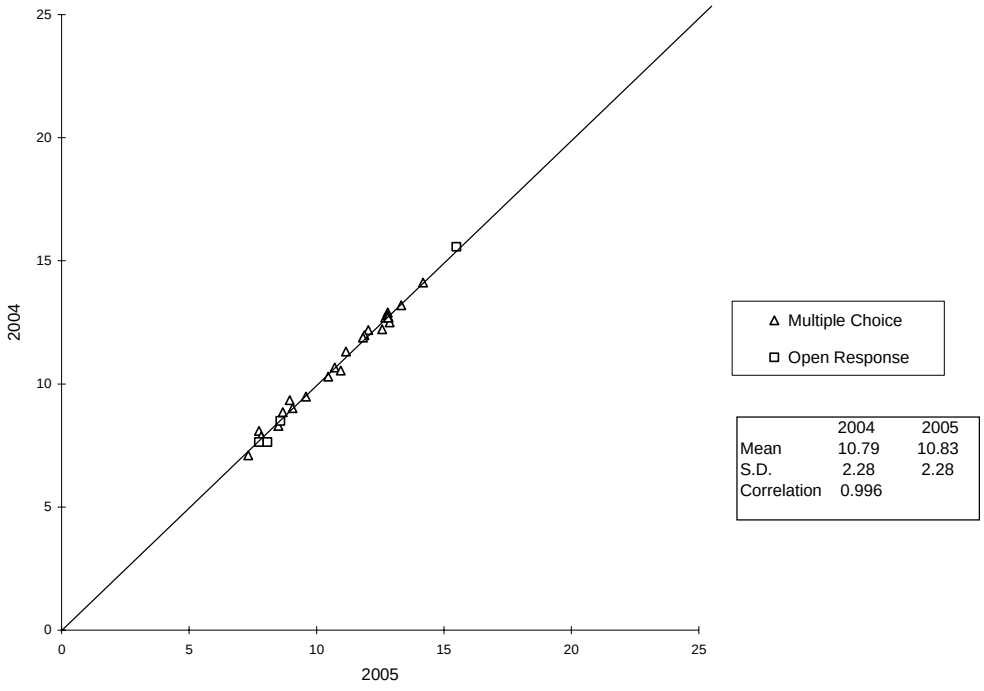

Figure 2. MCAS ELA Grade 4 b-Plot: 2004 vs. 2005

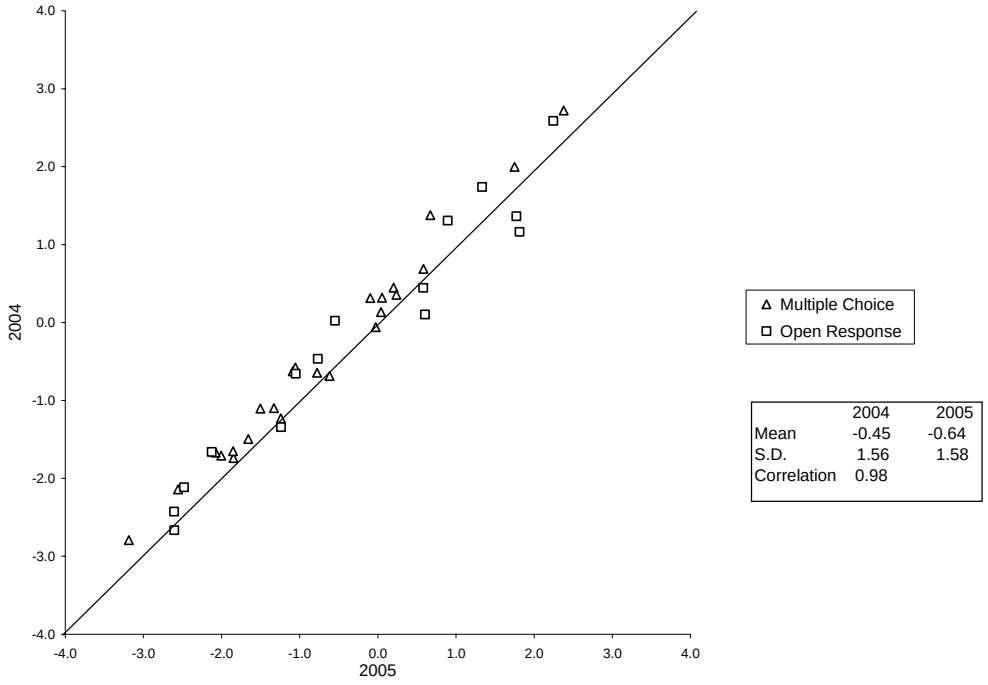

Figure 3. MCAS ELA Grade 4 a-Plot: 2004 vs. 2005

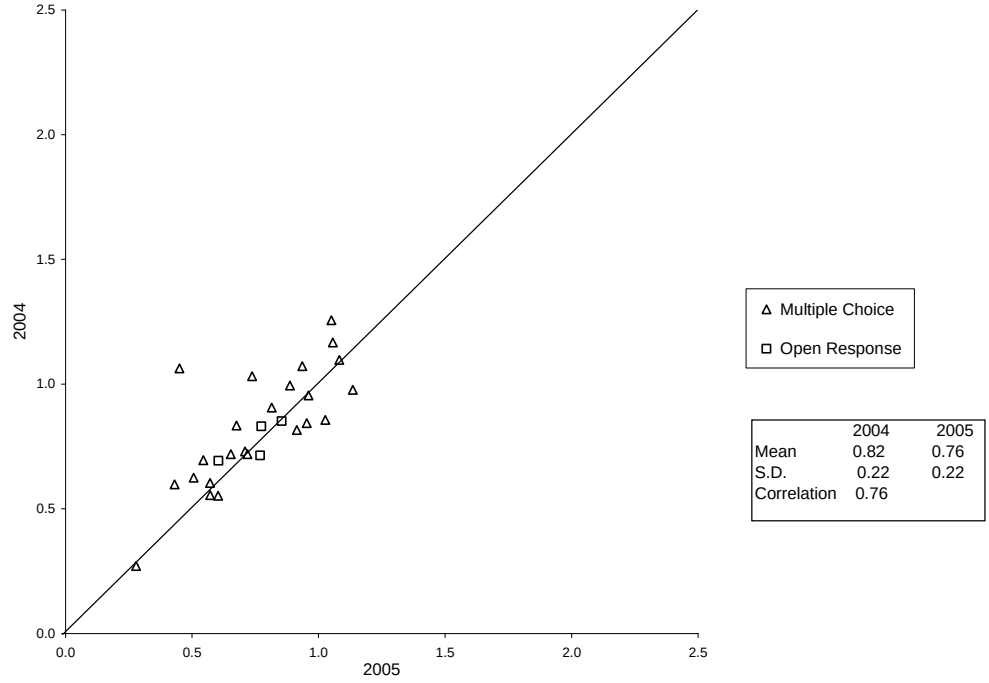

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Figure 4. MCAS ELA Grade 4 TCC: 2004 vs. 2005
(Scoring item 220781 had an unstable c parameter estimate during calibration. When the c parameter estimate of the item was fixed to 0.20, we obtained convergence.)

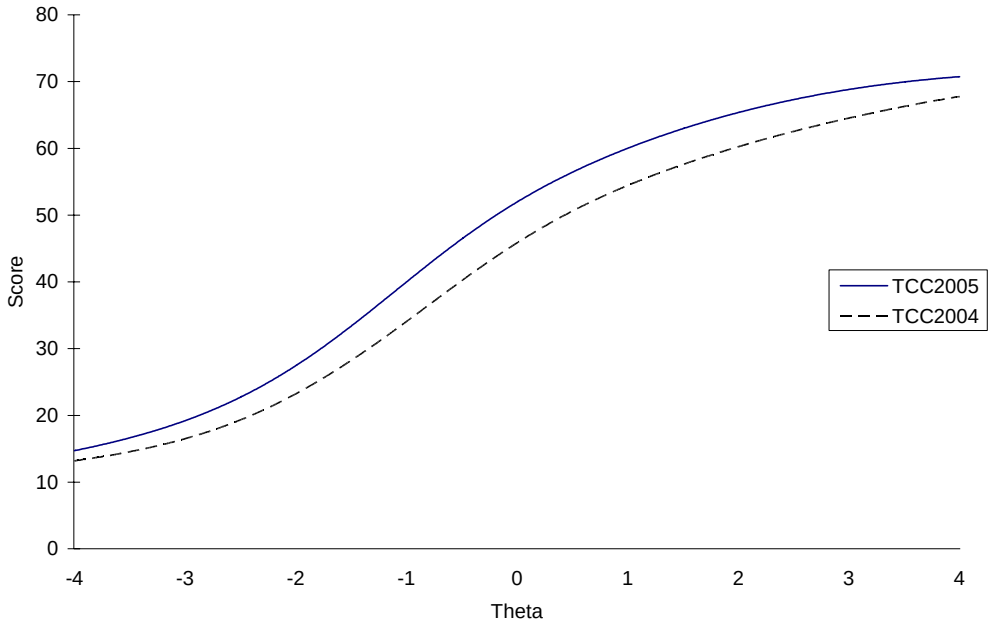

Figure 5. MCAS ELA Grade 7 Delta-Plot: 2004 vs. 2005

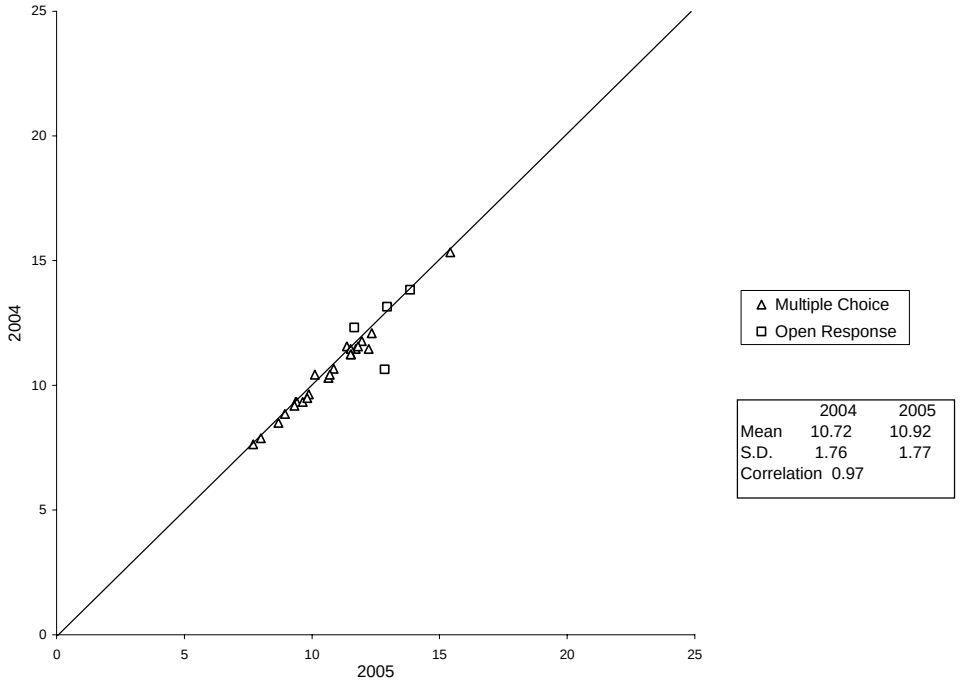

Table 1. 2005 ELA Grade 4

UMass Solution			MP Solution			
Conversion Table			Conversion Table			
E(2005)	Theta	E(2004)	E(2005)	Theta	E(2004)	Diff(2004): UMass-MP
4	-4.000	4.000	4	-4.000	4.000	0
5	-4.000	4.816	5	-4.000	4.817	0
6	-4.000	5.804	6	-4.000	5.805	0
7	-4.000	6.791	7	-4.000	6.793	0
8	-4.000	7.779	8	-4.000	7.781	0
9	-4.000	8.767	9	-4.000	8.769	0
10	-4.000	9.755	10	-4.000	9.757	0
11	-4.000	10.743	11	-4.000	10.745	0
12	-4.000	11.731	12	-4.000	11.733	0
13	-4.000	12.719	13	-4.000	12.721	0
14	-4.000	13.384	14	-4.000	13.384	0
15	-3.915	13.384	15	-3.915	13.384	0
16	-3.645	14.105	16	-3.645	14.105	0
17	-3.415	14.832	17	-3.415	14.832	0
18	-3.215	15.568	18	-3.215	15.568	0
19	-3.035	16.33	19	-3.035	16.33	0
20	-2.875	17.099	20	-2.875	17.099	0
21	-2.725	17.907	21	-2.725	17.907	0
22	-2.585	18.745	22	-2.595	18.682	0.06
23	-2.465	19.531	23	-2.465	19.531	0
24	-2.345	20.383	24	-2.355	20.309	0.07
25	-2.245	21.144	25	-2.245	21.144	0
26	-2.135	22.034	26	-2.135	22.034	0
27	-2.045	22.804	27	-2.045	22.804	0
28	-1.945	23.702	28	-1.945	23.702	0
29	-1.855	24.548	29	-1.855	24.548	0
30	-1.775	25.329	30	-1.775	25.329	0
31	-1.685	26.238	31	-1.685	26.238	0
32	-1.605	27.072	32	-1.605	27.072	0
33	-1.525	27.93	33	-1.525	27.93	0
34	-1.445	28.81	34	-1.455	28.699	0.11
35	-1.375	29.597	35	-1.375	29.597	0
36	-1.295	30.514	36	-1.295	30.514	0
37	-1.225	31.331	37	-1.225	31.331	0
38	-1.145	32.279	38	-1.145	32.279	0
39	-1.075	33.12	39	-1.075	33.12	0
40	-0.995	34.091	40	-0.995	34.091	0
41	-0.925	34.948	41	-0.925	34.948	0
42	-0.845	35.932	42	-0.845	35.932	0
43	-0.775	36.795	43	-0.775	36.795	0
44	-0.695	37.78	44	-0.695	37.78	0
45	-0.615	38.76	45	-0.615	38.76	0

