Technical Brief: Detection of Multiple Group Differential Item Functioning for Students with Disabilities of the Alternate ACCESS Field Tests in 2023

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DIF Methods

The purpose of this study is to examine if the probability of getting a certain score is different across disability groups. The relevant literature indicates that various conditions (e.g., sample size, test length, DIF method, number of groups) may result in false negative and false positive DIF. Since the ALT Access test length is shorter and group sample sizes are uneven and small, multiple DIF detection methods were considered in this study. The methods summarized below were used to conduct multigroup DIF in polytomous items.

Winsteps

DIF: This method estimates the item difficulty per group and combined groups. Then, compares the difficulty parameters of an induvial group with the combined groups. Based on Winsteps manual, Table 30.2 were used to flag items as follows: C items are those items that have a |DIF Size| ≥ .64 and p-value < .05; B items are items that have .67 <|DIF Size| ≥ .47 and p-value < .05, and the remaining items are classified as A. Only C level DIF items were reported in the tables below. The values in parenthesis indicate the group(s) different from the combined groups and the CAL ID. For example, *Blank-21771* means item difficulty for item with CAL ID of 21771 is different for Blank group compared to item difficulty for the combined groups.

R packages

mirt

RMSD: Root mean square deviance (RMSD) item-fit statistic (RMSD) is calculated for each group. RMSD values range between 0 and 1. A higher value of RMSD indicated a higher level of misfit for the given category. Items with RMSD > .3 are flagged as DIF. The values in parenthesis indicate the misfitting group, category, and the CAL ID. For example, *Blank-P5-21777* means the model based and observed fit statistics do not fit for category 5 (P5) for CAL ID of 21777.

MeasInv

LR: Logistic regression is conducted to compare two modes: 1) item and total score and 2) item, group, and interaction between group total score. Three types of DIF effects can be tested: uniform, nonuniform, and both types of effects altogether. Item purification is used to improve the detection of DIF items. Items with p-value < .05 are flagged as DIF.

MH: Contingency tables by groups and item responses are created at each total score. Then, the probabilities of getting an item score for the individual group and combined groups were compared. Item purification is used to improve the detection of DIF items. Items with p-value < .05 are flagged as DIF.

GPCMlasso

Lasso: Items outside the optimal model based on BIC criteria are flagged as DIF. CAL ID and DIF group are given in parenthesis. For example, Blank-21771 means the item with CAL ID of 21771 suffers from DIF with respect to variable group Blank.

Data

Fourteen different disability subgroups were identified in the ALT Access testing population, but groups with greater than 50 students were considered for the purposes of this study. And two of the groups (MD and OHI) were combined based on the feedback received from the accessibility expert. Sample sizes per group and form are given in Table 1.

Table 1 Sample size for groups selected for DIF analysis

Domain	Cluster	FormName	AS	Blank	DD	ID	MDOHI
Listening	K02	602FT_Alt_K2_1	629	59	265	90	83
		602FT_Alt_K2_2	595	64	191	136	119
		602FT_Alt_K2_3	784	144	445	122	193
		602FT_Alt_K2_4	437	84	154	119	73
		602FT_Alt_K2_5	571	75	187	165	101
	35	602FT_Alt_35_1	455	60	69	278	121
		602FT_Alt_35_2	416	77		357	155
		602FT_Alt_35_3	695	121	88	358	261
		602FT_Alt_35_4	380	102		359	127
		602FT_Alt_35_5	520	91	57	436	135
	68	602FT_Alt_68_1	219		71	287	115
		602FT_Alt_68_2	199	53		328	105
		602FT_Alt_68_3	381	87		427	188
		602FT_Alt_68_4	223			328	100
		602FT_Alt_68_5	365	105		470	112
	98	602FT_Alt_91_1	204	58	73	421	162
		602FT_Alt_91_2	169	70		361	132
		602FT_Alt_91_3	348	135		573	182
		602FT_Alt_91_4	153	59		421	115
		602FT_Alt_91_5	286	89		559	136
Reading	K02	602FT_Alt_K2_1	626	58	261	89	82
		602FT_Alt_K2_2	589	63	189	134	115
		602FT_Alt_K2_3	780	141	441	123	190
		602FT_Alt_K2_4	434	84	154	119	71
		602FT_Alt_K2_5	568	76	184	163	100
	35	602FT_Alt_35_1	454	58	68	275	119
		602FT_Alt_35_2	410	73		352	155
		602FT_Alt_35_3	690	120	88	356	260
		602FT_Alt_35_4	377	101		359	127
		602FT_Alt_35_5	518	91	57	436	133

