

Chapter 8

BRT

08-26-2020

Convergent/Divergent Validity

To examine convergent and divergent validity evidence, (a) correlations were conducted to examine the relation between scale scores in the different content areas (ELA with Math, ELA with Science, and Math with Science), and (b) Chi-squared tests of independence were conducted to examine whether performance level scores (i.e., *Advanced*, *Proficient*, *Emerging*, or *Novice*) were independent across content areas at the $p = .01$ significance level. Note that the p -values were computed for a Monte Carlo test (Hope, 1968) with 2,000 replicates.

We also display histograms of the number of items with no response and the number of items not attempted.

Correlations Among Content Areas

Correlations for ELA with Math ranged from 0.29 to 0.71, correlations for ELA with Science ranged from 0.61 to 0.82, and correlations for Math with Science ranged from 0.32 to 0.61. Please see Table 6.1.1. Across grades, correlations are almost always higher for Tier 1 than Tier 2 (except Grades 8 ELA with Math, and all Grade 11 correlations). Across Grades 4, 8 and 11, correlations for ELA with Science were higher than correlations for Math with Science.

Correlations between Content Areas by Grade and Tier

Grade	Tier	ELA with Math	ELA with Science	Math with Science
3	1	.51	—	—
3	2	.51	—	—
4	1	.69	.82	.61
4	2	.42	.70	.40
5	1	.71	—	—
5	2	.39	—	—
6	1	.69	—	—
6	2	.35	—	—
7	1	.71	—	—
7	2	.36	—	—
8	1	.36	.77	.37
8	2	.39	.66	.32
11	2	.29	.61	.37
11	1	.41	.80	.40

Chi-squared Tests of Independence for Performance Levels Among Content Areas

Across grades and tiers, all Chi-squared tests of independence were statistically significant, except Grade 4, Tier 2 ELA - Science. Thus, in general, performance level scores in one content area were not independent of performance level scores in another content area.

English/Language Arts (ELA) - Mathematics

Grade	Tier	Chi-Square	p-value
3	1	NaN	NA
3	2	NaN	NA
4	1	NaN	NA
4	2	NaN	NA
5	1	NaN	NA
5	2	NaN	NA
6	1	NaN	NA
6	2	NaN	NA
7	1	NaN	NA
7	2	NaN	NA
8	1	NaN	NA
8	2	NaN	NA
11	2	NaN	NA
11	1	NaN	NA

Performance Level Matrices

Grade 3 Tier 1

ELA	Math				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	79	0	0	0	9
Proficient	448	7	0	0	28
Emerging	326	167	0	1	59
Novice	198	4	0	1	17
Missing	0	0	0	0	0

Grade 3 Tier 2

ELA	Math				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	52	39	0	9	6
Proficient	6	28	0	11	7
Emerging	0	0	2	2	2
Novice	2	10	5	15	5
Missing	0	0	0	0	0

Grade 4 Tier 1

ELA	Math				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	151	221	6	21	29
Proficient	32	152	10	70	33
Emerging	0	26	229	83	58
Novice	5	64	44	80	17
Missing	0	0	0	0	0

Grade 4 Tier 2

ELA	Math				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	76	48	0	7	10
Proficient	22	57	6	23	14
Emerging	0	0	3	1	1
Novice	0	1	3	3	1
Missing	0	0	0	0	0

Grade 5 Tier 1

ELA	Math				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	34	18	0	2	4
Proficient	114	149	21	63	43
Emerging	3	12	217	80	41
Novice	12	76	81	83	24
Missing	0	0	0	0	0

Grade 5 Tier 2

ELA	Math				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	57	58	3	16	8
Proficient	26	73	35	69	15
Emerging	0	2	17	8	2
Novice	7	29	40	27	8
Missing	0	0	0	0	0

Grade 6 Tier 1

ELA	Math				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	110	134	11	50	47
Proficient	8	51	29	46	13
Emerging	1	15	264	29	36
Novice	2	32	54	37	16
Missing	0	0	0	0	0

Grade 6 Tier 2

ELA	Math				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	83	35	0	6	10
Proficient	127	118	13	63	29
Emerging	0	1	9	2	2
Novice	10	28	10	24	6
Missing	0	0	0	0	0

Grade 7 Tier 1

ELA	Math				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	95	62	4	35	31
Proficient	26	60	36	63	29
Emerging	1	4	186	29	17
Novice	2	17	90	70	21
Missing	0	0	0	0	0

Grade 7 Tier 2

ELA	Math				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	187	130	3	50	34
Proficient	53	97	4	60	19
Emerging	0	3	6	18	3
Novice	8	24	2	42	8
Missing	0	0	0	0	0

Grade 8 Tier 1

ELA	Math				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	130	10	3	4	20
Proficient	147	16	7	1	20
Emerging	25	94	2	0	14
Novice	152	71	5	0	37
Missing	0	0	0	0	0

Grade 8 Tier 2

ELA	Math				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	27	135	11	31	24
Proficient	22	110	28	72	31
Emerging	14	10	42	20	11
Novice	18	34	29	62	12
Missing	0	0	0	0	0

Grade 11 Tier 2

ELA	Math				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	231	45	0	15	14
Proficient	45	30	0	16	7
Emerging	10	12	1	16	2
Novice	11	7	0	6	4
Missing	0	0	0	0	0