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Table 1. 2005 ELA Grade 4

UMass Solution			MP Solution			
Conversion Table			Conversion Table			
E(2005)	Theta	E(2004)	E(2005)	Theta	E(2004)	Diff(2004): UMass-MP
46	-0.535	39.733	46	-0.535	39.733	0
47	-0.455	40.695	47	-0.455	40.695	0
48	-0.365	41.76	48	-0.365	41.76	0
49	-0.275	42.804	49	-0.275	42.804	0
50	-0.185	43.823	50	-0.185	43.823	0
51	-0.095	44.814	51	-0.095	44.814	0
52	0.005	45.881	52	0.005	45.881	0
53	0.105	46.909	53	0.105	46.909	0
54	0.215	47.995	54	0.215	47.995	0
55	0.325	49.033	55	0.325	49.033	0
56	0.445	50.111	56	0.445	50.111	0
57	0.575	51.217	57	0.575	51.217	0
58	0.705	52.262	58	0.705	52.262	0
59	0.845	53.323	59	0.845	53.323	0
60	0.995	54.394	60	0.995	54.394	0
61	1.155	55.468	61	1.155	55.468	0
62	1.325	56.54	62	1.325	56.54	0
63	1.505	57.608	63	1.505	57.608	0
64	1.705	58.722	64	1.705	58.722	0
65	1.915	59.819	65	1.915	59.819	0
66	2.155	60.991	66	2.155	60.991	0
67	2.415	62.172	67	2.415	62.172	0
68	2.715	63.431	68	2.715	63.431	0
69	3.065	64.777	69	3.065	64.777	0
70	3.525	66.361	70	3.525	66.361	0
71	4.000	72.000	71	4.000	72.000	0
72	4.000	72.000	72	4.000	72.000	0

Figure 6. MCAS ELA Grade 7 b-Plot: 2004 vs. 2005

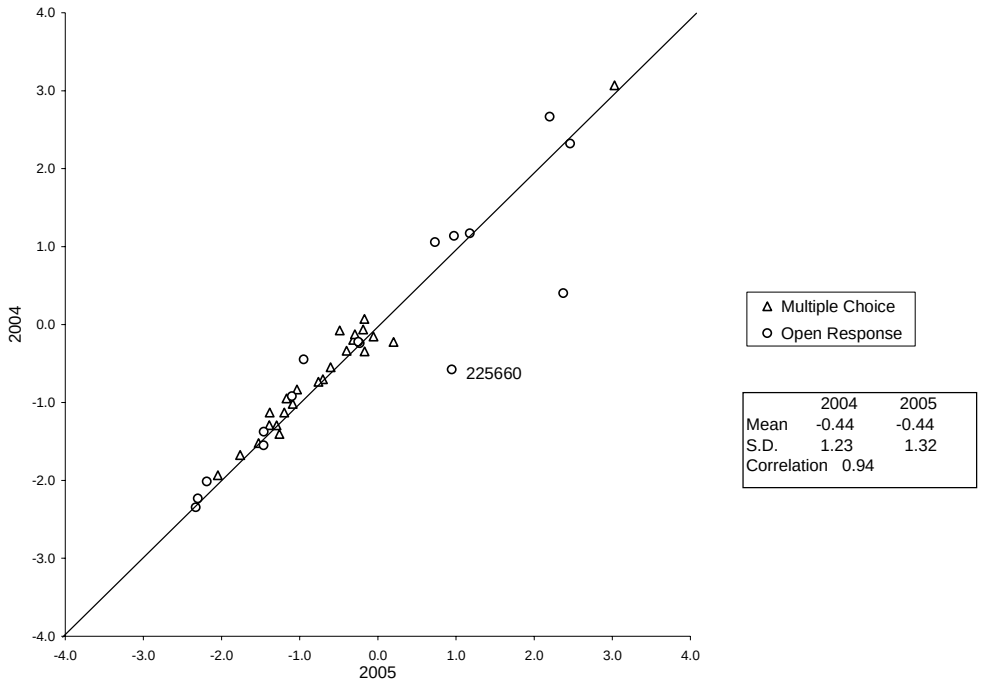

Figure 7. MCAS ELA Grade 7 a-Plot: 2004 vs. 2005

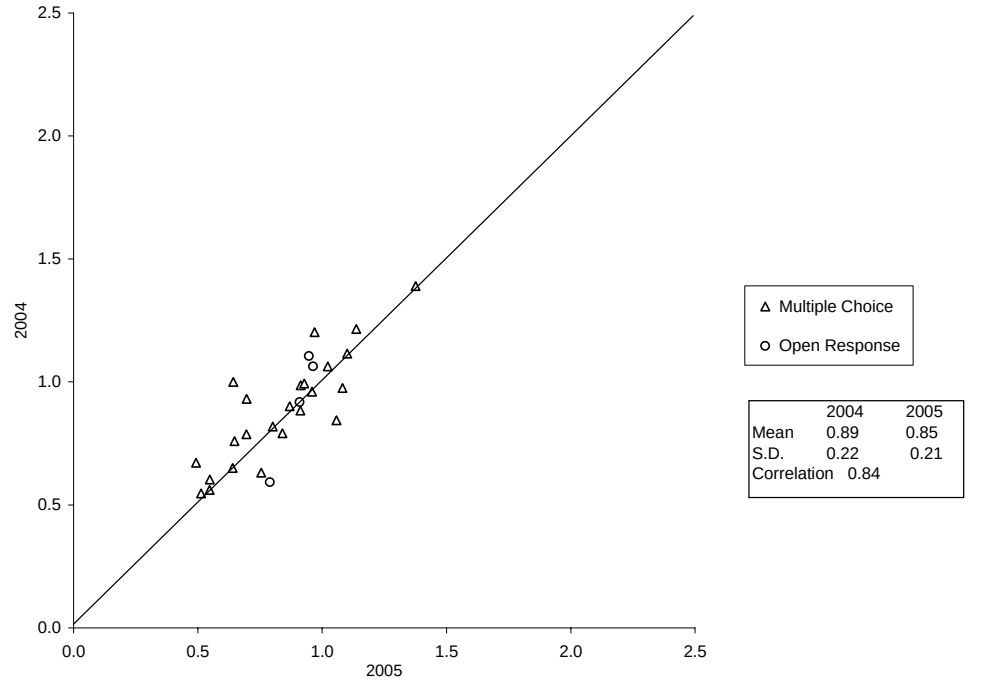

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Figure 8. MCAS ELA Grade 7 TCCs: 2004 vs. 2005
(Scoring items 224937 and 224991 had unstable c parameter estimates during calibration. Calibration was not achieved. When the c parameter estimates of these two items were fixed to 0.20, convergence was achieved.)

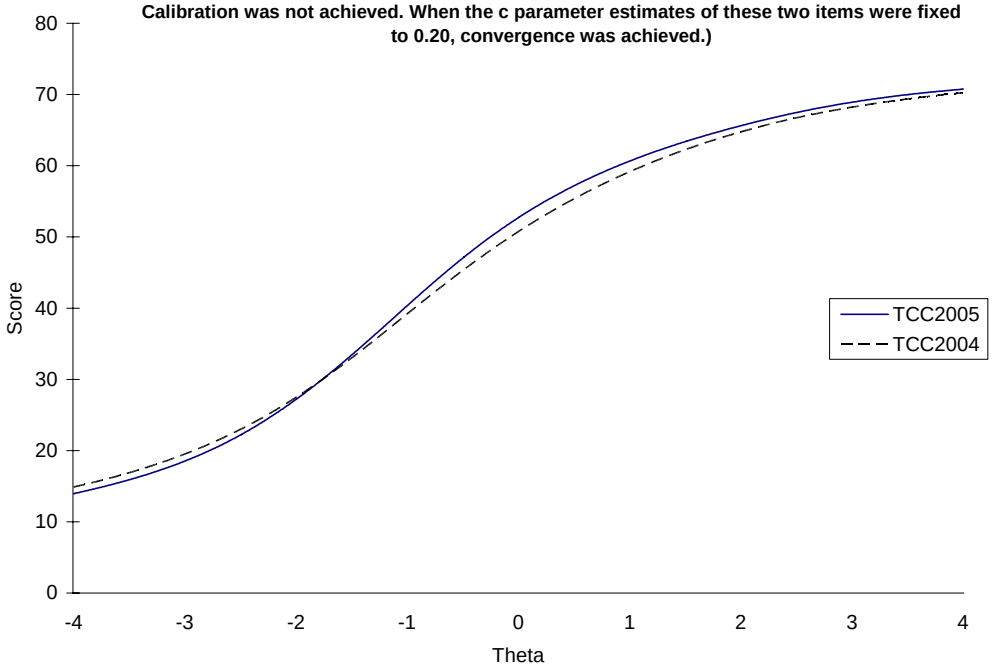

Figure 9. MCAS ELA Grade 7 TCCs: 2004 vs. 2005
(Revised-Item 225660 Deleted)