	68	602FT_Alt_68_1	219		71	286	111
		602FT_Alt_68_2	198	52		329	106
		602FT_Alt_68_3	378	86		423	189
		602FT_Alt_68_4	221			328	102
		602FT_Alt_68_5	362	106		466	111
	98	602FT_Alt_91_1	204	58	70	416	154
		602FT_Alt_91_2	169	70		361	131
		602FT_Alt_91_3	345	132		571	182
		602FT_Alt_91_4	152	60		420	115
		602FT_Alt_91_5	287	89		557	135
Writing	K02	602FT_Alt_K2_1	620	55	257	89	79
		602FT_Alt_K2_2	571	56	185	128	114
		602FT_Alt_K2_3	762	138	434	122	186
		602FT_Alt_K2_4	421	79	149	113	69
		602FT_Alt_K2_5	561	72	184	158	95
	35	602FT_Alt_35_1	443	56	66	268	110
		602FT_Alt_35_2	409	70		338	149
		602FT_Alt_35_3	679	120	87	349	252
		602FT_Alt_35_4	375	99		351	124
		602FT_Alt_35_5	512	90	56	429	130
	68	602FT_Alt_68_1	212		71	278	102
		602FT_Alt_68_2	189			319	99
		602FT_Alt_68_3	372	79		416	184
		602FT_Alt_68_4	217			329	99
		602FT_Alt_68_5	347	103		448	109
	98	602FT_Alt_91_1	159		60	342	67
		602FT_Alt_91_2	126	60		296	72
		602FT_Alt_91_3	335	124		561	178
		602FT_Alt_91_4	135			337	70
		602FT_Alt_91_5	235	75		446	79
Speaking	K02	602FT_Alt_K2_1	453		182	65	
		602FT_Alt_K2_2	403		134	93	67
		602FT_Alt_K2_3	493	97	317	82	93
		602FT_Alt_K2_4	265		105	85	
		602FT_Alt_K2_5	421	58	129	114	57
	35	602FT_Alt_35_1	329	53	54	219	72
		602FT_Alt_35_2	317	56		295	98
		602FT_Alt_35_3	500	95	74	286	163

		602FT_Alt_35_4	276	72		265	76
		602FT_Alt_35_5	410	76		367	70
	68	602FT_Alt_68_1	159		56	234	55
		602FT_Alt_68_2	142			277	70
		602FT_Alt_68_3	303	72		369	127
		602FT_Alt_68_4	155			273	64
		602FT_Alt_68_5	310	90		390	65
	98	602FT_Alt_91_1	165		62	365	90
		602FT_Alt_91_2	128	62		322	88
		602FT_Alt_91_3	288	122		479	115
		602FT_Alt_91_4	129	54		366	76
		602FT_Alt_91_5	250	85		487	86

Note: Blank cells indicate that the group is not included in the analysis because the sample size is not greater than 50.

Results

Preliminary results are summarized in this section.

All of the items flagged as DIF based on the aforementioned criterion are given in the tables below. Red bold CALIDs indicate the common items across five forms, whereas red CALIDs indicate the common items across two or three forms. The black CALIDs indicate the unique item and NA cells indicate that the corresponding DIF method did not converge for the given form.

Items flagged as DIF across different forms or DIF methods are summarized in bullet points for convenience. Since these items are somewhat consistently flagged as DIF, it would be advisable for test developers to review these items to determine whether the items assess the intended construct.

Listening

Common items

- Items marked as DIF by at least one DIF method in five out of the five forms: None
- Items marked as DIF by at least one DIF method in four out of the five forms: None
- Items marked as DIF by at least one DIF method in three out of the three forms: None
- Items marked as DIF by at least one DIF method in two out of the two forms: None

Unique items

- Items marked as DIF by at least three DIF methods: None

Table 2 Number of listening items flag as DIF (CALIDs in parenthesis)

Cluster	Form	Groups	Winsteps	mirt		MeasInv				GPCM Lasso
			Table 30.2	RMSD	anova	Uniform LR	Non-uniform LR	Both LR	MH	Lasso
K02	602FT_Alt_K2_1 (21603, 21604, 21610, 21609, 21612, 21613, 21622, 21623, 21674, 21675)	AS, Blank, DD, ID, MDOHI	0	0	0	2 (**21603**, 21613)	0	1 (**21603**)	1 (**21610**)	0
	602FT_Alt_K2_2 (21603, 21606, 21610, 21609, 21612, 21614, 21622, 21625, 21674, 21676)	AS, Blank, DD, ID, MDOHI	0	0	2 (**21603**, **21610**)	1 (**21603**)	0	2 (**21603**, **21610**)	2 (**21603**, **21610**)	0
	602FT_Alt_K2_3 (21603, 21604, 21610, 21609, 21612, 21615, 21622, 21672, 21674, 21677)	AS, Blank, DD, ID, MDOHI	0	0	2 (21604, **21622**)	1 (**21622**)	0	1 (**21609**)	1 (**21610**)	NA
	602FT_Alt_K2_4 (21603, 21606, 21610, 21609, 21612, 21620, 21622, 21673, 21674, 21676)	AS, Blank, DD, ID, MDOHI	0	0	0	0	0	0	1 (**21609**)	0