Grade 11 Tier 1

ELA	Math				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	46	123	0	1	5
Proficient	6	72	0	0	4
Emerging	1	266	0	0	42
Novice	0	65	0	0	3
Missing	0	0	0	0	0

English/Language Arts (ELA) - Science

Grade	Tier	Chi-Square	p-value
4	1	NaN	NA
4	2	NaN	NA
8	1	NaN	NA
8	2	NaN	NA
11	2	NaN	NA
11	1	NaN	NA

Performance Level Matrices

Grade 4 Tier 1

ELA	Science				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	0	225	1	161	41
Proficient	0	96	3	152	46
Emerging	0	12	99	201	84
Novice	0	48	4	131	27
Missing	0	0	0	0	0

Grade 4 Tier 2

ELA	Science				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	0	105	0	22	14
Proficient	0	44	1	60	17
Emerging	0	0	0	4	1
Novice	0	1	0	7	0
Missing	0	0	0	0	0

Grade 8 Tier 1

ELA	Science				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	9	70	1	63	24
Proficient	0	42	9	107	33
Emerging	0	0	101	11	23
Novice	0	15	98	116	36
Missing	0	0	0	0	0

Grade 8 Tier 2

ELA	Science				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	35	142	3	22	26
Proficient	9	156	4	55	39
Emerging	0	21	10	49	17
Novice	0	50	4	84	17
Missing	0	0	0	0	0

Grade 11 Tier 2

ELA	Science				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	32	215	0	39	19
Proficient	0	47	0	41	10
Emerging	0	20	0	16	5
Novice	1	15	0	8	4
Missing	0	0	0	0	0

Grade 11 Tier 1

ELA	Science				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	12	116	0	40	7
Proficient	0	45	0	31	6
Emerging	0	70	52	131	56
Novice	0	27	1	37	3
Missing	0	0	0	0	0

Mathematics - Science

Grade	Tier	Chi-Square	p-value
4	1	NaN	NA
4	2	NaN	NA
8	1	479.75	< .01
8	2	296.37	< .01
11	2	NaN	NA
11	1	NaN	NA

Performance Level Matrices

Grade 4 Tier 1

Math	Science				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	0	129	1	48	10
Proficient	0	164	3	261	35
Emerging	0	14	98	149	28
Novice	0	61	4	162	27
Missing	0	13	1	25	98

Grade 4 Tier 2

Math	Science				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	0	81	0	14	3
Proficient	0	49	0	47	10
Emerging	0	3	0	9	0
Novice	0	11	1	20	2
Missing	0	6	0	3	17

Grade 8 Tier 1

Math	Science				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	8	109	73	231	33
Proficient	0	10	128	38	15
Emerging	0	1	2	13	1
Novice	0	3	0	2	0
Missing	1	4	6	13	67

Grade 8 Tier 2

Math	Science				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	11	34	4	29	3
Proficient	28	187	2	49	23
Emerging	1	40	7	54	8
Novice	3	91	3	73	15
Missing	1	17	5	5	50

Grade 11 Tier 2

Math	Science				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	32	210	0	45	10
Proficient	1	53	0	34	6
Emerging	0	0	0	1	0
Novice	0	28	0	22	3
Missing	0	6	0	2	19

Grade 11 Tier 1

Math	Science				
	Advanced	Proficient	Emerging	Novice	Missing
Advanced	9	38	0	5	1
Proficient	3	216	50	229	28
Emerging	0	0	0	0	0
Novice	0	0	0	1	0
Missing	0	4	3	4	43

Number of Items with No Response or Not Attempted

English/Language Arts (ELA)

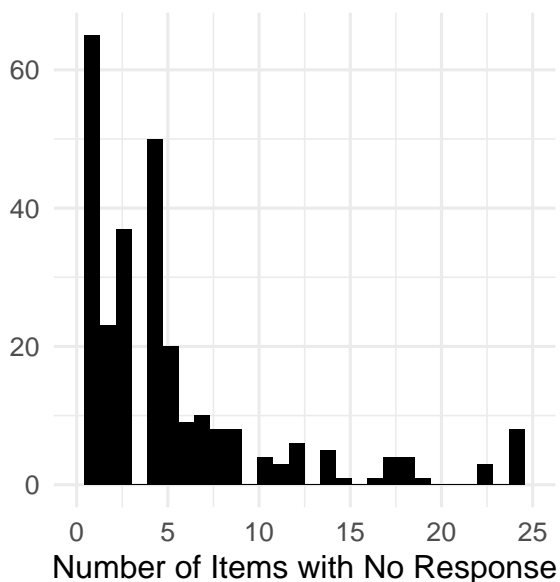
Grade 3 Tier - No Response

Figure 6.2.2.1

ELA Grade 3: Histograms of Items with No Response

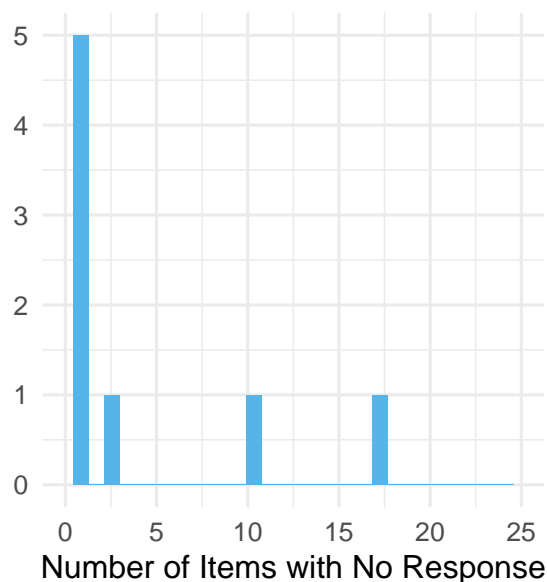
Tier 1

Showing 270 of 1344 Tier 1 students with at least one item with no response.