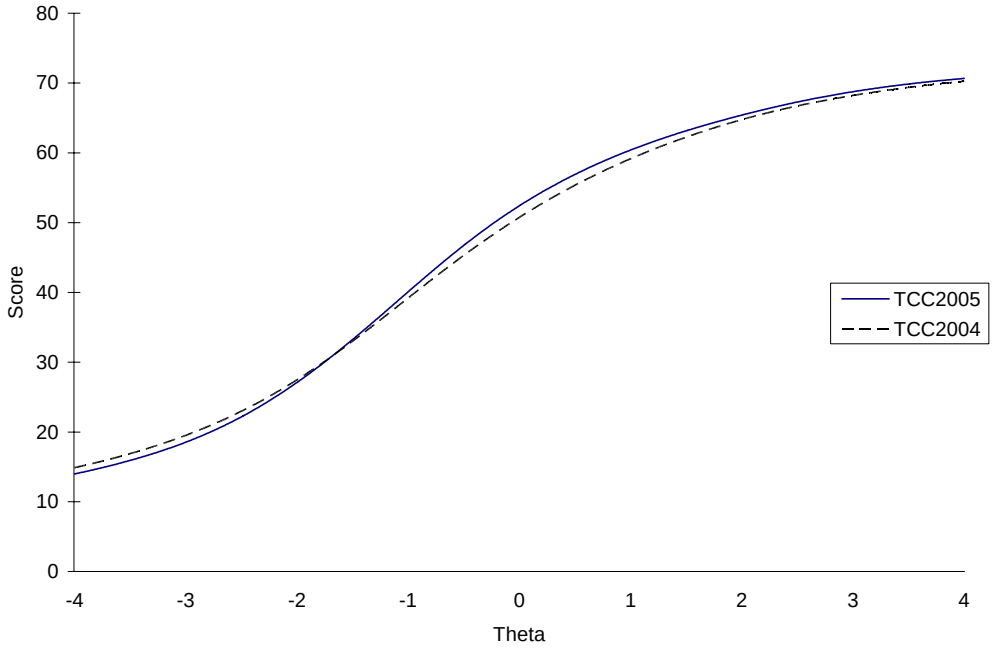

Table 2. 2005 ELA Grade 7

UMass Solution			MP Solution			
Conversion Table			Conversion Table			
E(2005)	Theta	E(2004)	E(2005)	Theta	E(2004)	Diff(2004): UMass-MP
4	-4.000	4.161	4	-4.000	4.171	-0.01
5	-4.000	5.165	5	-4.000	5.176	-0.01
6	-4.000	6.169	6	-4.000	6.182	-0.01
7	-4.000	7.173	7	-4.000	7.187	-0.01
8	-4.000	8.177	8	-4.000	8.192	-0.02
9	-4.000	9.181	9	-4.000	9.197	-0.02
10	-4.000	10.185	10	-4.000	10.203	-0.02
11	-4.000	11.189	11	-4.000	11.208	-0.02
12	-4.000	12.193	12	-4.000	12.213	-0.02
13	-4.000	13.197	13	-4.000	13.218	-0.02
14	-3.985	14.933	14	-3.995	14.897	0.04
15	-3.715	15.961	15	-3.725	15.92	0.04
16	-3.475	17	16	-3.485	16.954	0.05
17	-3.265	18.025	17	-3.275	17.973	0.05
18	-3.085	19.004	18	-3.095	18.947	0.06
19	-2.925	19.961	19	-2.925	19.961	0
20	-2.775	20.941	20	-2.775	20.941	0
21	-2.645	21.858	21	-2.645	21.858	0
22	-2.525	22.765	22	-2.525	22.765	0
23	-2.405	23.732	23	-2.405	23.732	0
24	-2.305	24.585	24	-2.295	24.672	-0.09
25	-2.205	25.481	25	-2.195	25.574	-0.09
26	-2.105	26.422	26	-2.105	26.422	0
27	-2.015	27.307	27	-2.005	27.407	-0.1
28	-1.925	28.227	28	-1.925	28.227	0
29	-1.845	29.073	29	-1.835	29.181	-0.11
30	-1.765	29.945	30	-1.755	30.056	-0.11
31	-1.685	30.842	31	-1.675	30.956	-0.11
32	-1.605	31.761	32	-1.595	31.878	-0.12
33	-1.535	32.583	33	-1.515	32.82	-0.24
34	-1.455	33.539	34	-1.445	33.66	-0.12
35	-1.385	34.389	35	-1.375	34.511	-0.12
36	-1.315	35.249	36	-1.295	35.496	-0.25
37	-1.235	36.241	37	-1.225	36.366	-0.12
38	-1.165	37.116	38	-1.155	37.241	-0.13
39	-1.095	37.994	39	-1.075	38.245	-0.25
40	-1.025	38.873	40	-1.005	39.124	-0.25
41	-0.955	39.751	41	-0.935	40.002	-0.25
42	-0.885	40.626	42	-0.865	40.875	-0.25
43	-0.805	41.619	43	-0.785	41.866	-0.25
44	-0.735	42.48	44	-0.715	42.725	-0.24
45	-0.655	43.453	45	-0.635	43.694	-0.24
46	-0.585	44.293	46	-0.555	44.649	-0.36

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Table 2. 2005 ELA Grade 7

UMass Solution			MP Solution			
Conversion Table			Conversion Table			
E(2005)	Theta	E(2004)	E(2005)	Theta	E(2004)	Diff(2004): UMass-MP
47	-0.505	45.237	47	-0.475	45.586	-0.35
48	-0.425	46.163	48	-0.395	46.505	-0.34
49	-0.335	47.182	49	-0.315	47.405	-0.22
50	-0.255	48.067	50	-0.225	48.393	-0.33
51	-0.165	49.036	51	-0.135	49.354	-0.32
52	-0.065	50.082	52	-0.045	50.287	-0.21
53	0.025	50.994	53	0.055	51.291	-0.3
54	0.135	52.07	54	0.165	52.357	-0.29
55	0.235	53.013	55	0.275	53.381	-0.37
56	0.355	54.1	56	0.385	54.364	-0.26
57	0.475	55.139	57	0.515	55.474	-0.34
58	0.605	56.211	58	0.645	56.53	-0.32
59	0.745	57.305	59	0.785	57.607	-0.3
60	0.895	58.412	60	0.935	58.696	-0.28
61	1.055	59.52	61	1.095	59.786	-0.27
62	1.235	60.683	62	1.275	60.93	-0.25
63	1.425	61.821	63	1.465	62.049	-0.23
64	1.625	62.925	64	1.675	63.187	-0.26
65	1.855	64.083	65	1.905	64.319	-0.24
66	2.095	65.168	66	2.145	65.378	-0.21
67	2.365	66.242	67	2.415	66.425	-0.18
68	2.665	67.267	68	2.725	67.453	-0.19
69	3.035	68.32	69	3.095	68.472	-0.15
70	3.505	69.391	70	3.575	69.529	-0.14
71	4.000	72.000	71	4.000	72.000	0
72	4.000	72.000	72	4.000	72.000	0

Figure 10. MCAS ELA Grade 10 Equating Items Delta-Plot: 2004 vs. 2005

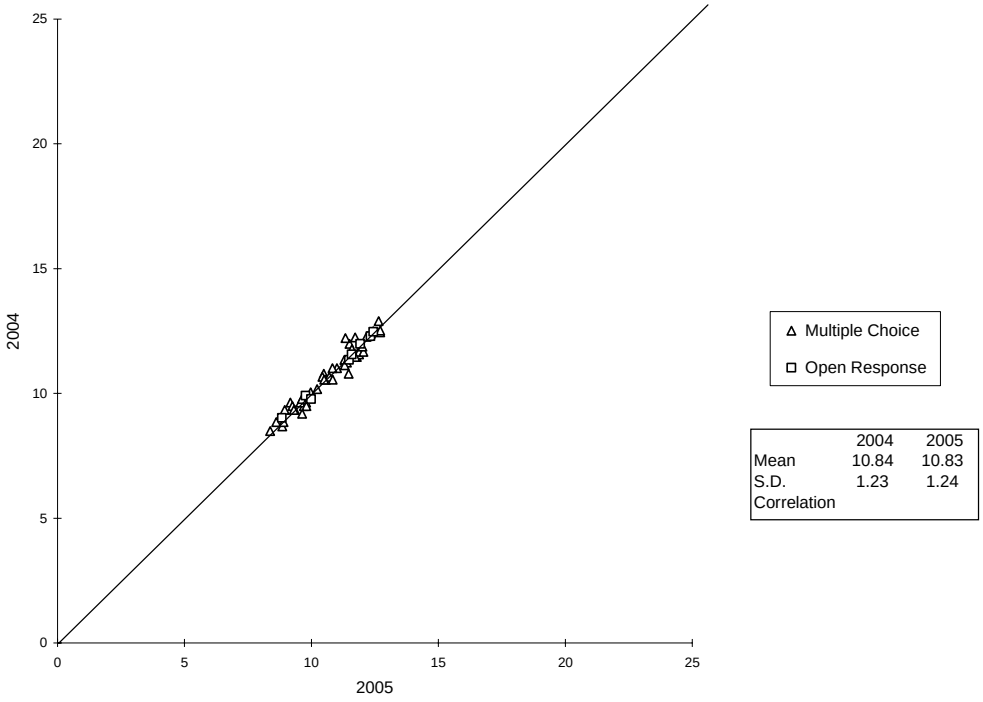

Figure 11. MCAS ELA Grade 10 Scoring Items b-Plot: 2005 Pre-equating vs. 2005 Post-equating

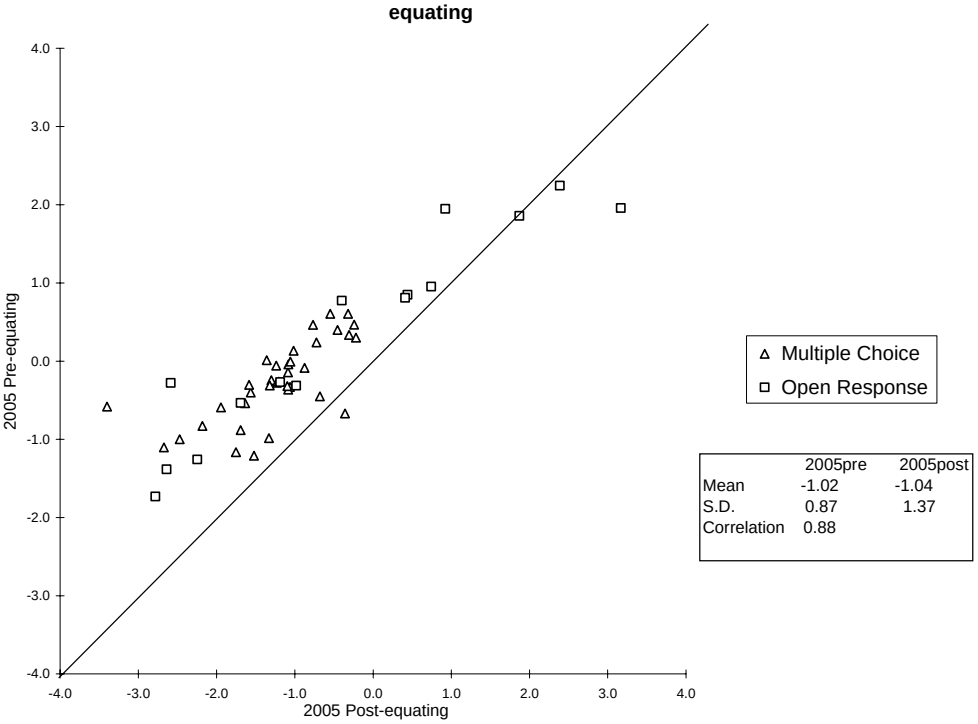

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Figure 12. MCAS ELA Grade 10 Scoring Items a-Plot: 2005 Pre-equating vs. 2005 Post-equating

