

Differential Item Functioning

Anyone developing tests today should be sensitive to the fact that some test items may present a bias for one or more subgroups in the population to which the test is administered. For example, because of societal value systems, boys and girls may be exposed to quite different learning experiences during their youth. A word test in mathematics may unintentionally give an advantage to one gender group over another simply by the examples used in the item. To identify possible bias in an item, one can examine the differential item functioning of each item for the sub-groups to which the test is administered. The Mantel-Haenszel test statistic may be applied to test the difference on the item characteristic curve for the difference between a "focus" group and a "reference" group. We will demonstrate using a data set in which 40 items have been administered to 1000 subjects in one group and 1000 subjects in another group. The groups are simply coded 1 and 2 for the reference and focus groups. Since there may be very few (or no) subjects that get a specific total score, we will group the total scores obtained by subjects into groups of 4 so that we are comparing subjects in the groups that have obtained total item scores of 0 to 3, 4 to 7, ..., 40 to 43. As you will see, even this grouping is too small for several score groups and we should probably change the score range for the lowest and highest scores to a larger range of scores in another run.

When you elect to do this analysis, the specification form below appears:

This procedure is an adaptation of the program written by Niels G. Waller, Dept. of Psychology, University of California - Davis, Jan. 1998. It's purpose is to identify test items that differ in the response pattern for two groups: a reference group and a focal group. The file of data to be analyzed should consist of a variable containing a code designating the two groups and variables containing subject's item responses coded 0 for incorrect and 1 for correct. No missing data may be included. The results provide the Mantel-Haenszel statistics for identifying those items which are different for the two groups.

Available Variables: VAR 1, VAR 2, VAR 3, VAR 4, VAR 5, VAR 6, VAR 7, VAR 8, VAR 9

Items Selected: VAR 1, VAR 2, VAR 3, VAR 4, VAR 5, VAR 6, VAR 7, VAR 8, VAR 9

Options:

- ☒ Item Statistics
- ☒ Test Statistics
- ☒ Item Intercorr.s
- ☒ Item-Test cor.s
- ☒ Alpha Reliability
- ☒ Mantel-Haenszel
- ☐ Logistic Regres.
- ☒ Item Char. Crvs.
- ☒ Level Counts

Grouping Variable: Group

Reference group code: 1

Focal Group Code: 2

No. of Score Levels: 11

Enter bounds for levels:

Down	Up	Level
1	11	
		40
		43

Reset Compute Return

Figure 1 Differential Item Functioning Dialog

On the above form you specify the items to be analyzed and also the variable defining the reference and focus group codes. You may then specify the options desired by clicking the corresponding buttons for the desired options. You also enter the number of score groups to be used in grouping the subject's total scores. When this is specified, you then enter the lowest and highest score for each of those score groups. When you have specified the low and hi score for the first group, click the right arrow on the "slider" bar to move to the next group. You will see that the lowest score has automatically been set to one higher than the previous group's highest score to save you time in entering data. You do not, of course, have to use the same size for the range of each score group. Using too large a range of scores may cut down the sensitivity of the test to differences between the groups. Fairly large samples of subjects is necessary for a reasonable

analysis. Once you have completed the specifications, click the Compute button and you will see the following results are obtained (we elected to print the descriptive statistics, correlations and item plots):

Mantel-Haenszel DIF Analysis adapted by Bill Miller from
EZDIF written by Niels G. Waller

Total Means with 2000 valid cases.

Variables	VAR 1	VAR 2	VAR 3	VAR 4	VAR 5
	0.688	0.064	0.585	0.297	0.451
Variables	VAR 6	VAR 7	VAR 8	VAR 9	VAR 10
	0.806	0.217	0.827	0.960	0.568
Variables	VAR 11	VAR 12	VAR 13	VAR 14	VAR 15
	0.350	0.291	0.725	0.069	0.524
Variables	VAR 16	VAR 17	VAR 18	VAR 19	VAR 20
	0.350	0.943	0.545	0.017	0.985
Variables	VAR 21	VAR 22	VAR 23	VAR 24	VAR 25
	0.778	0.820	0.315	0.203	0.982
Variables	VAR 26	VAR 27	VAR 28	VAR 29	VAR 30
	0.834	0.700	0.397	0.305	0.223
Variables	VAR 31	VAR 32	VAR 33	VAR 34	VAR 35
	0.526	0.585	0.431	0.846	0.115
Variables	VAR 36	VAR 37	VAR 38	VAR 39	VAR 40
	0.150	0.817	0.909	0.793	0.329

Total Variances with 2000 valid cases.