Tier 2

Showing 8 of 201 Tier 2 students with at least one item with no response.



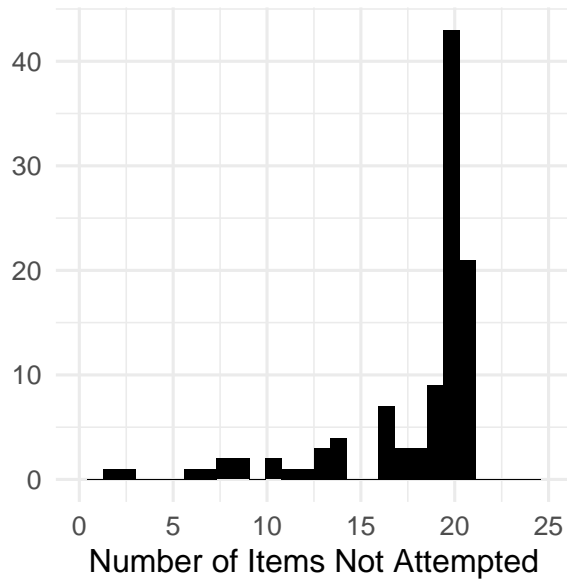
Grade 3 Tier - Not Attempted

Figure 6.2.2.2

ELA Grade 3: Histograms of Items Not Attempted

Tier 1

Showing 105 of 1344 Tier 1 students with at least one item not attempted.



Tier 2

Zero Tier 2 students with at least one item not attempted.

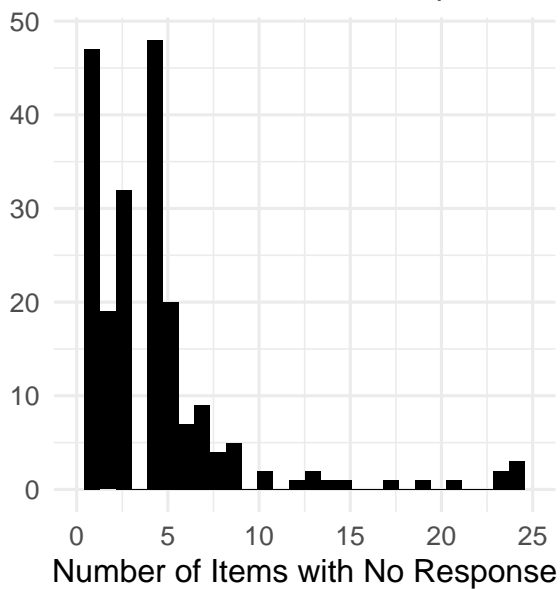
Grade 4 Tier - No Response

Figure 6.2.2.3

ELA Grade 4: Histograms of Items with No Response

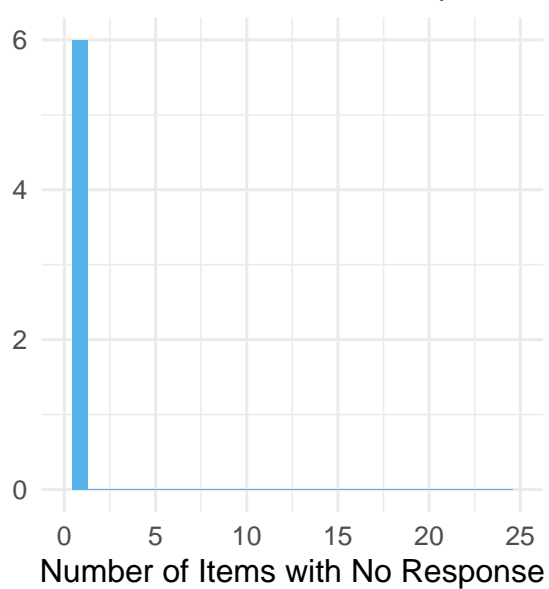
Tier 1

Showing 206 of 1331 Tier 1 students with at least one item with no response.



Tier 2

Showing 6 of 276 Tier 2 students with at least one item with no response.