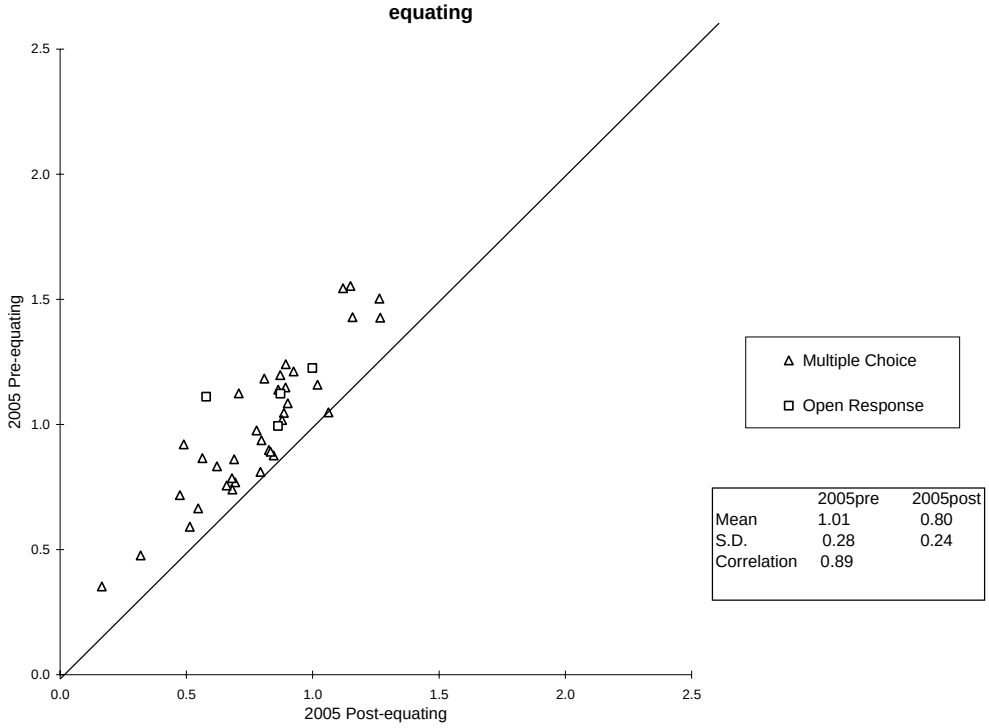

Figure 13. MCAS ELA Grade 10 Equating Items b-Plot: 2004 vs. 2005

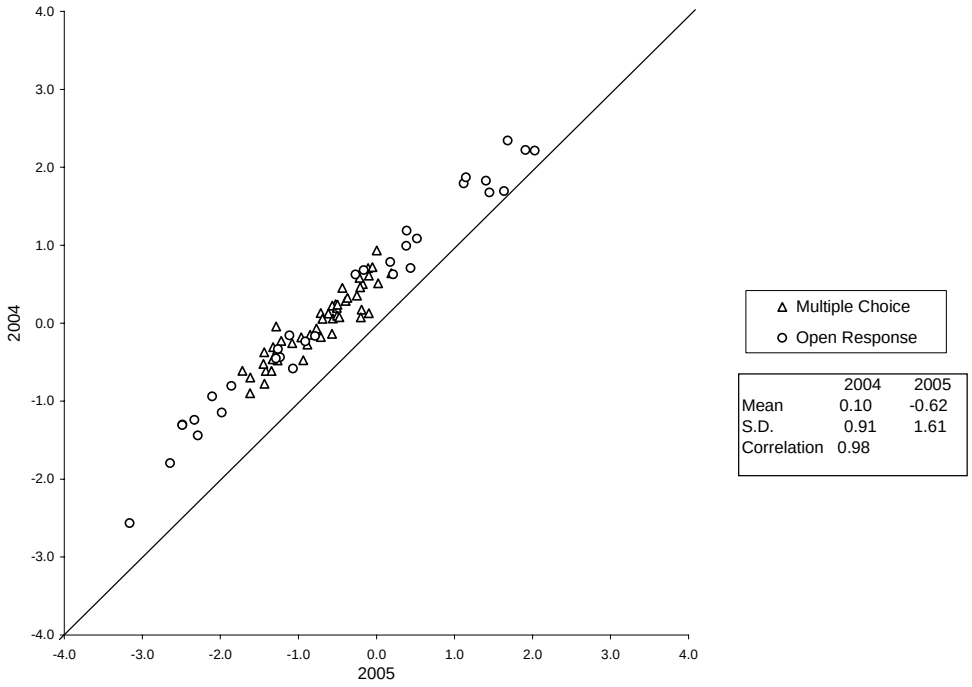

Figure 14. MCAS ELA Grade 10 Equating Items a-Plot: 2004 vs. 2005

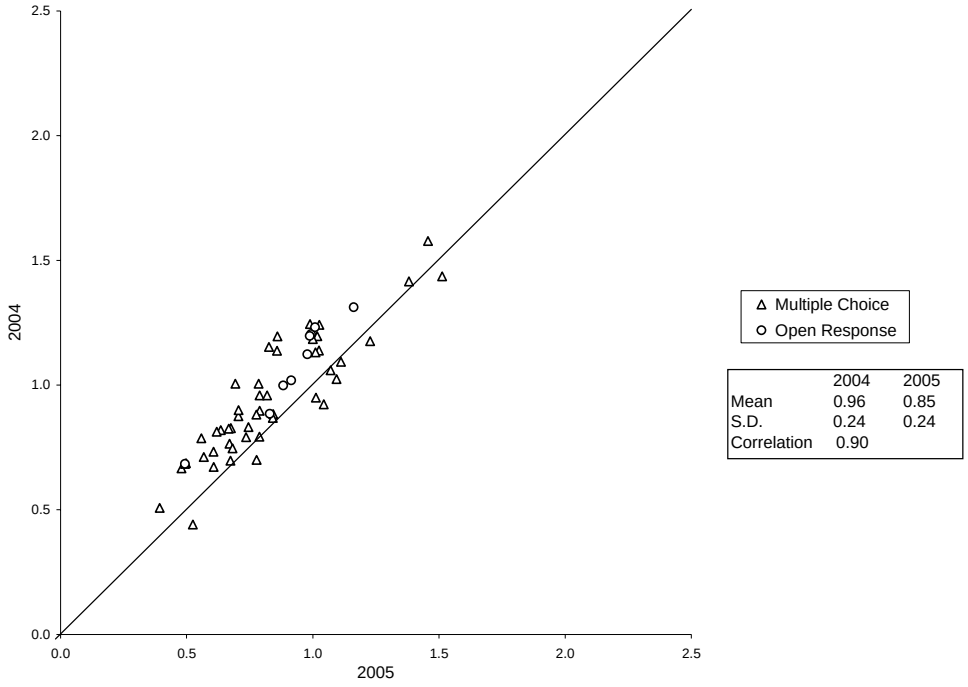

Figure 15. MCAS ELA Grade 10 TCC: 2004 vs. 2005 (Pre-equating--Equating Items Included)

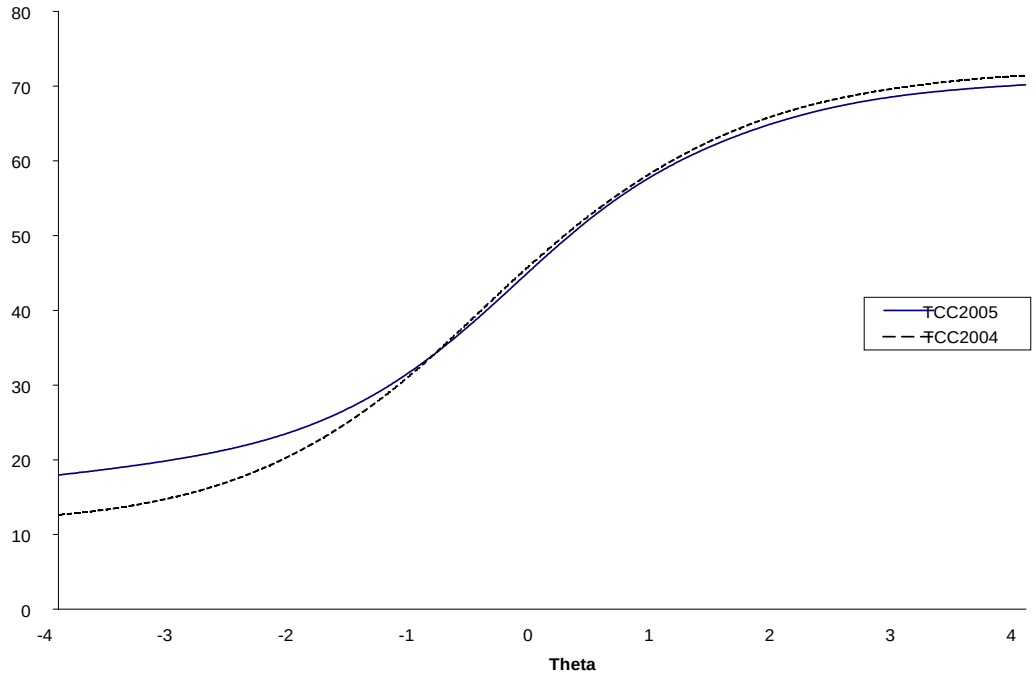

Figure 16. MCAS ELA Grade 10 TCC: 2004 vs. 2005 (Pre-equating--Equating Items Excluded)

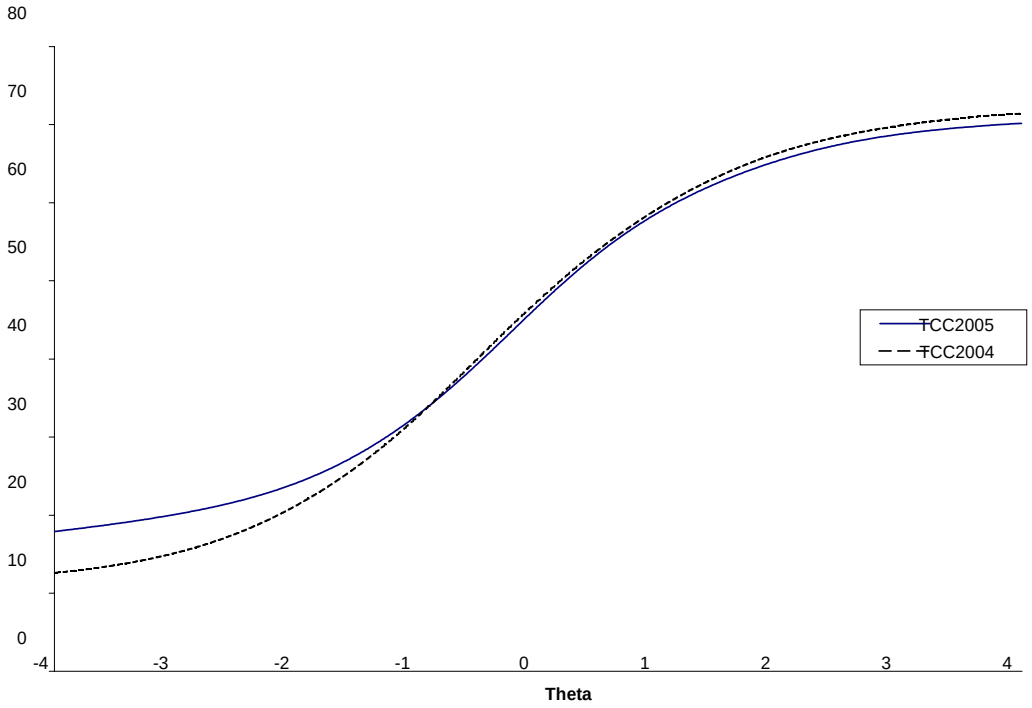

Figure 17. MCAS ELA Grade 10 TCC: 2004 vs. 2005 (Post-equating, Preliminary)
(Convergence not achieved in the final calibration due to common Item 3104364, so this item was skipped in the final calibration. Item parameters were picked up from the item bank.)

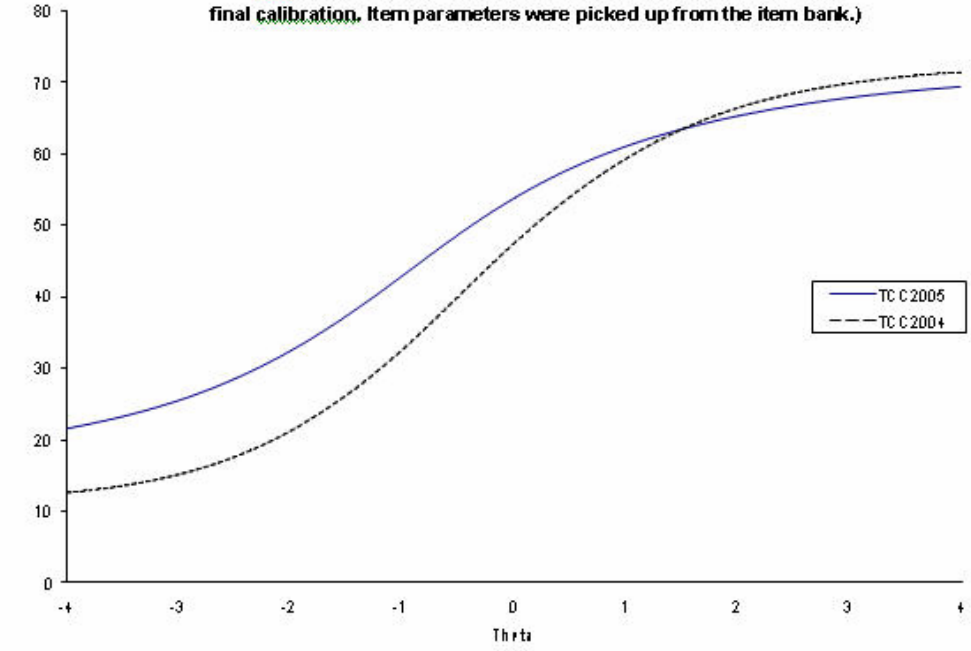

Figure 18. MCAS Math Grade 4 Delta-Plot: 2004 vs. 2005
(Equating items 222049, 222076, 222140 and 221884 were removed from the delta plot because no 2004 item parameters or p-values were made available to us.)