Variables	VAR 1	VAR 2	VAR 3	VAR 4	VAR 5
	0.215	0.059	0.243	0.209	0.248
Variables	VAR 6	VAR 7	VAR 8	VAR 9	VAR 10
	0.156	0.170	0.143	0.038	0.245
Variables	VAR 11	VAR 12	VAR 13	VAR 14	VAR 15
	0.228	0.206	0.199	0.064	0.250
Variables	VAR 16	VAR 17	VAR 18	VAR 19	VAR 20
	0.228	0.054	0.248	0.017	0.015
Variables	VAR 21	VAR 22	VAR 23	VAR 24	VAR 25
	0.173	0.148	0.216	0.162	0.018
Variables	VAR 26	VAR 27	VAR 28	VAR 29	VAR 30
	0.139	0.210	0.239	0.212	0.173
Variables	VAR 31	VAR 32	VAR 33	VAR 34	VAR 35
	0.249	0.243	0.245	0.130	0.102
Variables	VAR 36	VAR 37	VAR 38	VAR 39	VAR 40
	0.128	0.150	0.083	0.164	0.221

Total Standard Deviations with 2000 valid cases.

Variables	VAR 1	VAR 2	VAR 3	VAR 4	VAR 5
	0.463	0.244	0.493	0.457	0.498
Variables	VAR 6	VAR 7	VAR 8	VAR 9	VAR 10
	0.395	0.412	0.379	0.196	0.495

Variables	VAR 11	VAR 12	VAR 13	VAR 14	VAR 15
	0.477	0.454	0.447	0.253	0.500
Variables	VAR 16	VAR 17	VAR 18	VAR 19	VAR 20
	0.477	0.233	0.498	0.129	0.124
Variables	VAR 21	VAR 22	VAR 23	VAR 24	VAR 25
	0.416	0.384	0.465	0.403	0.135
Variables	VAR 26	VAR 27	VAR 28	VAR 29	VAR 30
	0.372	0.459	0.489	0.461	0.416
Variables	VAR 31	VAR 32	VAR 33	VAR 34	VAR 35
	0.499	0.493	0.495	0.361	0.319
Variables	VAR 36	VAR 37	VAR 38	VAR 39	VAR 40
	0.357	0.387	0.288	0.405	0.470

Total Score: Mean = 21.318, Variance = 66.227, Std.Dev. = 8.138

Reference group size = 1000, Focus group size = 1000

Correlations Among Items with 2000 cases.

Variables	VAR 1	VAR 2	VAR 3	VAR 4	VAR 5
VAR 1	1.000	0.162	0.389	0.308	0.406
VAR 2	0.162	1.000	0.190	0.275	0.259
VAR 3	0.389	0.190	1.000	0.368	0.382
VAR 4	0.308	0.275	0.368	1.000	0.423