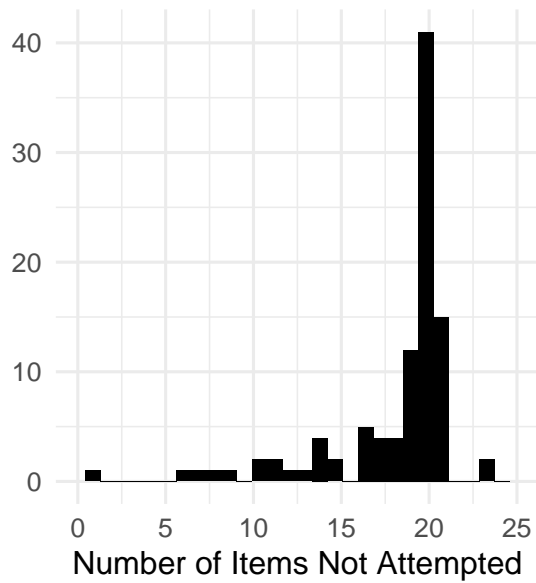
Grade 4 Tier - Not Attempted

Figure 6.2.2.4

ELA Grade 4: Histograms of Items Not Attempted

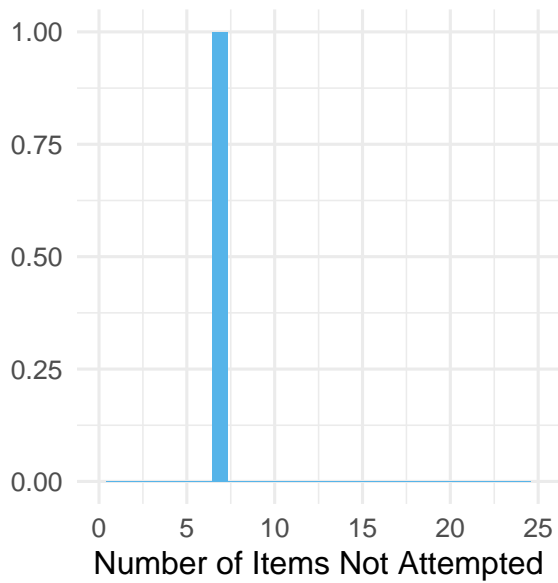
Tier 1

Showing 100 of 1331 Tier 1 students with at least one item not attempted.



Tier 2

Showing 1 of 276 Tier 2 students with at least one item not attempted.



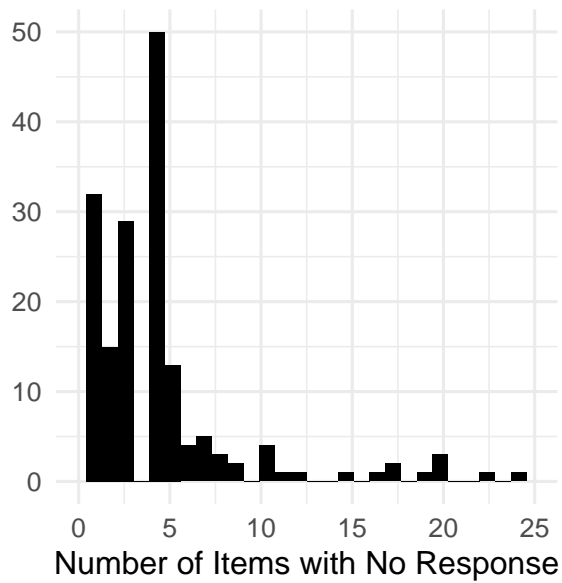
Grade 5 Tier - No Response

Figure 6.2.2.5

ELA Grade 5: Histograms of Items with No Response

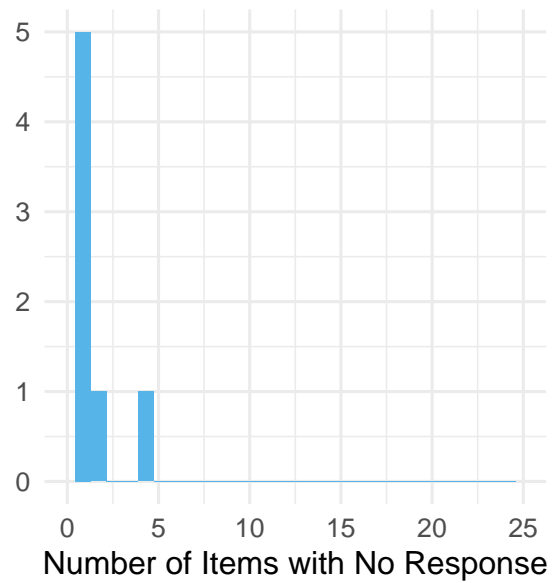
Tier 1

Showing 169 of 1077 Tier 1 students with at least one item with no response.



Tier 2

Showing 7 of 500 Tier 2 students with at least one item with no response.