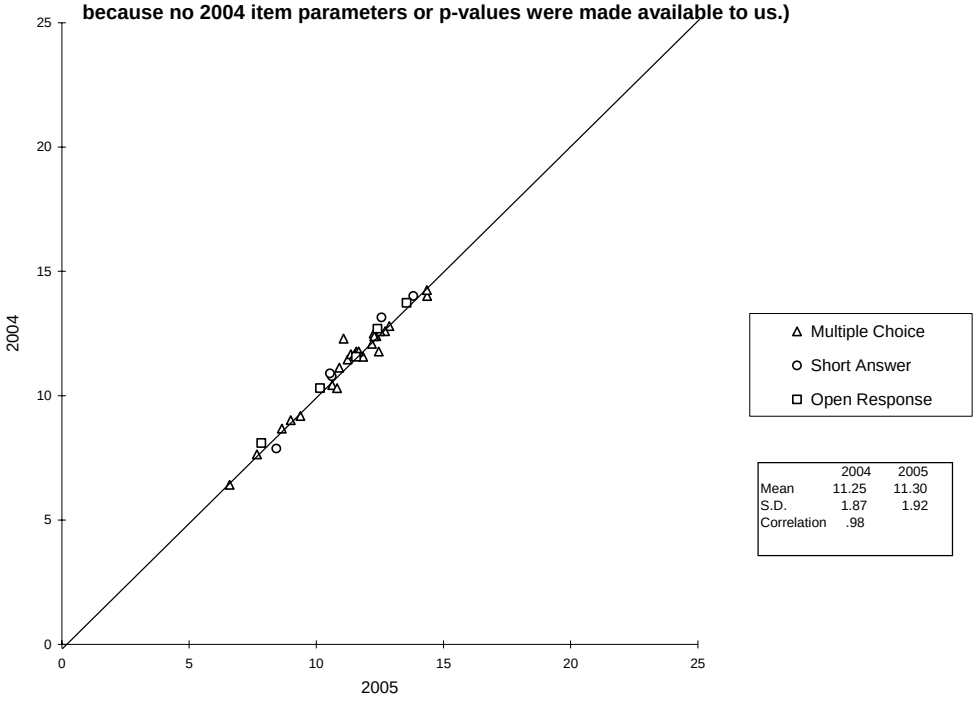

Figure 19. MCAS Math Grade 4 b-Plot: 2004 vs. 2005
(Equating items 222049, 222076, 222140 and 221884 were removed from the b plot because no 2004 item parameters were made available to us.)

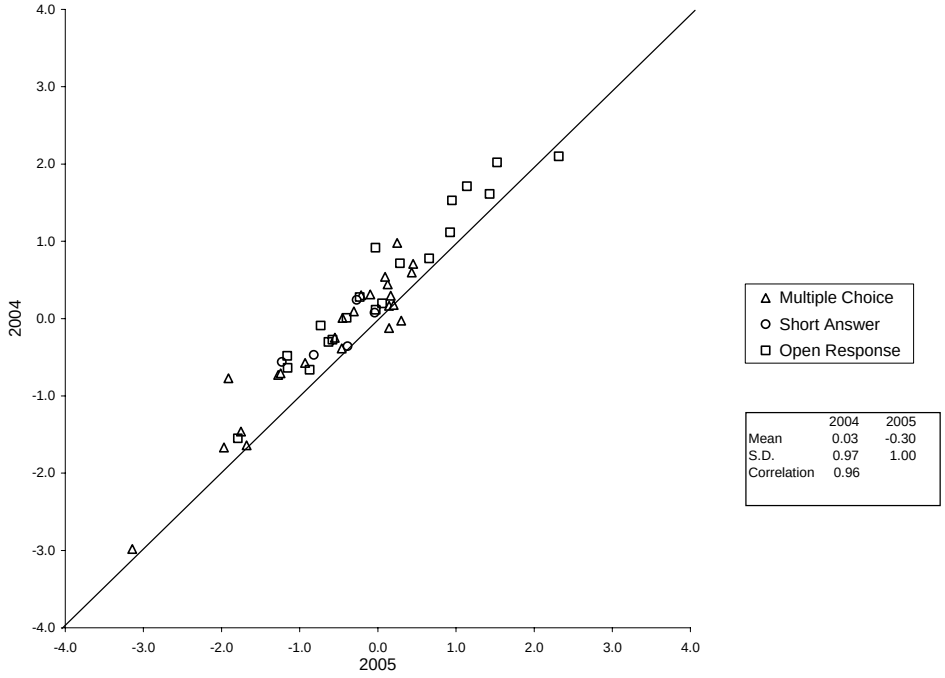

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Figure 20. MCAS Math Grade 4 a-Plot: 2004 vs. 2005
(Equating items 222049, 222076, 222140 and 221884 were removed from the a plot because no 2004 item parameters were made available to us.)

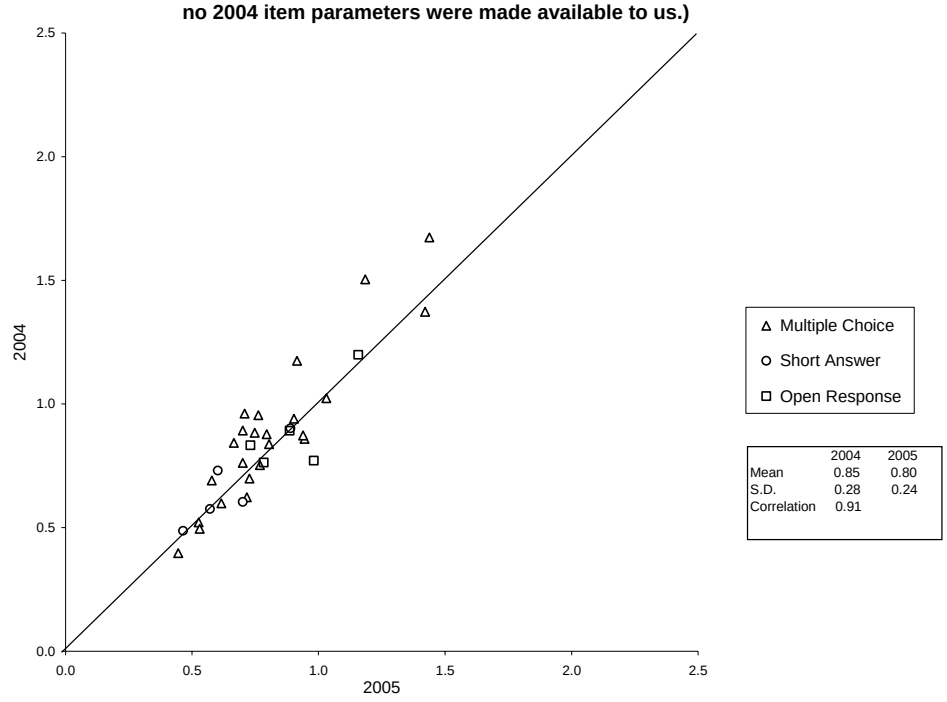

Figure 21. MCAS Math Grade 4 TCC: 2004 vs. 2005

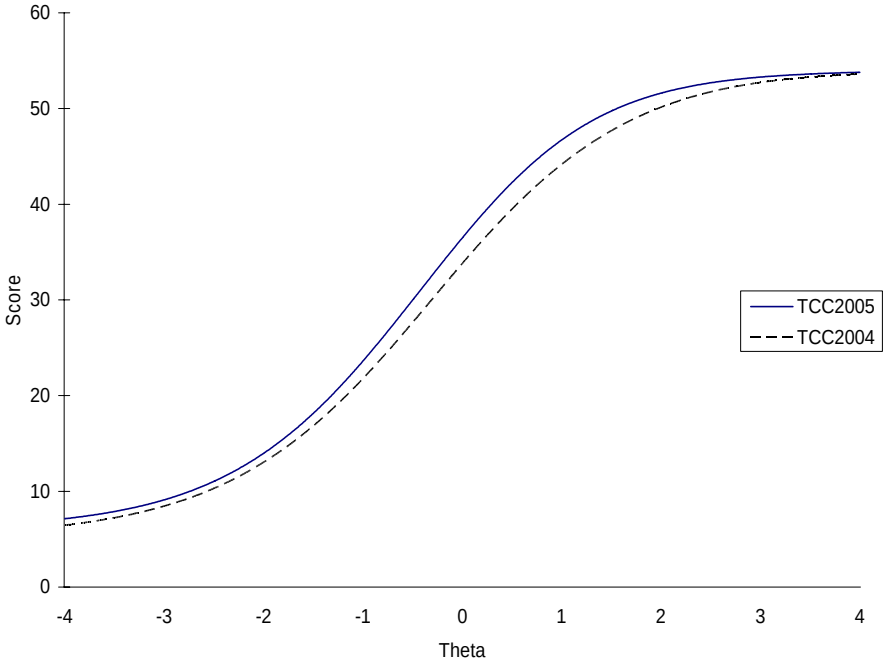

Table 3. 2005 Math Grade 4

UMass Solution			MP Solution			
Conversion Table			Conversion Table			
E(2005)	Theta	E(2004)	E(2005)	Theta	E(2004)	Diff(2004) UMass-MP
0	-4.000	0	0	-4.000	0	0
1	-4.000	0.542	1	-4.000	0.541	0
2	-4.000	1.497	2	-4.000	1.496	0
3	-4.000	2.453	3	-4.000	2.451	0
4	-4.000	3.408	4	-4.000	3.406	0
5	-4.000	4.364	5	-4.000	4.361	0
6	-4.000	5.319	6	-4.000	5.317	0
7	-4.000	6.275	7	-4.000	6.272	0
8	-3.445	7.351	8	-3.445	7.351	0
9	-3.035	8.35	9	-3.035	8.35	0
10	-2.745	9.301	10	-2.745	9.301	0
11	-2.505	10.278	11	-2.505	10.278	0
12	-2.315	11.194	12	-2.315	11.194	0
13	-2.145	12.13	13	-2.145	12.13	0
14	-1.995	13.055	14	-1.995	13.055	0
15	-1.865	13.936	15	-1.855	14.007	-0.07
16	-1.735	14.894	16	-1.735	14.894	0
17	-1.625	15.766	17	-1.625	15.766	0
18	-1.515	16.694	18	-1.515	16.694	0
19	-1.415	17.587	19	-1.415	17.587	0
20	-1.315	18.527	20	-1.315	18.527	0
21	-1.225	19.411	21	-1.225	19.411	0
22	-1.135	20.332	22	-1.135	20.332	0
23	-1.055	21.178	23	-1.055	21.178	0
24	-0.965	22.161	24	-0.965	22.161	0
25	-0.885	23.06	25	-0.885	23.06	0
26	-0.805	23.98	26	-0.805	23.98	0
27	-0.725	24.919	27	-0.725	24.919	0
28	-0.655	25.754	28	-0.655	25.754	0
29	-0.575	26.721	29	-0.575	26.721	0
30	-0.495	27.7	30	-0.495	27.7	0
31	-0.425	28.563	31	-0.425	28.563	0
32	-0.345	29.553	32	-0.345	29.553	0
33	-0.275	30.421	33	-0.265	30.545	-0.12
34	-0.195	31.412	34	-0.195	31.412	0
35	-0.115	32.398	35	-0.115	32.398	0
36	-0.035	33.377	36	-0.035	33.377	0
37	0.045	34.344	37	0.045	34.344	0
38	0.125	35.296	38	0.125	35.296	0
39	0.205	36.232	39	0.205	36.232	0

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Table 3. 2005 Math Grade 4

UMass Solution			MP Solution			
Conversion Table			Conversion Table			
E(2005)	Theta	E(2004)	E(2005)	Theta	E(2004)	Diff(2004) UMass-MP
40	0.295	37.261	40	0.295	37.261	0
41	0.385	38.261	41	0.385	38.261	0
42	0.475	39.23	42	0.475	39.23	0
43	0.575	40.267	43	0.575	40.267	0
44	0.675	41.26	44	0.675	41.26	0
45	0.785	42.299	45	0.785	42.299	0
46	0.905	43.368	46	0.905	43.368	0
47	1.035	44.449	47	1.045	44.529	-0.08
48	1.185	45.598	48	1.185	45.598	0
49	1.355	46.775	49	1.355	46.775	0
50	1.555	47.996	50	1.555	47.996	0
51	1.805	49.292	51	1.805	49.292	0
52	2.145	50.682	52	2.155	50.717	-0.03
53	2.725	52.249	53	2.725	52.249	0
54	4.000	54.000	54	4.000	54.000	0

Figure 22. MCAS Math Grade 6 Delta-Plot: 2004 vs. 2005
(Equating tems 227430, 226188 and 226187 were removed from the delta plot because no 2004 item parameters were made available to us.)