	602FT_Alt_K2_5 (21603, 21604, 21610, 21609, 21612, 21613, 21622, 21623, 21674, 21677)	AS, Blank, DD, ID, MDOHI	0	0	1 (21604)	0	1 (21604)	1 (21604)	0	0
	Combined	AS, Blank, DD, ID, MDOHI	0	NA	NA	NA	NA	NA	NA	NA
35	602FT_Alt_35_1 (21529, 21530, 21610, 21650, 21649 21656, 21622, 21658, 21657, 21660)	AS, Blank, DD, ID, MDOHI	0	0	0	1 (**21657**)	0	0	1 (**21657**)	0
	602FT_Alt_35_2 (21529, 21645, 21610, 21651, 21649, 21653, 21622, 21659, 21657, 21661)	AS, Blank, ID, MDOHI	0	0	0	2 (**21529**, 21661)	1 (21645)	1 (21645)	0	0
	602FT_Alt_35_3 (21529, 21647, 21610, 21646, 21649, 21652, 21622, 21655, 21657, 21658)	AS, Blank, DD, ID, MDOHI	0	0	0	1 (21652)	0	1 (21652)	2 (**21529**, 21652)	0
	602FT_Alt_35_4 (21529, 21647, 21648, 21646, 21649, 21653, 21654, 21655, 21657, 21659)	AS, Blank, ID, MDOHI	0	0	0	2 (21648, **21649**)	0	1 (21659)	2 (**21649**, 21653)	0
	602FT_Alt_35_5 (21529, 21647, 21648, 21646, 21649, 21654, 21656, 21655, 21657, 21658)	AS, Blank, DD, ID, MDOHI	0	0	0	3 (21646, 21654, 21658)	0	2 (21654, 21658)	1 (**21529**)	1 (AS-21654)
	Combined	AS, Blank, DD, ID, MDOHI	0	NA	NA	NA	NA	NA	NA	NA
68	602FT_Alt_68_1 (21747, 21749, 21751, 21755, 21752, 21758, 21760, 21765, 21763, 21767)	AS, DD, ID, MDOHI	0	0	1 (21749)	3 (**21747**, 21749, 21751)	2 (21749, **21752**)	4 (**21747**, 21749, 21751, **21752**)	0	1 (ID-21751)
	602FT_Alt_68_2 (21747, 21749, 21754, 21757, 21752, 21759, 21760, 21767, 21763, 21768)	AS, Blank, ID, MDOHI	0	0	0	NA	NA	NA	NA	0
	602FT_Alt_68_3 (21747, 21749, 21646, 21755, 21752, 21762, 21760, 21655, 21763, 21767)	AS, Blank, ID, MDOHI	0	0	0	2 (21646, **21747**)	2 (21646, **21747**)	2 (21646, **21747**)	1 (**21747**)	0
	602FT_Alt_68_4 (21747, 21748, 21646, 21757, 21752, 21751, 21758, 21655, 21763, 21768)	AS, ID, MDOHI	0	0	0	2 (21748, 21757)	0	1 (21757)	0	0
	602FT_Alt_68_5 (21747, 21748, 21646, 21755, 21752, 21754, 21759, 21655, 21763, 21769)	AS, Blank, ID, MDOHI	0	0	0	0	1 (**21752**)	0	0	
	Combined	AS, Blank, DD, ID, MDOHI	0	NA	NA	NA	NA	NA	NA	NA

91	602FT_Alt_91_1 (21793, 21797, 21749, 21804, 21806, 21809, 21760, 21813, 21815, 21814)	AS, Blank, DD, ID, MDOHI	0	0	0	2 (21797, 21813)	2 (**21793**, 21797)	2 (21797, 21813)	NA	1 (DD-21813)
	602FT_Alt_91_2 (21793, 21800, 21749, 21805, 21806, 21810, 21760, 21814, 21815, 21816)	AS, Blank, ID, MDOHI	0	0	0	1 (**21800**)	0	0	NA	0
	602FT_Alt_91_3 (21793, 21801, 21749, 21807, 21806, 21811, 21760, 21813, 21815, 21816)	AS, Blank, ID, MDOHI	0	0	0	2 (21760, 21807)	1 (21811)	2 (21807, 21811)	0	1 (AS-21807)
	602FT_Alt_91_4 (21793, 21797, 21802, 21808, 21806, 21811, 21812, 21813, 21815, 21816)	AS, Blank, ID, MDOHI	0	0	0	NA	NA	NA	0	0
	602FT_Alt_91_5 (21793, 21800, 21803, 21808, 21806, 21809, 21810, 21814, 21815, 21816)	AS, Blank, ID, MDOHI	0	0	0	5 (**21793**, **21800**, 21803, 21808, 21814)	3 (**21800**, 21803, **21806**)	5 (**21793**, **21800**, 21803, 21808, 21814)	NA	0
	Combined	AS, Blank, DD, ID, MDOHI	0	NA	NA	NA	NA	NA	NA	NA

Note: Red bold, red, and black CALIDs mean the item included in all forms, more than one form but not all forms, and only one form, respectively. NA cells indicate that DIF method did not converge.