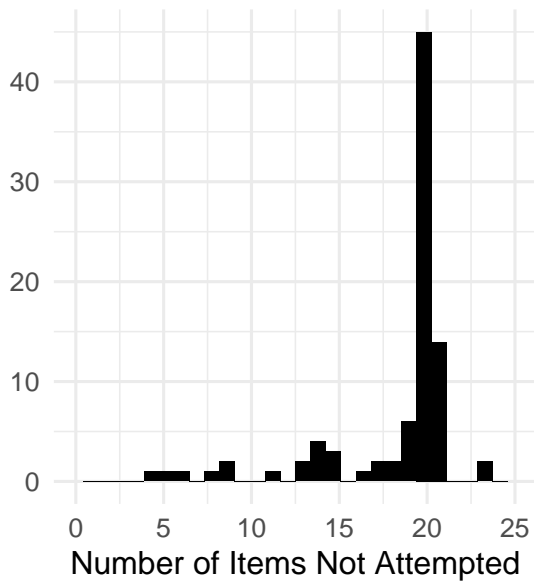
Grade 5 Tier - Not Attempted

Figure 6.2.2.6

ELA Grade 5: Histograms of Items Not Attempted

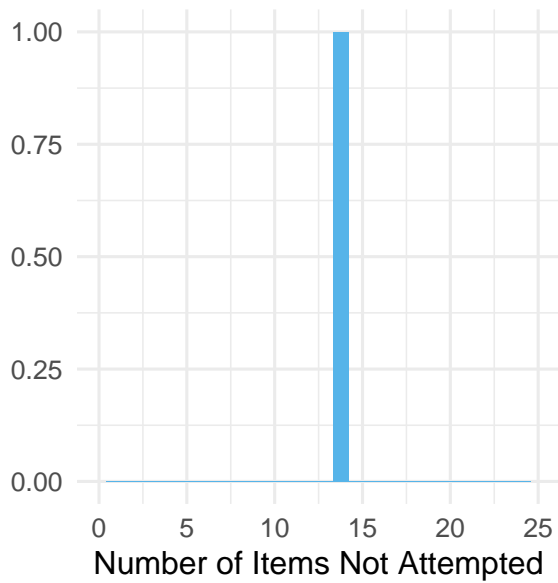
Tier 1

Showing 88 of 1077 Tier 1 students with at least one item not attempted.



Tier 2

Showing 1 of 500 Tier 2 students with at least one item not attempted.



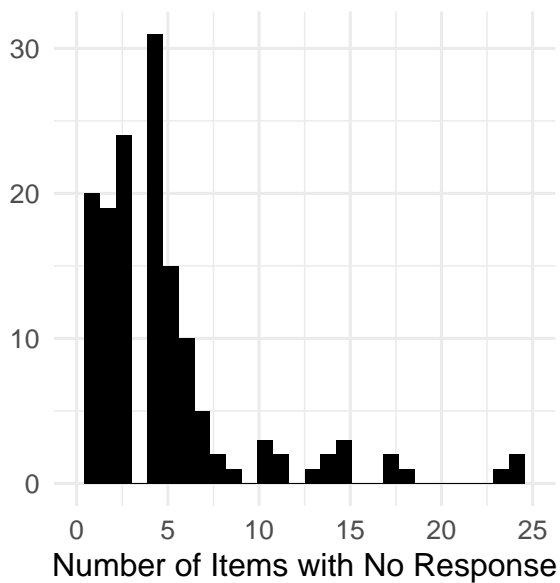
Grade 6 Tier - No Response

Figure 6.2.2.7

ELA Grade 6: Histograms of Items with No Response

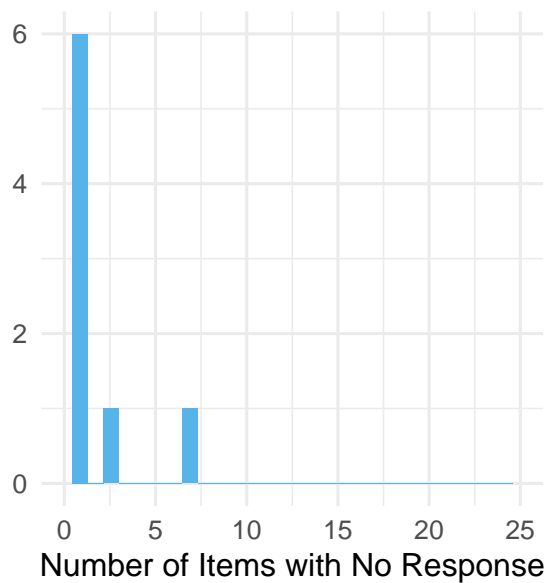
Tier 1

Showing 144 of 985 Tier 1 students with at least one item with no response.



Tier 2

Showing 8 of 576 Tier 2 students with at least one item with no response.