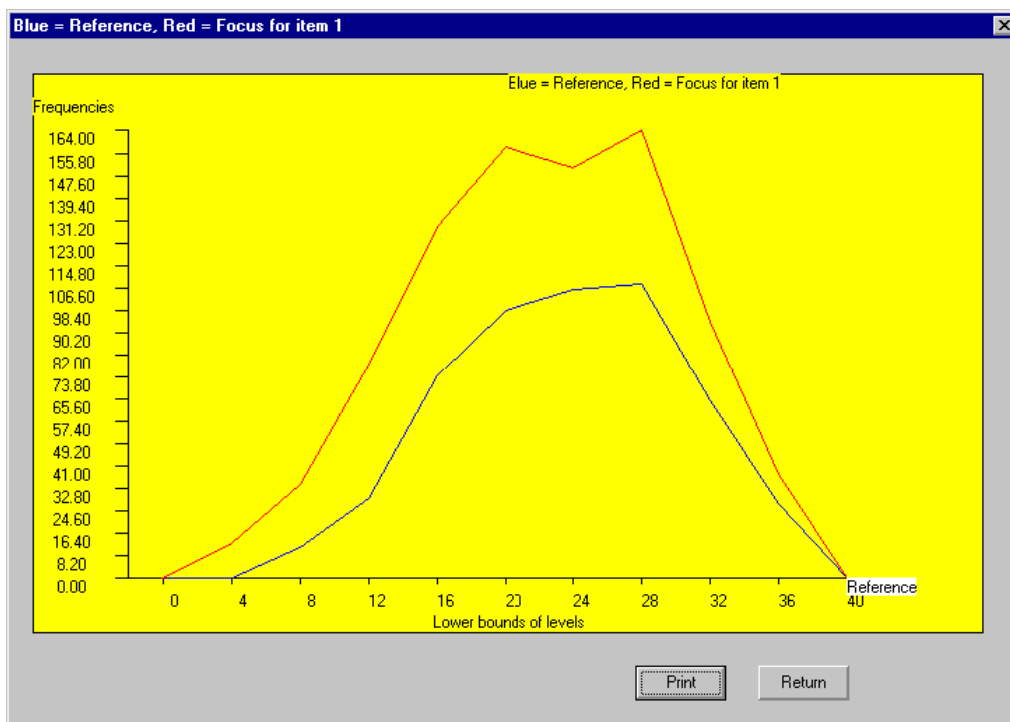


Figure 2 Differential Item Functioning Curves

Etc.

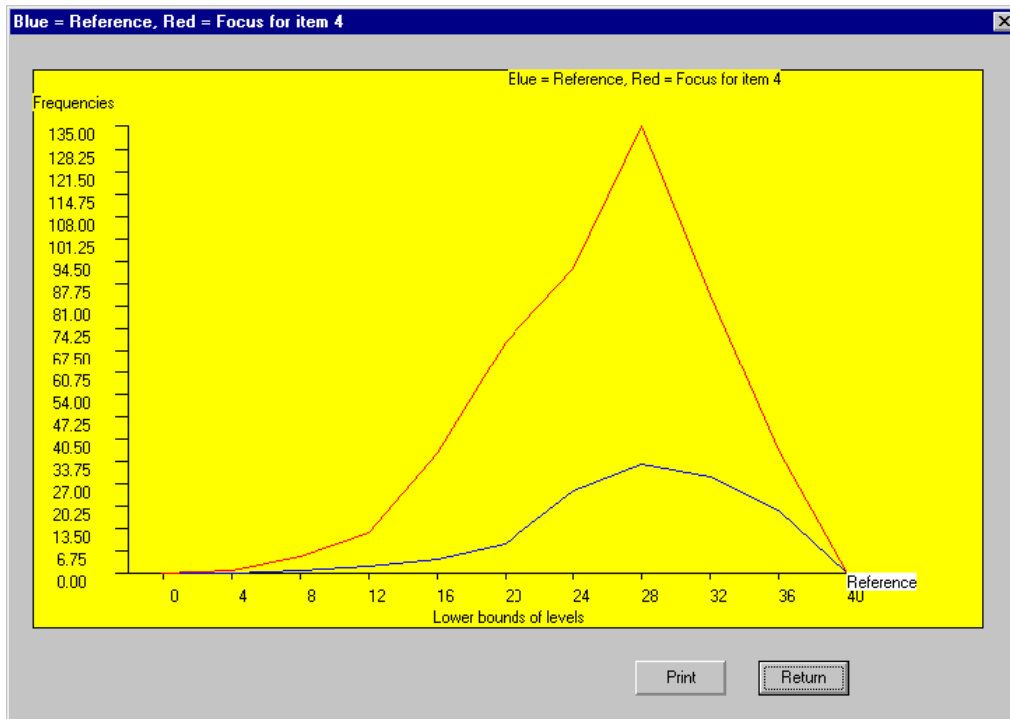


Figure 3 Another Item Differential Functioning Curve

Variables	VAR 36	VAR 37	VAR 38	VAR 39	VAR 40
VAR 1	0.213	0.234	0.203	0.230	0.273
VAR 2	0.229	0.107	0.075	0.123	0.211
VAR 3	0.209	0.233	0.206	0.274	0.255
VAR 4	0.236	0.180	0.156	0.221	0.284
VAR 5	0.253	0.241	0.196	0.248	0.289
VAR 6	0.149	0.338	0.254	0.282	0.227
VAR 7	0.305	0.183	0.158	0.197	0.290
VAR 8	0.163	0.271	0.259	0.278	0.222

VAR 9	0.086	0.167	0.228	0.236	0.121
VAR 37	0.155	1.000	0.250	0.276	0.204
VAR 38	0.118	0.250	1.000	0.242	0.181
VAR 39	0.180	0.276	0.242	1.000	0.262
VAR 40	0.288	0.204	0.181	0.262	1.000

Item-Total Correlations with 2000 valid cases.