Reading

Common items

- Items marked as DIF by at least one DIF method in five out of the five forms: 21684 (K02), 21667 (K35), 21826 (K91)
- Items marked as DIF by at least one DIF method in four out of the five forms: 21730 (K02), 21695 (K35), 21817 (K91)
- Items marked as DIF by at least one DIF method in three out of the three forms: 21684 (K35), 21666 (K35), 21666(K68), 21777 (K91), 21597 (K91)
- Items marked as DIF by at least one DIF method in two out of the two forms: 21724 (K02), 21679 (K02), 21600 (K68), 21770 (K68), 21827 (K91)

Unique items

- Items marked as DIF by at least three DIF methods: 21670 (K35), 21598 (K68)

Table 3 Number of reading items flag as DIF (CALIDs in parenthesis)

Cluster	Form	Groups	Winsteps	mirt		MeasInv				GPCM Lasso
			Table 30.2	RMSD	anova	Uniform LR	Non-uniform LR	Both LR	MH	Lasso
K02	602FT_Alt_K2_1 (21678, 21679, 21684, 21682, 21687, 21689, 21722, 21716, 21730, 21724)	AS, Blank, DD, ID, MDOHI	0	0	3 (**21684**, **21730**, 21724)	4 (21682, **21684**, **21687**, 21716)	1 (**21684**)	5 (21679, 21682, **21684**, **21687**, 21716)	3 (**21684**, 21724, **21730**)	4 (AS-21682, AS-**21684**, AS-21724, AS-**21730**)
	602FT_Alt_K2_2 (21678, 21680, 21684, 21683, 21687, 21690, 21722, 21720, 21730, 21728)	AS, Blank, DD, ID, MDOHI	0	0	2 (**21678**, **21730**)	2 (**21684**, **21730**)	1 (**21684**)	2 (**21684**, **21730**)	2 (**21684**, **21730**)	3 (DD-**21678**, ID-**21684**, MDOHI-**21730**)
	602FT_Alt_K2_3 (21678, 21681, 21684, 21682, 21687, 21691, 21722, 21716, 21730, 21724)	AS, Blank, DD, ID, MDOHI	0	0	2 (**21684**, 21724)	3 (**21678**, **21684**, 21691)	2 (**21684**, 21691)	3 (**21678**, **21684**, 21691)	2 (**21678**, **21684**)	1 (AS-**21684**)
	602FT_Alt_K2_4 (21678, 21679, 21684, 21683, 21687, 21692, 21722, 21723, 21730, 21732)	AS, Blank, DD, ID, MDOHI	0	0	1 (21679)	3 (21679, **21684**, **21730**)	2 (21683, **21722**)	3 (21679, **21684**, **21722**)	0	2 (AS-**21684**, AS-**21722**)
	602FT_Alt_K2_5 (21678, 21680, 21684, 21682, 21687, 21691, 21722, 21728, 21730, 21733)	AS, Blank, DD, ID, MDOHI	0	0	0	1 (**21684**)	0	1 (**21684**)	2 (21680, **21730**)	2 (AS-**21684**, AS-21728)
	Combined	AS, Blank, DD, ID, MDOHI		NA	NA	NA	NA	NA	NA	NA
35	602FT_Alt_35_1 (21663, 21662, 21684, 21668, 21667, 21669, 21722, 21693, 21695, 21696)	AS, Blank, DD, ID, MDOHI	0	0	0	1 (**21667**)	2 (**21667**, **21684**)	2 (**21667**, **21684**)	1 (**21667**)	