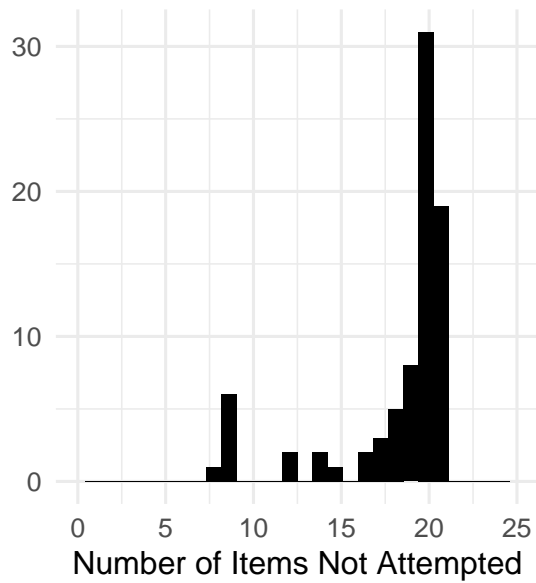
Grade 6 Tier - Not Attempted

Figure 6.2.2.8

ELA Grade 6: Histograms of Items Not Attempted

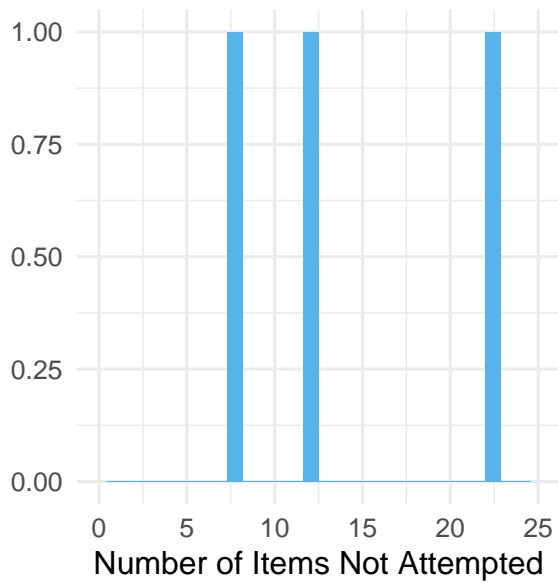
Tier 1

Showing 80 of 985 Tier 1 students with at least one item not attempted.



Tier 2

Showing 3 of 576 Tier 2 students with at least one item not attempted.



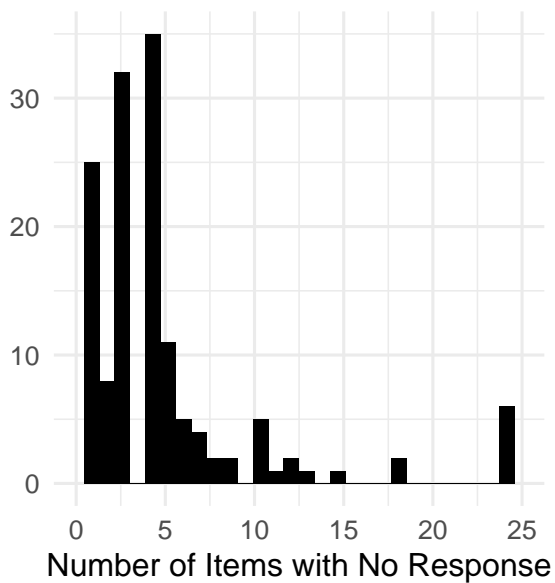
Grade 7 Tier - No Response

Figure 6.2.2.9

ELA Grade 7: Histograms of Items with No Response

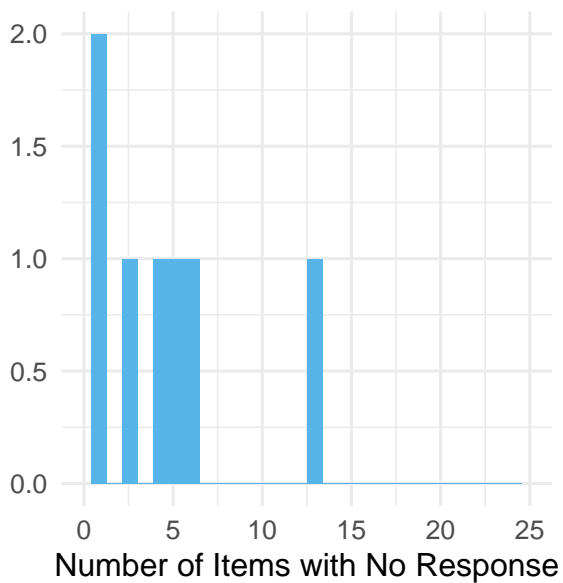
Tier 1

Showing 142 of 878 Tier 1 students with at least one item with no response.



Tier 2

Showing 7 of 751 Tier 2 students with at least one item with no response.