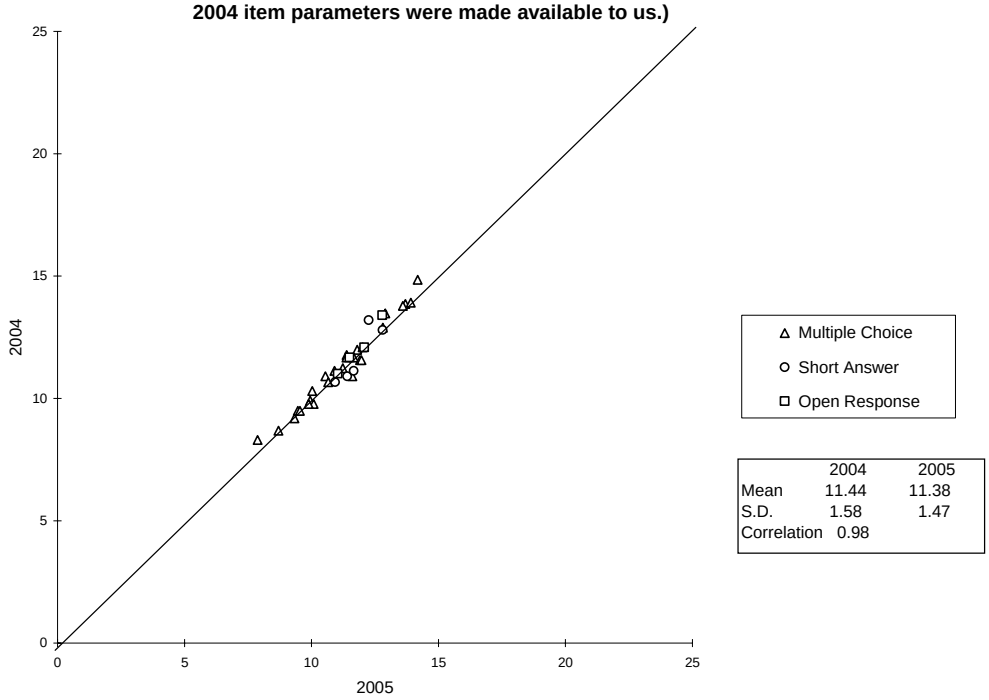

Figure 23. MCAS Math Grade 6 b-Plot: 2004 vs. 2005
(Equating tems 227430, 226188 and 226187 were removed from the b plot because no 2004 item parameters were made available to us.)

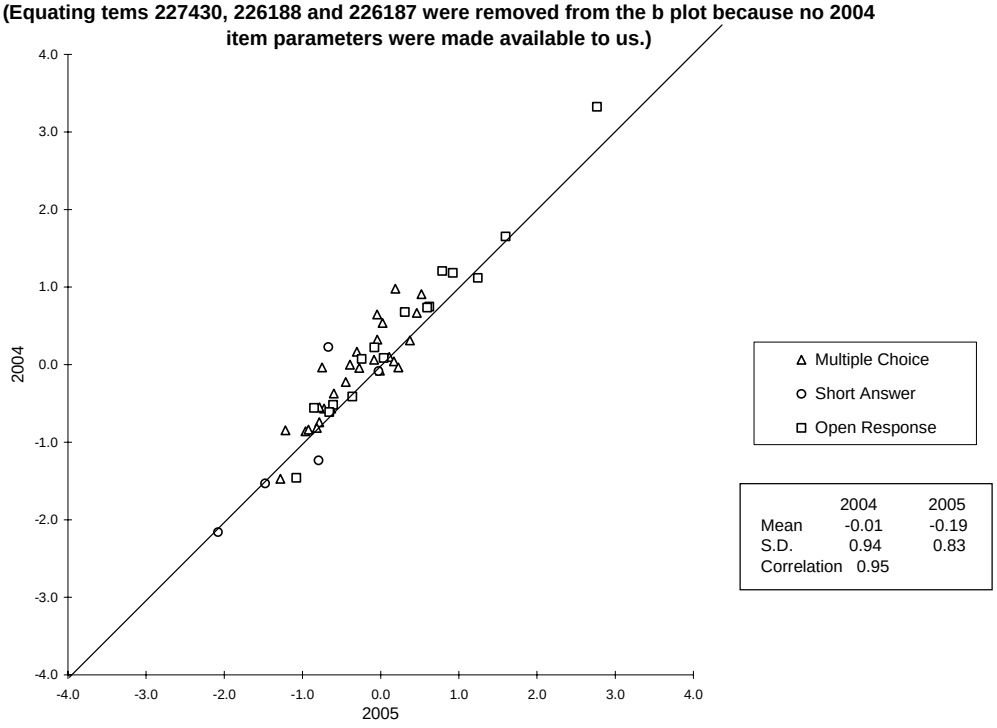

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Figure 24. MCAS Math Grade 6 a-Plot: 2004 vs. 2005
(Equating tems 227430, 226188 and 226187 were removed from the a plot because no 2004 item parameters were made available to us.)

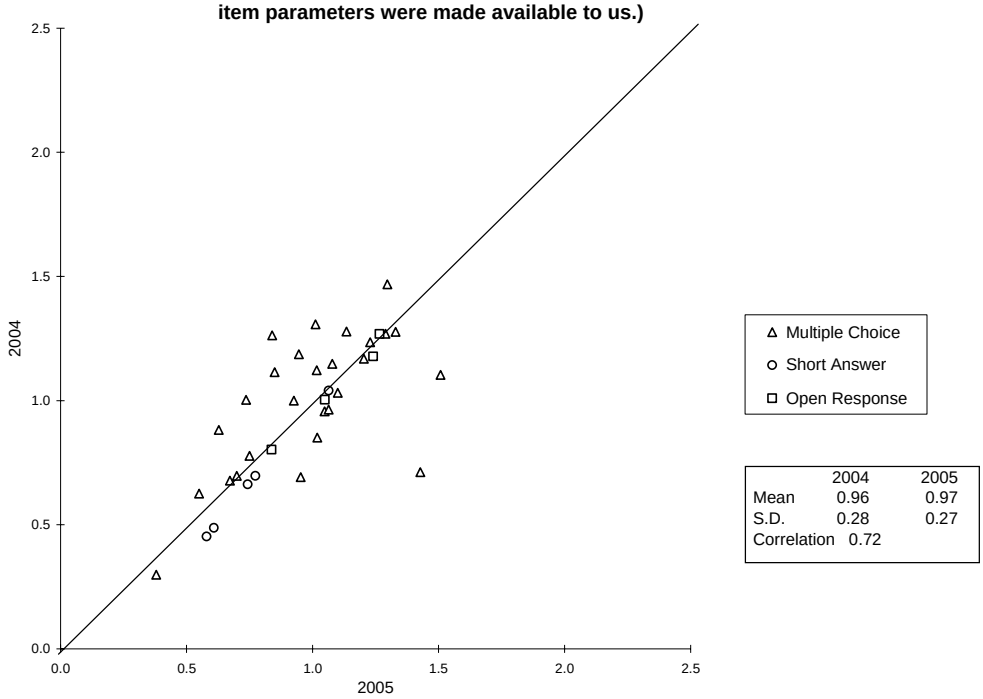

Figure 25. MCAS Math Grade 6 TCCs: 2004 vs. 2005
(Scoring items 226268 and 226339 had unstable c parameter estimates during caliration. When the c parameter estimates of these were fixed to 0.20, convergence was achieved.)

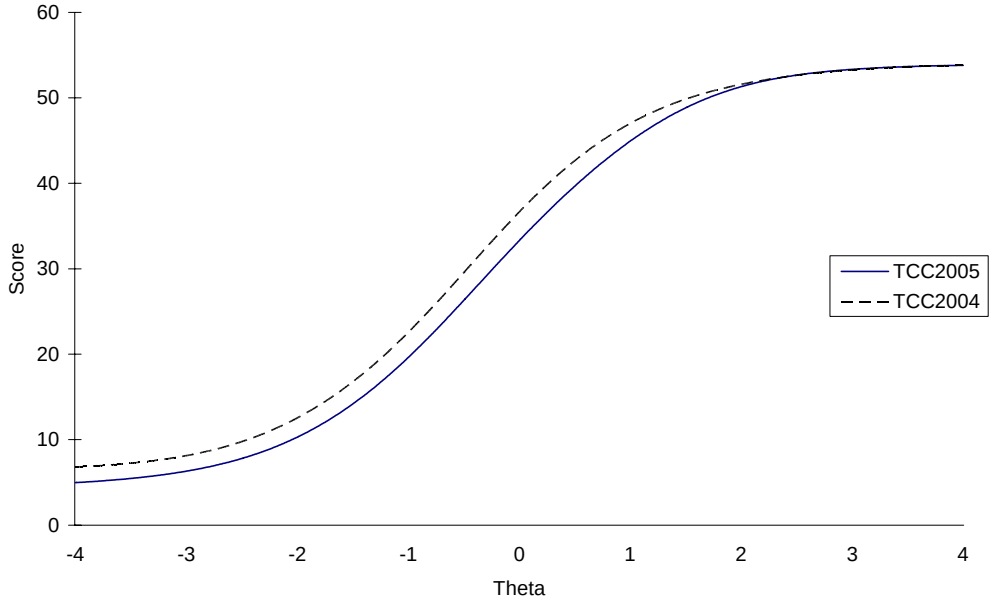

Table 4. 2005 Math Grade 6

UMass Solution			MP Solution			
Conversion Table			Conversion Table			
E(2005)	Theta	E(2004)	E(2005)	Theta	E(2004)	Diff(2004) UMass-MP
0	-4.000	1.466	0	-4.000	1.472	-0.01
1	-4.000	2.63	1	-4.000	2.637	-0.01
2	-4.000	3.794	2	-4.000	3.802	-0.01
3	-4.000	4.957	3	-4.000	4.967	-0.01
4	-4.000	6.121	4	-4.000	6.132	-0.01
5	-3.965	6.824	5	-3.955	6.83	-0.01
6	-3.155	7.797	6	-3.145	7.817	-0.02
7	-2.735	8.881	7	-2.735	8.881	0
8	-2.445	10.01	8	-2.445	10.01	0
9	-2.225	11.129	9	-2.225	11.129	0
10	-2.045	12.236	10	-2.045	12.236	0
11	-1.895	13.3	11	-1.895	13.3	0
12	-1.755	14.417	12	-1.755	14.417	0
13	-1.635	15.472	13	-1.635	15.472	0
14	-1.515	16.618	14	-1.515	16.618	0
15	-1.415	17.644	15	-1.415	17.644	0
16	-1.315	18.733	16	-1.315	18.733	0
17	-1.225	19.767	17	-1.225	19.767	0
18	-1.135	20.849	18	-1.135	20.849	0
19	-1.055	21.851	19	-1.055	21.851	0
20	-0.965	23.018	20	-0.965	23.018	0
21	-0.895	23.953	21	-0.895	23.953	0
22	-0.815	25.047	22	-0.815	25.047	0
23	-0.735	26.166	23	-0.735	26.166	0
24	-0.665	27.16	24	-0.665	27.16	0
25	-0.595	28.166	25	-0.595	28.166	0
26	-0.525	29.18	26	-0.525	29.18	0
27	-0.455	30.197	27	-0.445	30.342	-0.15
28	-0.375	31.359	28	-0.375	31.359	0
29	-0.305	32.372	29	-0.305	32.372	0
30	-0.235	33.376	30	-0.235	33.376	0
31	-0.165	34.369	31	-0.165	34.369	0
32	-0.095	35.345	32	-0.095	35.345	0
33	-0.025	36.303	33	-0.025	36.303	0
34	0.055	37.37	34	0.055	37.37	0
35	0.125	38.277	35	0.125	38.277	0
36	0.205	39.281	36	0.205	39.281	0
37	0.285	40.246	37	0.285	40.246	0
38	0.365	41.171	38	0.365	41.171	0
39	0.445	42.055	39	0.445	42.055	0
40	0.525	42.895	40	0.525	42.895	0

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Table 4. 2005 Math Grade 6

UMass Solution			MP Solution			
Conversion Table			Conversion Table			
E(2005)	Theta	E(2004)	E(2005)	Theta	E(2004)	Diff(2004) UMass-MP
41	0.615	43.789	41	0.615	43.789	0
42	0.705	44.627	42	0.705	44.627	0
43	0.805	45.495	43	0.805	45.495	0
44	0.905	46.297	44	0.905	46.297	0
45	1.005	47.035	45	1.005	47.035	0
46	1.125	47.838	46	1.125	47.838	0
47	1.245	48.558	47	1.245	48.558	0
48	1.375	49.251	48	1.375	49.251	0
49	1.525	49.948	49	1.525	49.948	0
50	1.705	50.657	50	1.705	50.657	0
51	1.925	51.367	51	1.925	51.367	0
52	2.215	52.095	52	2.215	52.095	0
53	2.715	52.951	53	2.715	52.951	0
54	4.000	54.000	54	4.000	54.000	0