	602FT_Alt_35_2 (21663, 21662, 21684, 21668, 21667, 21670, 21722, 21694, 21695, 21696)	AS, Blank, ID, MDOHI	0	0	5 (**21662**, **21667**, 21670, **21684**, 21694)	3 (**21667**, 21670, **21684**)	3 (21668, 21670, **21695**)	5 (**21667**, 21668, 21670, **21684**, **21695**)	7 (**21667**, 21668, 21670, 21684, 21694, **21695**, 21696)	4 (AS-**21667**, AS-21694, AS-21696, ID-21722)
	602FT_Alt_35_3 (21663, 21662, 21684, 21666, 21667, 21671, 21722, 21685, 21695, 21696)	AS, Blank, DD, ID, MDOHI	0	0	5 (21666, **21667**, **21684**, 21685, **21695**)	3 (21666, **21667**, **21684**)	3 (21666, 21671, 21722)	3 (21666, **21667**, **21684**)	4 (21666, **21667**, **21684**, 21685)	2 (ID-**21667**, AS-**21684**)
	602FT_Alt_35_4 (21663, 21662, 21664, 21666, 21667, 21686, 21688, 21685, 21695, 21693)	AS, Blank, ID, MDOHI	0	0	4 (21666, **21667**, 21688, **21695**)	2 (21666, **21667**)	3 (21666, 21686, 21688)	4 (21666, **21667**, 21686, 21693)	4 (21666, **21667**, 21688, **21695**)	1 (AS-21693)
	602FT_Alt_35_5 (21663, 21662, 21665, 21666, 21667, 21688, 21669, 21685, 21695, 21694)	AS, Blank, DD, ID, MDOHI	0	0	1 (**21667**)	3 (21665, **21667**, **21695**)	2 (21665, 21666)	5 (**21662**, 21665, 21666, **21667**, **21695**)	2 (**21667**, **21695**)	0
	Combined	AS, Blank, DD, ID, MDOHI		NA	NA	NA	NA	NA	NA	NA
68	602FT_Alt_68_1 (21771, 21777, 21772, 21596, 21595, 21598, 21597, 21607, 21605, 21608)	AS, DD, ID, MDOHI	0	0	1 (21598)	3 (21596, 21598, **21771**)	1 (**21771**)	3 (21596, 21598, **21771**)	2 (21597, 21598)	1 (AS-21598)
	602FT_Alt_68_2 (21771, 21777, 21774, 21596, 21595, 21599, 21597, 21608, 21605, 21611)	AS, Blank, ID, MDOHI	0	1 (Blank-P5-21777)	0	2 (**21595**, 21605)	0	0	1 (**21595**)	0
	602FT_Alt_68_3 (21771, 21777, 21666, 21596, 21595, 21600, 21597, 21685, 21605, 21607)	AS, Blank, ID, MDOHI	1 (Blank-**21771**)	0	3 (**21595**, 21605, **21666**)	4 (21605, **21666**, **21771**, 21777)	2 (**21595**, 21777)	2 (**21595**, 21596, **21666**, **21771**, 21777)	6 (**21595**, 21597, 21600, 21605, **21666**, 21685)	2 (AS-**21666**, MDOHI-**21771**)
	602FT_Alt_68_4 (21771, 21770, 21666, 21772, 21595, 21601, 21600, 21685, 21605, 21608)	AS, ID, MDOHI	0	0	0	2 (21601, **21666**)	2 (**21666**, 21772)	2 (**21666**, 21772)	4 (21600, 21601, **21666**, 21770)	0
	602FT_Alt_68_5 (21771, 21770, 21666, 21774, 21595, 21602, 21601, 21685, 21605, 21611)	AS, Blank, ID, MDOHI	0	0	2 (**21595**, 21770)	2 (**21666**, 21770)	0	2 (**21666**, 21770)	2 (**21595**, 21611)	0
	Combined	AS, Blank, DD, ID, MDOHI	0	NA	NA	NA	NA	NA	NA	NA
91	602FT_Alt_91_1 (21817, 21777, 21820, 21824, 21826, 21828, 21597, 21831, 21832, 21833)	AS, Blank, DD, ID, MDOHI	0	0	1 (21828)	3 (21777, **21817**, 21831)	5 (21597, 21777, **21817**, 21824, 21828)	7 (21597, 21777, **21817**, 21824, 21828, 21831, **21832**)	4 (21597, **21826**, 21831, **21832**)	0
	602FT_Alt_91_2 (21817, 21777, 21821, 21825, 21826, 21829, 21597, 21833, 21832, 21834)	AS, Blank, ID, MDOHI	0	0	0	3 (21597, 21777, **21826**)	0	4 (21597, 21777, 21825, **21826**)	1 (21829)	0

	602FT_Alt_91_3 (21817, 21777, 21822, 21827, 21826, 21830, 21597, 21834, 21832, 21835)	AS, Blank, ID, MDOHI	1 (Blank-**21817**)	0	0	5 (21597, **21817**, 21822, **21826**, 21835)	2 (21822, 21827)	6 (21597, 21777, **21817**, 21822, 21827, 21835)	1 (21835)	0
	602FT_Alt_91_4 (21817, 21818, 21823, 21824, 21826, 21831, 21829, 21835, 21832, 21834)	AS, Blank, ID, MDOHI	0	0	0	2 (**21817**, 21823)	2 (21818, **21826**)	3 (**21817**, 21818, **21826**)	1 (**21826**)	0
	602FT_Alt_91_5 (21817, 21819, 21820, 21827, 21826, 21828, 21830, 21833, 21832, 21835)	AS, Blank, ID, MDOHI	0	0	1 (**21826**)	4 (**21817**, 21819, 21820, **21826**)	4 (21820, **21826**, 21827, 21830)	5 (**21817**, 21819, 21820, **21826**, 21827)	1 (**21826**)	0
	Combined	AS, Blank, DD, ID, MDOHI	0	NA	NA	NA	NA	NA	NA	NA

Note: Red bold, red, and black CALIDs mean the item included in all forms, more than one form but not all forms, and only one form, respectively. NA cells indicate that DIF method did not converge.