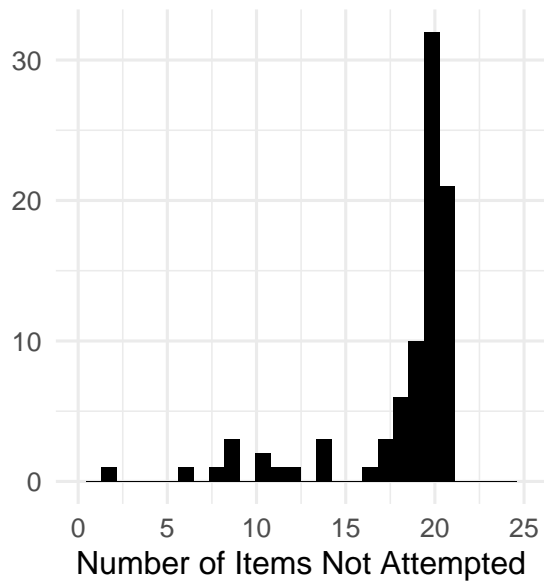
Grade 7 Tier - Not Attempted

Figure 6.2.2.10

ELA Grade 7: Histograms of Items Not Attempted

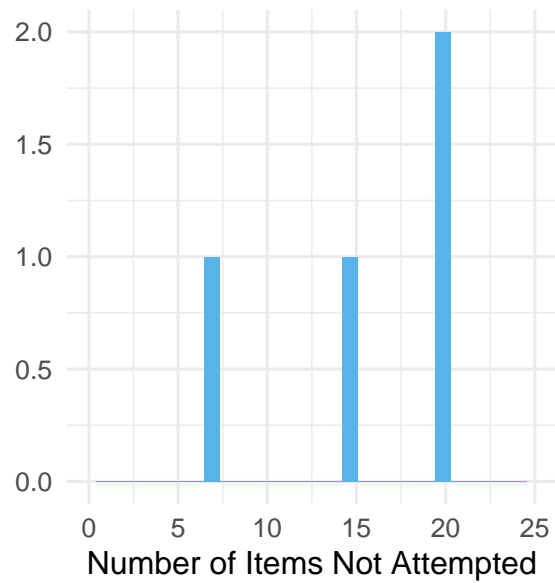
Tier 1

Showing 86 of 878 Tier 1 students with at least one item not attempted.



Tier 2

Showing 4 of 751 Tier 2 students with at least one item not attempted.



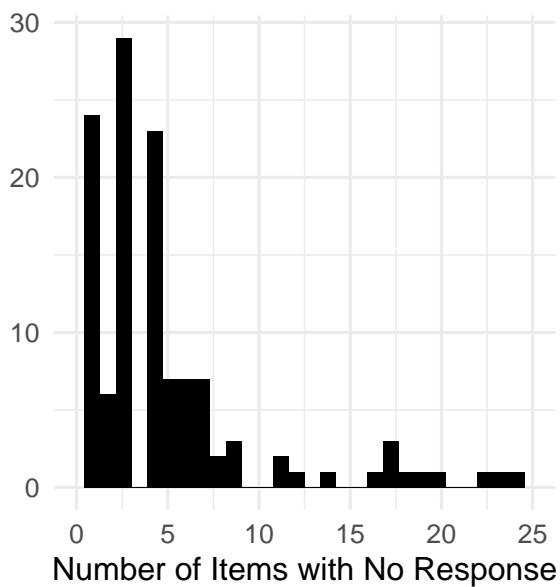
Grade 8 Tier - No Response

Figure 6.2.2.11

ELA Grade 8: Histograms of Items with No Response

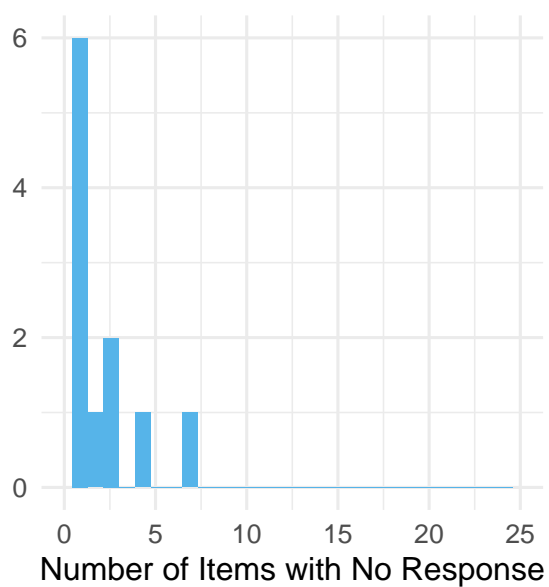
Tier 1

Showing 122 of 758 Tier 1 students with at least one item with no response.



Tier 2

Showing 11 of 743 Tier 2 students with at least one item with no response.



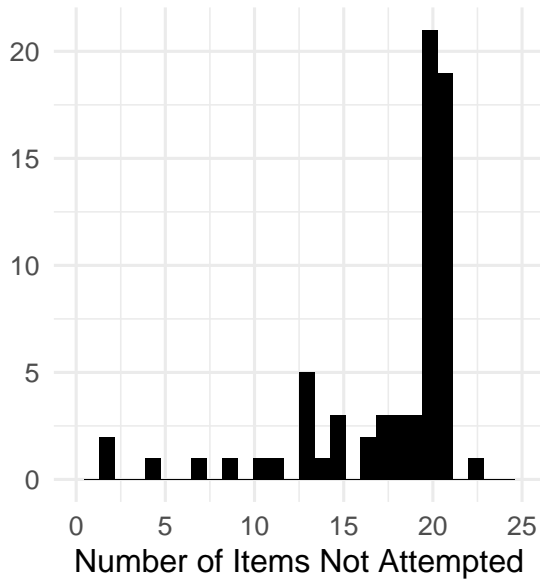
Grade 8 Tier - Not Attempted

Figure 6.2.2.12

ELA Grade 8: Histograms of Items Not Attempted

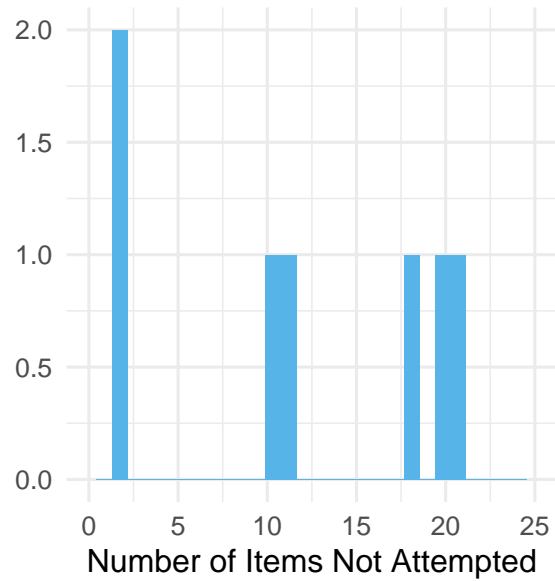
Tier 1

Showing 68 of 758 Tier 1 students with at least one item not attempted.