Variables	VAR 1	VAR 2	VAR 3	VAR 4	VAR 5
	0.527	0.352	0.556	0.514	0.563
Variables	VAR 6	VAR 7	VAR 8	VAR 9	VAR 10
	0.507	0.509	0.488	0.302	0.579
Variables	VAR 11	VAR 12	VAR 13	VAR 14	VAR 15
	0.566	0.502	0.556	0.352	0.586
Variables	VAR 16	VAR 17	VAR 18	VAR 19	VAR 20
	0.564	0.371	0.582	0.171	0.200

Variables	VAR 21	VAR 22	VAR 23	VAR 24	VAR 25
	0.532	0.511	0.574	0.511	0.235
Variables	VAR 26	VAR 27	VAR 28	VAR 29	VAR 30
	0.507	0.570	0.591	0.569	0.507
Variables	VAR 31	VAR 32	VAR 33	VAR 34	VAR 35
	0.580	0.584	0.590	0.501	0.411
Variables	VAR 36	VAR 37	VAR 38	VAR 39	VAR 40
	0.465	0.482	0.415	0.513	0.556

Conditioning Levels

Lower	Upper
0	3
4	7
8	11
12	15
16	19
20	23
24	27
28	31
32	35
36	39
40	43

etc. for all items. Note the difference for the two item plots shown above! Next, the output reflects multiple passes to "fit" the data for the M-H test:

COMPUTING M-H CHI-SQUARE, PASS # 1

Cases in Reference Group

Score Level Counts by Item					
Variables	VAR 1	VAR 2	VAR 3	VAR 4	VAR 5
0- 3	8	8	8	8	8
4- 7	38	38	38	38	38
8- 11	65	65	65	65	65
12- 15	108	108	108	108	108
16- 19	153	153	153	153	153
20- 23	175	175	175	175	175
24- 27	154	154	154	154	154
28- 31	167	167	167	167	167
32- 35	94	94	94	94	94
36- 39	38	38	38	38	38
40- 43	0	0	0	0	0

Score Level Counts by Item					
Variables	VAR 6	VAR 7	VAR 8	VAR 9	VAR 10
0- 3	8	8	8	8	8
4- 7	38	38	38	38	38
8- 11	65	65	65	65	65
12- 15	108	108	108	108	108
16- 19	153	153	153	153	153
20- 23	175	175	175	175	175
24- 27	154	154	154	154	154
28- 31	167	167	167	167	167
32- 35	94	94	94	94	94
36- 39	38	38	38	38	38
40- 43	0	0	0	0	0

Score Level Counts by Item

Variables	VAR 11	VAR 12	VAR 13	VAR 14	VAR 15
0- 3	8	8	8	8	8
4- 7	38	38	38	38	38
8- 11	65	65	65	65	65
12- 15	108	108	108	108	108
16- 19	153	153	153	153	153
20- 23	175	175	175	175	175
24- 27	154	154	154	154	154
28- 31	167	167	167	167	167
32- 35	94	94	94	94	94
36- 39	38	38	38	38	38
40- 43	0	0	0	0	0

Score Level Counts by Item					
Variables	VAR 16	VAR 17	VAR 18	VAR 19	VAR 20
0- 3	8	8	8	8	8
4- 7	38	38	38	38	38
8- 11	65	65	65	65	65
12- 15	108	108	108	108	108
16- 19	153	153	153	153	153
20- 23	175	175	175	175	175
24- 27	154	154	154	154	154
28- 31	167	167	167	167	167
32- 35	94	94	94	94	94
36- 39	38	38	38	38	38
40- 43	0	0	0	0	0

Score Level Counts by Item					
Variables	VAR 21	VAR 22	VAR 23	VAR 24	VAR 25
0- 3	8	8	8	8	8
4- 7	38	38	38	38	38
8- 11	65	65	65	65	65
12- 15	108	108	108	108	108
16- 19	153	153	153	153	153
20- 23	175	175	175	175	175
24- 27	154	154	154	154	154
28- 31	167	167	167	167	167
32- 35	94	94	94	94	94
36- 39	38	38	38	38	38
40- 43	0	0	0	0	0