Speaking

Common items

- Items marked as DIF by at least one DIF method in five out of the five forms: None
- Items marked as DIF by at least one DIF method in four out of the five forms: 21627 (K68)
- Items marked as DIF by at least one DIF method in three out of the three forms: None
- Items marked as DIF by at least one DIF method in two out of the two forms: 21631 (K68)

Unique items

- Items marked as DIF by at least three DIF methods: 21746 (K02)

Table 4 Number of speaking items flag as DIF (CALIDs in parenthesis)

Cluster	Form	Groups	Winsteps	mirt		MeasInv				GPCM Lasso
			Table 30.2	RMSD	anova	Uniform LR	Non-uniform LR	Both LR	MH	Lasso
K02	602FT_Alt_K2_1 (21734, 21736, 21737, 21750, 21746, 21753, 21773, 21780)	AS, DD, ID	0	0	1 (21746)	1 (21746)	1 (21734)	1 (21746)	2 (21734, 21746)	0
	602FT_Alt_K2_2 (21735, 21736, 21738, 21750, 21756, 21753, 21776, 21780)	AS, DD, ID, MDOHI	0	0	0	0	0	0	1 (21735)	NA
	602FT_Alt_K2_3 (21734, 21736, 21737, 21750, 21761, 21753, 21773, 21780)	AS, Blank, DD, ID, MDOHI	0	0	0	1 (21737)	0	0	1 (21737)	NA
	602FT_Alt_K2_4 (21735, 21736, 21745, 21750, 21764, 21753, 21877, 21780)	AS, DD, ID	0	0	0	0	1 (**21750**)	0	1 (**21750**)	0
	602FT_Alt_K2_5 (21734, 21736, 21737, 21750, 21766, 21753, 21776, 21780)	AS, Blank, DD, ID, MDOHI	0	0	0	0	2 (21734, 21737)	0	0	1 (ID-21734)
	Combined	AS, Blank,	0	NA	NA	NA	NA	NA	NA	NA

		DD, ID, MDOHI								
35	602FT_Alt_35_1 (21697, 21698, 21750, 21700, 21707, 21705, 21709, 21780)	AS, Blank, DD, ID, MDOHI	0	0	0	1 (**21698**)	0	0	1 (**21697**)	0
	602FT_Alt_35_2 (21697, 21698, 21750, 21702, 21708, 21705, 21711, 21780)	AS, Blank, ID, MDOHI	0	0	0	1 (21708)	0	0	0	1 (**21697**)
	602FT_Alt_35_3 (21697, 21698, 21750, 21700, 21703, 21705, 21710, 21780)	AS, Blank, DD, ID, MDOHI	0	0	0	2 (21703, 21780)	0	0	0	0
	602FT_Alt_35_4 (21697, 21698, 21699, 21700, 21704, 21705, 21710, 21713)	AS, Blank, ID, MDOHI	0	0	0	2 (**21705**, 21713)	0	1 (**21705**)	1 (21704)	0
	602FT_Alt_35_5 (21697, 21698, 21699, 21701, 21706, 21705, 21710, 21712)	AS, Blank, ID, MDOHI	0	0	0	1 (21699)	1 (21712)	0	1 (21699)	NA
	Combined	AS, Blank, DD, ID, MDOHI	0	NA	NA	NA	NA	NA	NA	NA
68	602FT_Alt_68_1 (21616, 21619, 21624, 21628, 21630, 21627, 21633, 21635)	AS, DD, ID, MDOHI	0	0	0	0	2 (**21627**, 21635)	2 (**21627**, 21635)	2 (**21619**, **21627**)	0
	602FT_Alt_68_2 (21617, 21619, 21624, 21629, 21631, 21627, 21634, 21635)	AS, ID, MDOHI	0	0	1 (**21627**)	1 (21631)	0	0	1 (**21627**)	0
	602FT_Alt_68_3 (21618, 21619, 21624, 21700, 21630, 21627, 21710, 21635)	AS, Blank, ID, MDOHI	0	0	1 (21618)	2 (21618, 21635)	0	0	1 (**21627**)	1 (21618)
	602FT_Alt_68_4 (21616, 21619, 21621, 21700, 21631, 21627, 21710, 21636)	AS, ID, MDOHI	0	0	0	1 (21631)	1 (21636)	1 (**21627**)	0	1 (21616)
	602FT_Alt_68_5 (21617, 21619, 21626, 21701, 21632, 21627, 21710, 21636)	AS, Blank, ID, MDOHI	0	0	0	1 (21626)	0	1 (21626)	0	0