Figure 26. MCAS Math Grade 8 Delta-Plot: 2004 vs. 2005

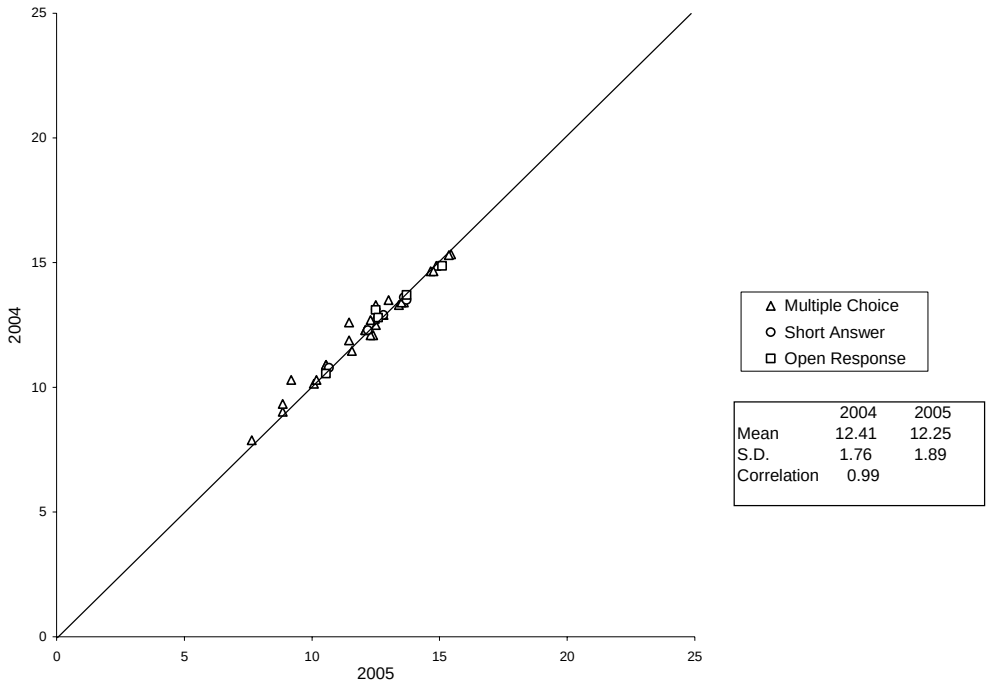

Figure 27. MCAS Math Grade 8 b-Plot: 2004 vs. 2005

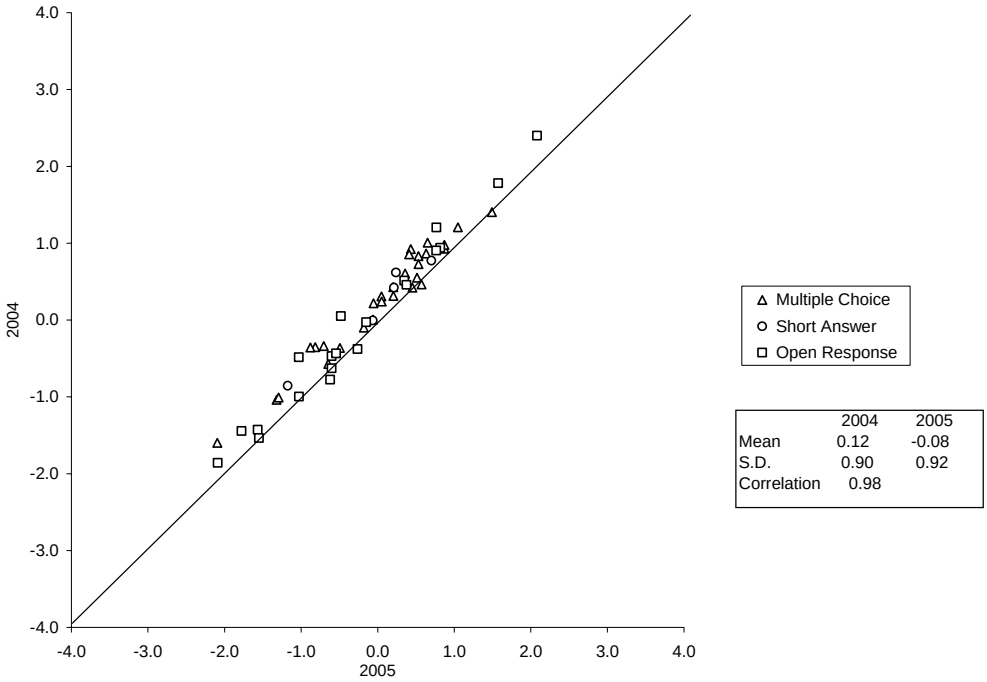

Figure 28. MCAS Math Grade 8 a-Plot: 2004 vs. 2005

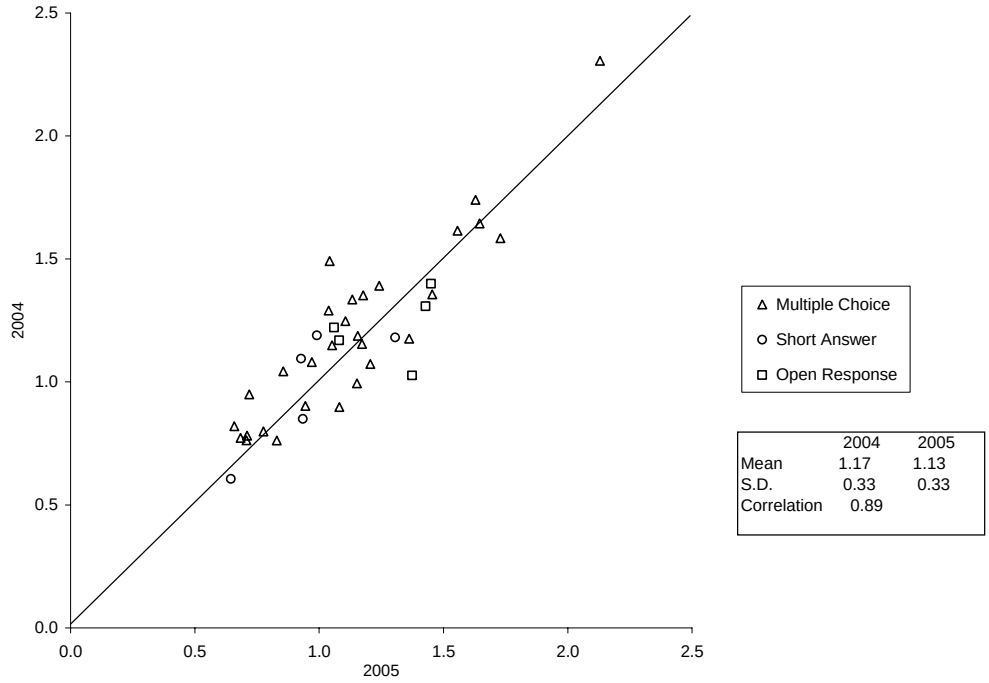

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Figure 29. MCAS Math Grade 8 TCCs: 2004 vs. 2005

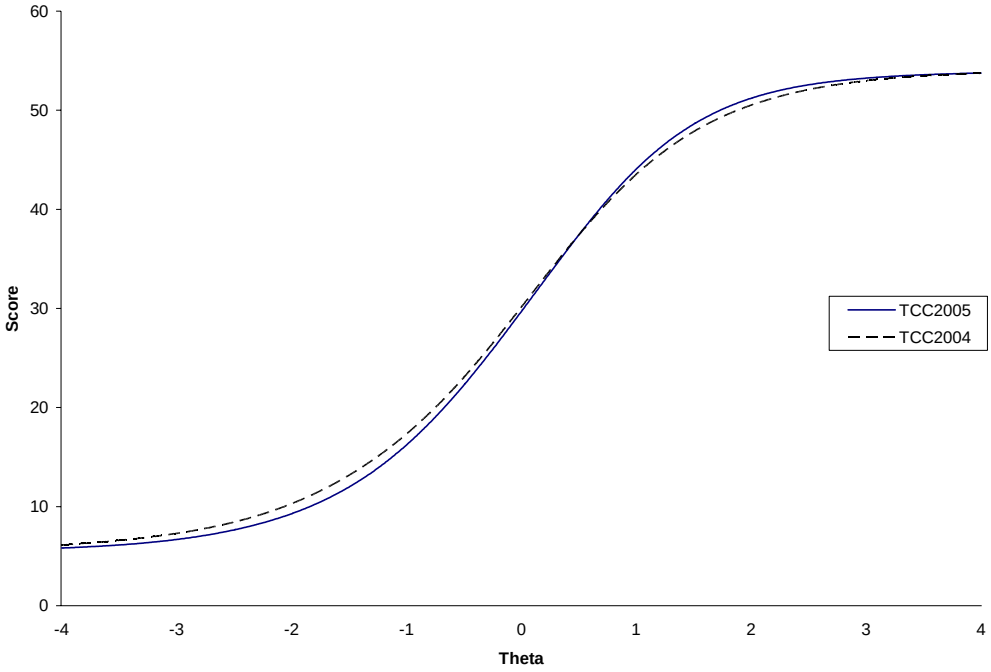

Table 5. 2005 Math Grade 8

UMass Solution			MP Solution			
Conversion Table			Conversion Table			
E(2005)	Theta	E(2004)	E(2005)	Theta	E(2004)	Diff(2004) UMass-MP
0	-4.000	0	0	-4.000	0	0
1	-4.000	0.858	1	-4.000	0.864	-0.01
2	-4.000	1.859	2	-4.000	1.866	-0.01
3	-4.000	2.86	3	-4.000	2.868	-0.01
4	-4.000	3.86	4	-4.000	3.87	-0.01
5	-4.000	4.861	5	-4.000	4.872	-0.01
6	-3.685	6.407	6	-3.685	6.407	0
7	-2.805	7.684	7	-2.815	7.663	0.02
8	-2.375	8.823	8	-2.385	8.79	0.03
9	-2.075	9.955	9	-2.085	9.912	0.04
10	-1.845	11.059	10	-1.855	11.006	0.05
11	-1.655	12.146	11	-1.665	12.084	0.06
12	-1.495	13.194	12	-1.515	13.056	0.14
13	-1.355	14.22	13	-1.375	14.067	0.15
14	-1.235	15.186	14	-1.255	15.019	0.17
15	-1.125	16.145	15	-1.135	16.055	0.09
16	-1.025	17.081	16	-1.035	16.985	0.1
17	-0.925	18.081	17	-0.945	17.876	0.21
18	-0.835	19.036	18	-0.855	18.819	0.22
19	-0.755	19.929	19	-0.765	19.815	0.11

Table 5. 2005 Math Grade 8

UMass Solution			MP Solution			
Conversion Table			Conversion Table			
E(2005)	Theta	E(2004)	E(2005)	Theta	E(2004)	Diff(2004) UMass-MP
20	-0.675	20.864	20	-0.685	20.745	0.12
21	-0.595	21.84	21	-0.605	21.716	0.12
22	-0.515	22.857	22	-0.535	22.599	0.26
23	-0.445	23.777	23	-0.465	23.511	0.27
24	-0.375	24.724	24	-0.395	24.451	0.27
25	-0.305	25.696	25	-0.325	25.416	0.28
26	-0.245	26.546	26	-0.255	26.403	0.14
27	-0.175	27.555	27	-0.185	27.41	0.15
28	-0.105	28.579	28	-0.125	28.285	0.29
29	-0.045	29.465	29	-0.055	29.317	0.15
30	0.015	30.357	30	0.005	30.208	0.15
31	0.085	31.4	31	0.075	31.251	0.15
32	0.145	32.292	32	0.135	32.144	0.15
33	0.215	33.329	33	0.195	33.034	0.3
34	0.275	34.21	34	0.265	34.064	0.15
35	0.345	35.226	35	0.325	34.938	0.29
36	0.405	36.084	36	0.395	35.942	0.14
37	0.475	37.066	37	0.455	36.788	0.28
38	0.535	37.89	38	0.525	37.754	0.14
39	0.605	38.828	39	0.595	38.696	0.13
40	0.675	39.738	40	0.665	39.609	0.13
41	0.755	40.74	41	0.745	40.617	0.12
42	0.825	41.582	42	0.815	41.463	0.12
43	0.905	42.502	43	0.895	42.389	0.11
44	0.995	43.481	44	0.985	43.375	0.11
45	1.085	44.399	45	1.075	44.3	0.1
46	1.185	45.346	46	1.175	45.255	0.09
47	1.295	46.3	47	1.285	46.217	0.08
48	1.415	47.24	48	1.405	47.165	0.07
49	1.555	48.209	49	1.545	48.144	0.06
50	1.725	49.217	50	1.715	49.163	0.05
51	1.945	50.285	51	1.935	50.242	0.04
52	2.245	51.394	52	2.235	51.362	0.03
53	2.775	52.65	53	2.765	52.633	0.02
54	4.000	54.000	54	4.000	54.000	0