Score Level Counts by Item					
Variables	VAR 26	VAR 27	VAR 28	VAR 29	VAR 30
0- 3	8	8	8	8	8
4- 7	38	38	38	38	38
8- 11	65	65	65	65	65
12- 15	108	108	108	108	108
16- 19	153	153	153	153	153
20- 23	175	175	175	175	175
24- 27	154	154	154	154	154
28- 31	167	167	167	167	167
32- 35	94	94	94	94	94
36- 39	38	38	38	38	38
40- 43	0	0	0	0	0

Score Level Counts by Item

Variables	VAR 31	VAR 32	VAR 33	VAR 34	VAR 35
0- 3	8	8	8	8	8
4- 7	38	38	38	38	38
8- 11	65	65	65	65	65
12- 15	108	108	108	108	108
16- 19	153	153	153	153	153
20- 23	175	175	175	175	175
24- 27	154	154	154	154	154
28- 31	167	167	167	167	167
32- 35	94	94	94	94	94
36- 39	38	38	38	38	38
40- 43	0	0	0	0	0

Variables	Score Level Counts by Item				
	VAR 36	VAR 37	VAR 38	VAR 39	VAR 40
0- 3	8	8	8	8	8
4- 7	38	38	38	38	38
8- 11	65	65	65	65	65
12- 15	108	108	108	108	108
16- 19	153	153	153	153	153
20- 23	175	175	175	175	175
24- 27	154	154	154	154	154
28- 31	167	167	167	167	167
32- 35	94	94	94	94	94
36- 39	38	38	38	38	38
40- 43	0	0	0	0	0

Cases in Focus Group

Variables	Score Level Counts by Item				
	VAR 1	VAR 2	VAR 3	VAR 4	VAR 5
0- 3	7	7	7	7	7
4- 7	47	47	47	47	47
8- 11	94	94	94	94	94
12- 15	139	139	139	139	139
16- 19	177	177	177	177	177
20- 23	174	174	174	174	174
24- 27	141	141	141	141	141
28- 31	126	126	126	126	126
32- 35	68	68	68	68	68
36- 39	27	27	27	27	27
40- 43	0	0	0	0	0

Variables	Score Level Counts by Item				
	VAR 6	VAR 7	VAR 8	VAR 9	VAR 10
0- 3	7	7	7	7	7
4- 7	47	47	47	47	47
8- 11	94	94	94	94	94
12- 15	139	139	139	139	139
16- 19	177	177	177	177	177
20- 23	174	174	174	174	174
24- 27	141	141	141	141	141
28- 31	126	126	126	126	126
32- 35	68	68	68	68	68
36- 39	27	27	27	27	27
40- 43	0	0	0	0	0

Score Level Counts by Item

Variables	VAR 11	VAR 12	VAR 13	VAR 14	VAR 15
0- 3	7	7	7	7	7
4- 7	47	47	47	47	47
8- 11	94	94	94	94	94
12- 15	139	139	139	139	139
16- 19	177	177	177	177	177
20- 23	174	174	174	174	174
24- 27	141	141	141	141	141
28- 31	126	126	126	126	126
32- 35	68	68	68	68	68
36- 39	27	27	27	27	27
40- 43	0	0	0	0	0

Score Level Counts by Item					
Variables	VAR 16	VAR 17	VAR 18	VAR 19	VAR 20
0- 3	7	7	7	7	7
4- 7	47	47	47	47	47
8- 11	94	94	94	94	94
12- 15	139	139	139	139	139
16- 19	177	177	177	177	177
20- 23	174	174	174	174	174
24- 27	141	141	141	141	141
28- 31	126	126	126	126	126
32- 35	68	68	68	68	68
36- 39	27	27	27	27	27
40- 43	0	0	0	0	0

Score Level Counts by Item					
Variables	VAR 21	VAR 22	VAR 23	VAR 24	VAR 25
0- 3	7	7	7	7	7
4- 7	47	47	47	47	47
8- 11	94	94	94	94	94
12- 15	139	139	139	139	139
16- 19	177	177	177	177	177
20- 23	174	174	174	174	174
24- 27	141	141	141	141	141
28- 31	126	126	126	126	126
32- 35	68	68	68	68	68
36- 39	27	27	27	27	27
40- 43	0	0	0	0	0

Score Level Counts by Item					
Variables	VAR 26	VAR 27	VAR 28	VAR 29	VAR 30
0- 3	7	7	7	7	7
4- 7	47	47	47	47	47
8- 11	94	94	94	94	94
12- 15	139	139	139	139	139
16- 19	177	177	177	177	177
20- 23	174	174	174	174	174
24- 27	141	141	141	141	141
28- 31	126	126	126	126	126
32- 35	68	68	68	68	68
36- 39	27	27	27	27	27
40- 43	0	0	0	0	0