	Combined	AS, Blank, DD, ID, MDOHI	0	NA	NA	NA	NA	NA	NA	NA
91	602FT_Alt_91_1 (21836, 21838, 21839, 21624, 21842, 21574, 21575, 21635)	AS, DD, ID, MDOHI	0	0	1 (21635)	0	0	0	1 (21635)	0
	602FT_Alt_91_2 (21837, 21838, 21840, 21624, 21843, 21574, 21576, 21635)	AS, Blank, ID, MDOHI	0	0	0	0	0	0	0	0
	602FT_Alt_91_3 (21836, 21838, 21839, 21624, 21844, 21574, 21577, 21635)	AS, Blank, ID, MDOHI	0	0	1 (21839)	1 (21844)	0	1 (21844)	2 (21577, 21839)	NA
	602FT_Alt_91_4 (21837, 21838, 21840, 21841, 21554, 21574, 21578, 21576)	AS, Blank, ID, MDOHI	0	0	0	1 (**21838**)	0	1 (**21838**)	0	NA
	602FT_Alt_91_5 (21836, 21838, 21840, 21839, 21842, 21574, 21579, 21577)	AS, Blank, ID, MDOHI	0	0	0	0	2 (21836, 21840)	1 (21840)	0	0
	Combined	AS, Blank, DD, ID, MDOHI	0	NA	NA	NA	NA	NA	NA	NA

Note: Red bold, red, and black CALIDs mean the item included in all forms, more than one form but not all forms, and only one form, respectively. NA cells indicate that DIF method did not converge.

Writing

Common items

- Items marked as DIF by at least one DIF method in five out of the five forms: 21785 (K02), 21717 (G35), 21639 (G68), 21582 (G91)
- Items marked as DIF by at least one DIF method in four out of the five forms: None
- Items marked as DIF by at least one DIF method in three out of the three forms: 21787 (G35), 21637 (G68), 21642 (G68)
- Items marked as DIF by at least one DIF method in two out of the two forms: 21792 (K02), 21784 (K02), 21715 (G35), 21638 (G68), 21643 (G68), 21584 (G91), 21581 (G91)

Unique items

- Items marked as DIF by at least three DIF methods: None

Table 5 Number of writing items flag as DIF (CALIDs in parenthesis)

Cluster	Form	Groups	Winsteps	mirt		MeasInv				GPCM Lasso
			Table 30.2	RMSD	anova	Uniform LR	Non-uniform LR	Both LR	MH	Lasso
K02	602FT_Alt_K2_1 (21783, 21785, 21787, 21789, 21792, 21790, 21799, 21798)	AS, Blank, DD, ID, MDOHI	1 (Blank-**21787**)	NA	NA	NA	NA	NA	4 (**21785**, **21787**, **21789**, 21792)	NA
	602FT_Alt_K2_2 (21784, 21785, 21787, 21789, 21794, 21790, 21799, 21798)	AS, Blank, DD, ID, MDOHI	2 (MDOHI-21784, Blank-**21785**)	NA	NA	0	0	0	NA	0
	602FT_Alt_K2_3 (21783, 21785, 21787, 21789, 21795, 21790, 21799, 21798)	AS, Blank, DD, ID, MDOHI	1 (MDOHI-21783)	NA	NA	NA	NA	NA	3 (21783, **21785**, 21795)	NA
	602FT_Alt_K2_4 (21784, 21785, 21787, 21789, 21796, 21790, 21799, 21798)	AS, Blank, DD, ID, MDOHI	2 (MDOHI-ID-21784)	NA	NA	NA	NA	NA	2 (21784, **21785**)	NA
	602FT_Alt_K2_5	AS, Blank, DD, ID, MDOHI	0	NA	NA	0	5		2 (**21785**, **21787**)	0