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Figure 31. MCAS Math Grade 10 Scoring items b-Plot: 2005 Pre-equating vs. 2005 Post-equating

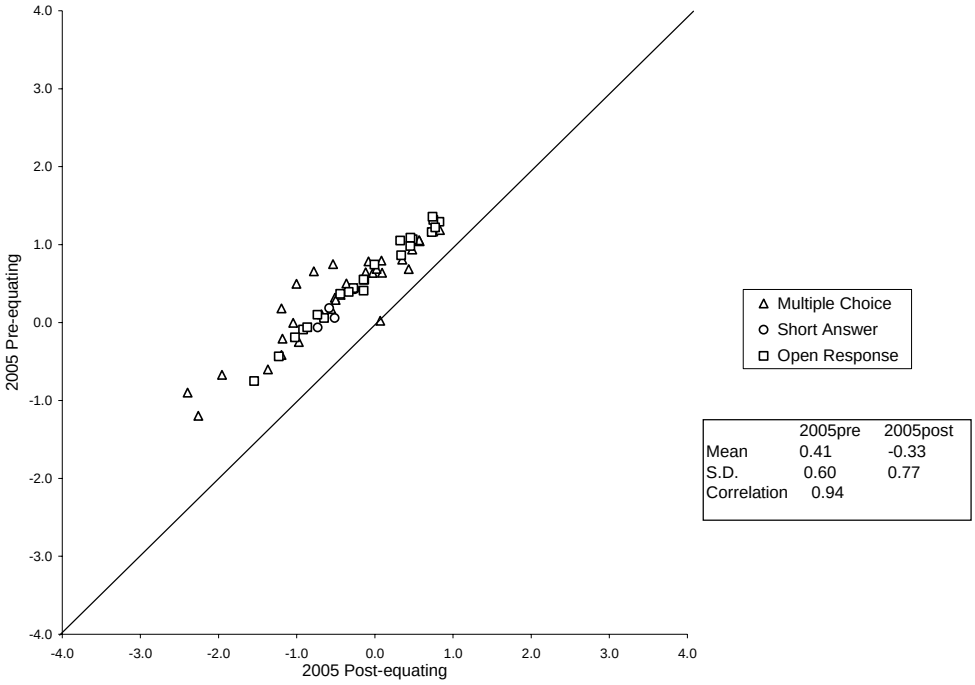


Figure 32. MCAS Math Grade 10 Scoring Items a-Plot: 2005 Pre-equating vs. 2005 Post-equating

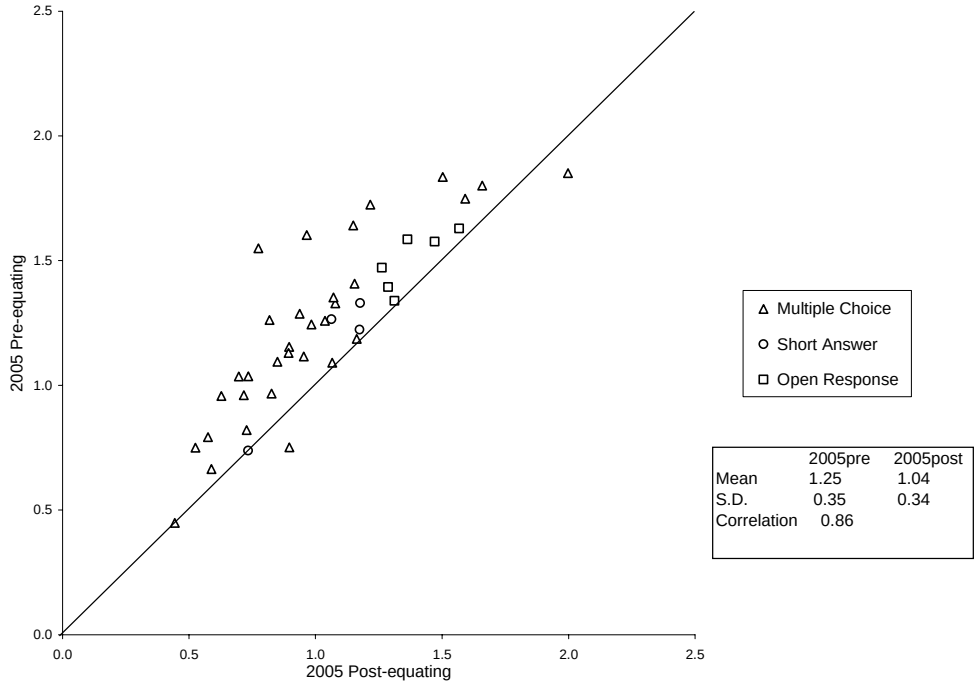


Figure 33. MCAS Math Grade 10 Equating Items b-Plot: 2004 vs. 2005

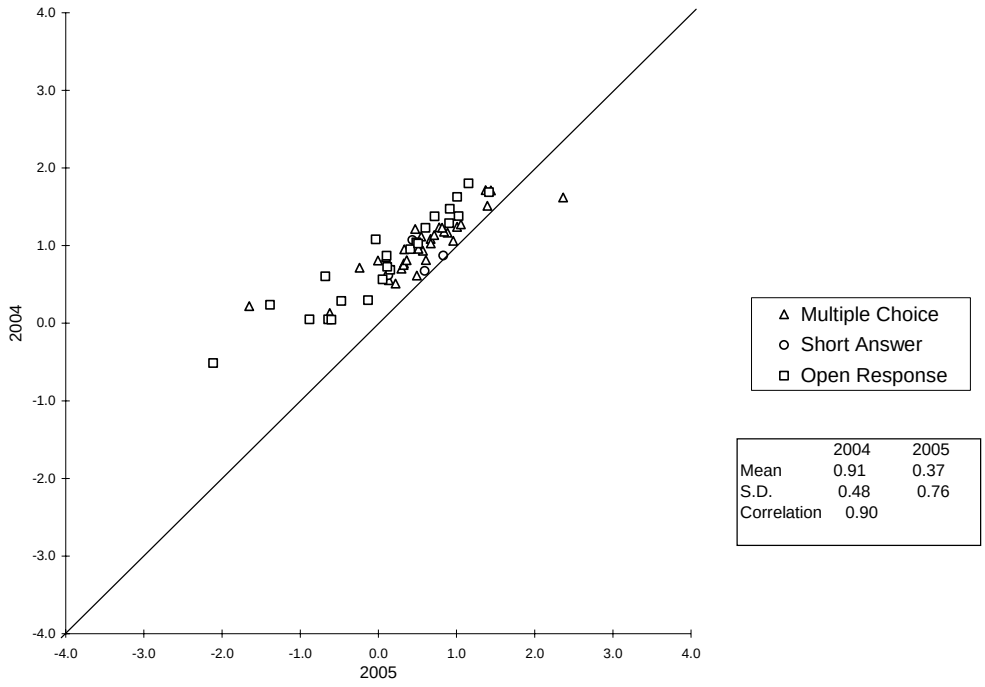
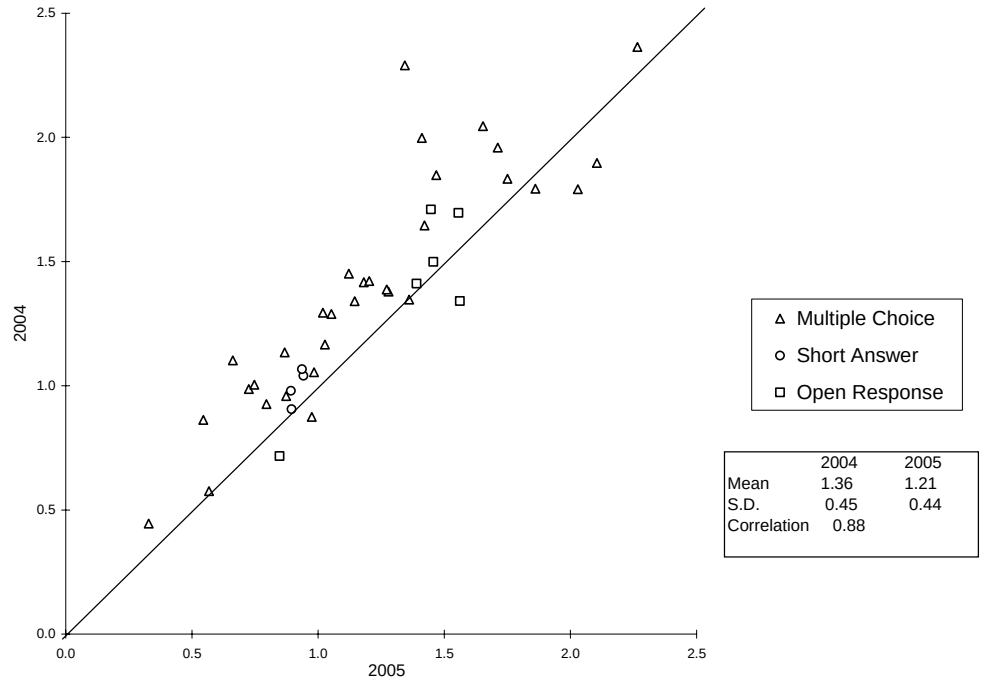


Figure 34. MCAS Math Grade 10 Equating Items a-Plot: 2004 vs. 2005



Appendix H

Figure 35. MCAS Math Grade 10 TCC: 2004 vs. 2005 (Pre-equating)

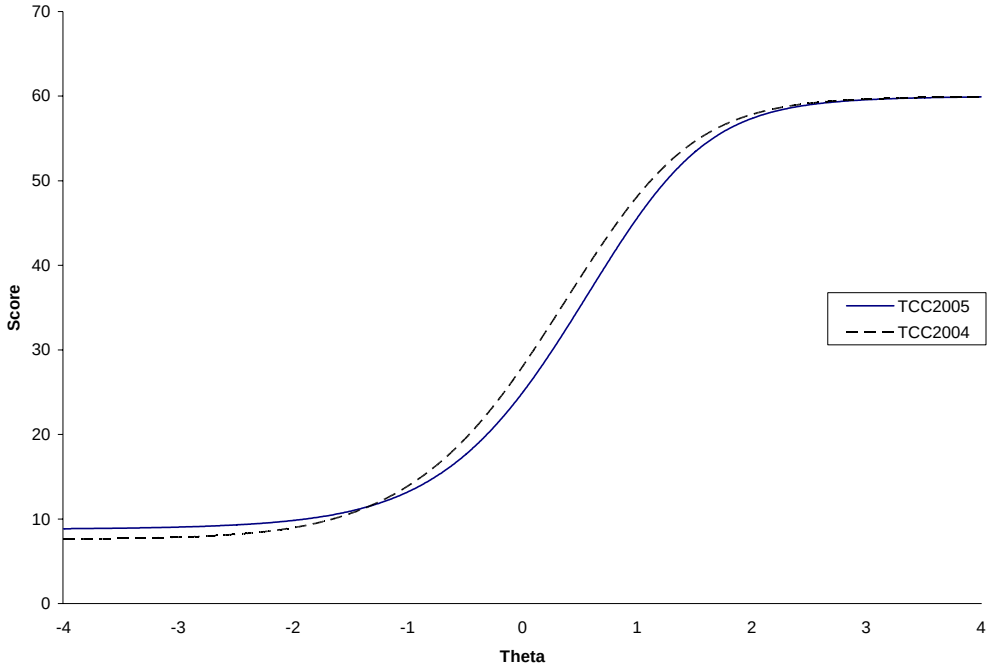


Figure 36. MCAS Math Grade 10 TCC: 2004 vs. 2005 (Post-equating, Preliminary)