Score Level Counts by Item

Variables	VAR 31	VAR 32	VAR 33	VAR 34	VAR 35
0- 3	7	7	7	7	7
4- 7	47	47	47	47	47
8- 11	94	94	94	94	94
12- 15	139	139	139	139	139
16- 19	177	177	177	177	177
20- 23	174	174	174	174	174
24- 27	141	141	141	141	141
28- 31	126	126	126	126	126
32- 35	68	68	68	68	68
36- 39	27	27	27	27	27
40- 43	0	0	0	0	0

Score Level Counts by Item					
Variables	VAR 36	VAR 37	VAR 38	VAR 39	VAR 40
0- 3	7	7	7	7	7
4- 7	47	47	47	47	47
8- 11	94	94	94	94	94
12- 15	139	139	139	139	139
16- 19	177	177	177	177	177
20- 23	174	174	174	174	174
24- 27	141	141	141	141	141
28- 31	126	126	126	126	126
32- 35	68	68	68	68	68
36- 39	27	27	27	27	27
40- 43	0	0	0	0	0

Insufficient data found in level: 0 - 3

Insufficient data found in level: 40 - 43

CODES	ITEM	SIG.	ALPHA	CHI2	P-VALUE	MH D-DIF	S.E. MH D-DIF
C R	1	***	8.927	276.392	0.000	-5.144	0.338
C R	2	***	10.450	68.346	0.000	-5.514	0.775
C R	3	***	7.547	280.027	0.000	-4.750	0.305
C R	4	***	10.227	298.341	0.000	-5.464	0.350
C R	5	***	12.765	393.257	0.000	-5.985	0.339
B	6	***	0.571	15.476	0.000	1.316	0.331
A	7	*	0.714	6.216	0.013	0.791	0.310
A	8	*	0.705	5.694	0.017	0.822	0.335
B	9	**	0.493	6.712	0.010	1.664	0.621
B	10	***	0.621	17.349	0.000	1.121	0.267
A	11	*	0.775	4.511	0.034	0.599	0.275
A	12	***	0.687	9.833	0.002	0.883	0.277
B	13	***	0.647	11.904	0.001	1.024	0.294
B	14	**	0.568	7.160	0.007	1.331	0.482
B	15	***	0.600	19.747	0.000	1.199	0.267
B	16	***	0.601	18.326	0.000	1.198	0.278
A	17		0.830	0.486	0.486	0.438	0.538
A	18	***	0.709	8.989	0.003	0.807	0.264
A	19		0.582	1.856	0.173	1.270	0.834
A	20		1.991	1.769	0.183	-1.618	1.072
A	21	*	0.725	5.783	0.016	0.754	0.308
A	22	*	0.743	4.023	0.045	0.697	0.337
B	23	***	0.572	20.804	0.000	1.315	0.286
A	24	*	0.723	5.362	0.021	0.764	0.321
A	25		0.555	1.782	0.182	1.385	0.915
B	26	***	0.540	16.456	0.000	1.447	0.353
A	27	***	0.687	9.240	0.002	0.884	0.287
A	28	**	0.735	6.822	0.009	0.723	0.271
A	29	***	0.681	9.458	0.002	0.904	0.289
A	30	*	0.756	4.342	0.037	0.658	0.306
A	31	***	0.724	8.016	0.005	0.758	0.263

A	32	*	0.745	6.513	0.011	0.693	0.266
A	33	**	0.738	6.907	0.009	0.715	0.267
A	34		0.944	0.089	0.766	0.135	0.360
A	35		0.769	2.381	0.123	0.618	0.383
A	36		0.819	1.530	0.216	0.469	0.357
A	37	*	0.709	5.817	0.016	0.809	0.326
A	38	*	0.665	4.552	0.033	0.960	0.431
A	39		0.779	3.305	0.069	0.588	0.312
B	40	***	0.644	13.215	0.000	1.034	0.280

No. of items purged in pass 1 = 5

Item Numbers:

1
2
3
4
5

COMPUTING M-H CHI-SQUARE, PASS # 2

Cases in Reference Group

Score Level Counts by Item					
Variables	VAR 1	VAR 2	VAR 3	VAR 4	VAR 5
0- 3	8	9	9	9	9
4- 7	44	49	47	47	47
8- 11	76	92	77	91	81
12- 15	150	163	148	158	159
16- 19	183	191	185	184	176
20- 23	188	178	187	173	180
24- 27	176	177	173	170	172
28- 31	129	103	128	123	130
32- 35	46	38	46	45	46
36- 39	0	0	0	0	0
40- 43	0	0	0	0	0

Score Level Counts by Item					
Variables	VAR 6	VAR 7	VAR 8	VAR 9	VAR 10
0- 3	9	9	9	9	9
4- 7	49	49	49	49	49
8- 11	92	92	92	92	92
12- 15	163	163	163	163	163
16- 19	193	193	193	193	193
20- 23	180	180	180	180	180
24- 27	184	184	184	184	184
28- 31	106	106	106	106	106
32- 35	24	24	24	24	24
36- 39	0	0	0	0	0
40- 43	0	0	0	0	0

Score Level Counts by Item					
Variables	VAR 11	VAR 12	VAR 13	VAR 14	VAR 15
0- 3	9	9	9	9	9
4- 7	49	49	49	49	49

etc.

Insufficient data found in level: 0 - 3
Insufficient data found in level: 36 - 39
Insufficient data found in level: 40 - 43

CODES	ITEM	SIG.	ALPHA	CHI2	P-VALUE	MH D-DIF	S.E. MH D-DIF
C R	1	***	11.643	331.803	0.000	-5.769	0.354
C R	2	***	13.737	91.260	0.000	-6.157	0.776
C R	3	***	10.273	346.784	0.000	-5.474	0.324
C R	4	***	13.828	358.692	0.000	-6.173	0.373
C R	5	***	16.713	460.515	0.000	-6.618	0.356
A	6		0.823	1.758	0.185	0.457	0.327
A	7		1.061	0.144	0.704	-0.139	0.310
A	8		0.992	0.000	1.000	0.019	0.331
A	9		0.682	1.770	0.183	0.901	0.619
A	10		0.887	1.033	0.309	0.283	0.264
A	11		1.147	1.261	0.261	-0.321	0.272
A	12		0.958	0.100	0.752	0.102	0.272
A	13		0.932	0.262	0.609	0.166	0.291
A	14		0.909	0.134	0.714	0.225	0.480
A	15		0.875	1.318	0.251	0.314	0.261
A	16		0.887	0.949	0.330	0.281	0.273
A	17		1.187	0.417	0.518	-0.403	0.532
A	18		1.017	0.009	1.000	-0.039	0.260
A	19		0.809	0.168	0.682	0.498	0.844
B	20		2.529	3.536	0.060	-2.180	1.075
A	21		1.031	0.028	0.866	-0.072	0.308
A	22		1.073	0.175	0.675	-0.166	0.337
A	23		0.861	1.390	0.238	0.352	0.284
A	24		1.105	0.448	0.503	-0.235	0.319
A	25		0.737	0.357	0.550	0.717	0.911
A	26		0.797	2.143	0.143	0.534	0.348
A	27		1.002	0.002	1.000	-0.004	0.284
A	28		1.095	0.540	0.463	-0.212	0.268
A	29		1.031	0.039	0.843	-0.073	0.281
A	30		1.124	0.707	0.400	-0.274	0.303
A	31		1.041	0.094	0.759	-0.095	0.261
A	32		1.073	0.320	0.572	-0.165	0.265
A	33		1.099	0.619	0.431	-0.222	0.264
A	34	*	1.375	4.152	0.042	-0.748	0.355
A	35		1.160	0.686	0.408	-0.348	0.384
A	36		1.276	2.370	0.124	-0.572	0.354
A	37		0.982	0.004	1.000	0.042	0.323
A	38		0.923	0.121	0.728	0.188	0.428
A	39		1.090	0.354	0.552	-0.203	0.308
A	40		0.953	0.126	0.722	0.114	0.274

One should probably combine the first two score groups (0-3 and 4-7) into one group and the last three groups into one group so that sufficient sample size is available for the comparisons of the two groups. This would, of course, reduce the number of groups from 11 in our original specifications to 8 score groups. The chi-square statistic identifies items you will want to give specific attention. Examine the data plots for those items. Differences found may suggest bias in those items. Only examination of the actual content can help in this decision. Even though two groups may differ in there item response patterns does not provide sufficient grounds to establish bias - perhaps it simply identifies a true difference in educational achievement due to other factors.