	(21783, 21785, 21787, 21789, 21792, 21790, 21799, 21798)						(21783, **21785**, **21789**, **21790**, 21792)			
	Combined	AS, Blank, DD, ID, MDOHI	1 (MDOHI-21784)	NA	NA	NA	NA	NA	NA	NA
35	602FT_Alt_35_1 (21714, 21717, 21787, 21727, 21731, 21726, 21741, 21798)	AS, Blank, DD, ID, MDOHI	0	0	0	3 (21714, **21717**, 21787)	5 (21714, **21717**, 21727, 21731, 21787)	5 (21714, **21717**, 21727, 21731, 21787)	3 (21714, **21717**, 21787)	NA
	602FT_Alt_35_2 (21715, 21717, 21787, 21729, 21739, 21726, 21742, 21798)	AS, Blank, ID, MDOHI	0	0	0	3 (21715, **21717**, 21729)	4 (21715, **21717**, 21729, 21787)	4 (21715, **21717**, 21729, 21787)	3 (**21717**, 21729, 21787)	0
	602FT_Alt_35_3 (21714, 21717, 21787, 21725, 21731, 21726, 21743, 21798)	AS, Blank, DD, ID, MDOHI	1 (DD-**21717**)	0	0	1 (21725)	4 (**21717**, 21725, 21743, 21787)	4 (**21717**, 21725, 21743, 21787)	4 (**21717**, 21725, 21743, 21787)	NA
	602FT_Alt_35_4 (21715, 21717, 21719, 21725, 21739, 21726, 21743, 21744)	AS, Blank, ID, MDOHI	0	0	0	2 (21715, **21726**)	1 (21719)	3 (21715, 21719, **21726**)	2 (**21717**, 21719)	1 (21715)
	602FT_Alt_35_5 (21718, 21717, 21721, 21725, 21731, 21726, 21743, 21744)	AS, Blank, DD, ID, MDOHI	0	0	0	2 (**21717**, 21721)	3 (**21717**, 21721, 21731)	4 (**21717**, 21718, 21721, 21731)	3 (**21717**, 21721, 21725)	2 (21718, 21725)
	Combined	AS, Blank, DD, ID, MDOHI	0	NA	NA	NA	NA	NA	NA	NA
68	602FT_Alt_68_1 (21637, 21639, 21642, 21643, 21644, 21778, 21781, 21788)	AS, DD, ID, MDOHI	0	0	0	4 (21637, **21639**, 21642, 21643)	4 (21637, 21642)	4 (21637, **21639**, 21642, 21643)	1 (**21639**)	0
	602FT_Alt_68_2 (21638, 21639, 21642, 21643, 21775, 21778, 21782, 21788)	AS, ID, MDOHI	0	0	0	2 (21638, 21642, 21775)	1 (21638)	3 (21638, 21642, 21775)	3 (21638, **21639**, 21643)	0
	602FT_Alt_68_3 (21637, 21639, 21642, 21725, 21779, 21778, 21743, 21788)	AS, Blank, ID, MDOHI	0	0	0	3 (21637, **21639**, 21725)	3 (**21639**, 21642, **21778**)	4 (21637, **21639**, 21642, 21725)	2 (21637, **21639**, 21725)	NA
	602FT_Alt_68_4	AS, ID, MDOHI	0	0	0	2 (21638, 21640)	2	3	2	NA

	(21638, 21639, 21640, 21725, 21644, 21778, 21743, 21786)						(21638, **21639**, 21743)	(21638, **21639**, 21640)	(21638, 21640)	
	602FT_Alt_68_5 (21637, 21639, 21641, 21725, 21775, 21778, 21743, 21791)	AS, Blank, ID, MDOHI	0	0	0	2 (21637, 21641)	4 (21637, **21639**, 21641, 21725)	4 (21637, **21639**, 21641, 21725)	2 (21637, 21641)	0
	Combined	AS, Blank, DD, ID, MDOHI	NA	NA	NA	NA	NA	NA	NA	NA
91	602FT_Alt_91_1 (21580, 21582, 21583, 21642, 21589, 21588, 21591, 21788)	AS, DD, ID, MDOHI	0	0	0	1 (**21582**)	0	1 (**21582**)	2 (**21582**, 21589)	NA
	602FT_Alt_91_2 (21581, 21582, 21584, 21642, 21590, 21588, 21592, 21788)	AS, Blank, ID, MDOHI	0	0	0	0	1 (21584)	1 (21584)	3 (21581, **21582**, 21584)	0
	602FT_Alt_91_3 (21580, 21582, 21585, 21642, 21589, 21588, 21593, 21788)	AS, Blank, ID, MDOHI	0	0	2 (21580, 21788)	4 (21580, **21582**, 21585, 21788)	3 (21580, **21582**, 21588)	5 (21580, **21582**, 21585, 21588, 21788)	3 (21580, **21582**, 21788)	0
	602FT_Alt_91_4 (21581, 21582, 21583, 21586, 21590, 21588, 21594, 21591)	AS, ID, MDOHI	0	0	1 (**21582**)	2 (21581, **21582**)	0	2 (**21582**, 21591)	2 (21581, **21582**)	3 (21581, **21582**, 21591)
	602FT_Alt_91_5 (21580, 21582, 21584, 21587, 21589, 21588, 21593, 21592)	AS, Blank, ID, MDOHI	0	0	2 (21580, 21584)	2 (21580, **21582**, 21588)	1 (21584)	4 (21580, **21582**, 21584, 21588)	3 (21580, **21582**, 21584)	2 (**21582**, 21587)
	Combined	AS, Blank, DD, ID, MDOHI	NA	NA	NA	NA	NA	NA	NA	NA

Note: Red bold, red, and black CALIDs mean the item included in all forms, more than one form but not all forms, and only one form, respectively. NA cells indicate that DIF method did not converge.