Tier 2

Showing 7 of 743 Tier 2 students with at least one item not attempted.



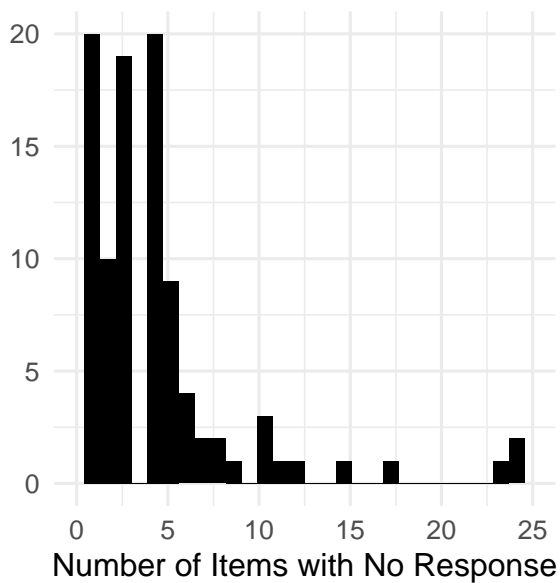
Grade 11 Tier - No Response

Figure 6.2.2.13

ELA Grade 11: Histograms of Items with No Response

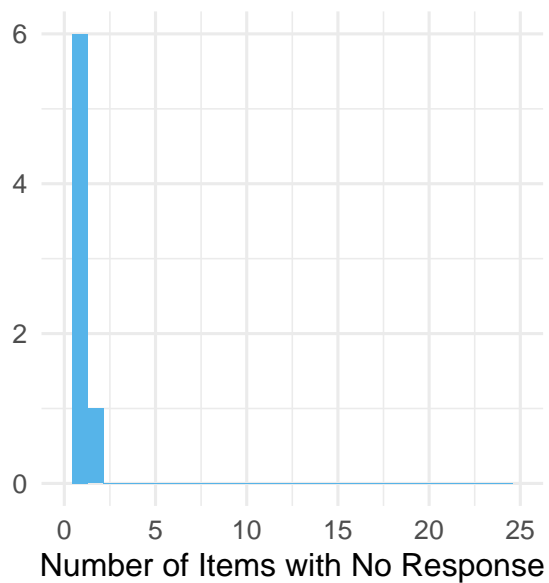
Tier 1

Showing 97 of 634 Tier 1 students with at least one item with no response.



Tier 2

Showing 7 of 472 Tier 2 students with at least one item with no response.



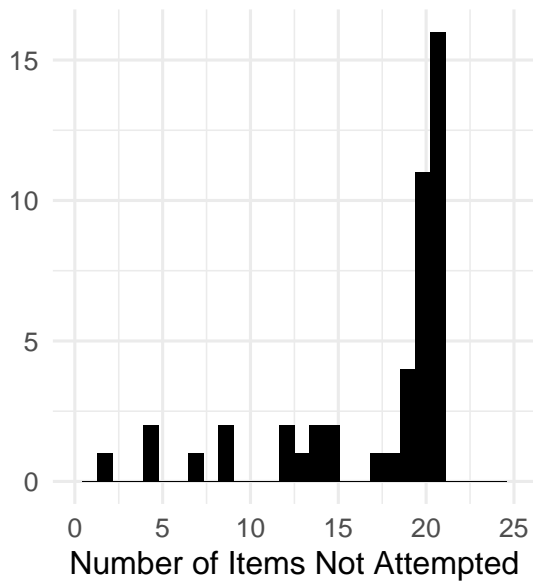
Grade 11 Tier - Not Attempted

Figure 6.2.2.14

ELA Grade 11: Histograms of Items Not Attempted

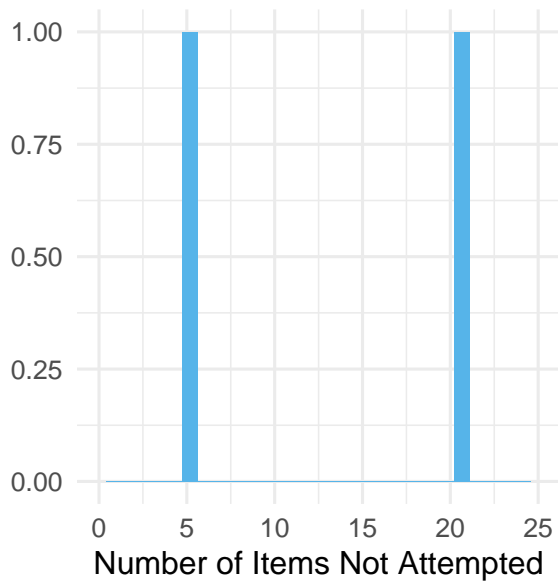
Tier 1

Showing 46 of 634 Tier 1 students with at least one item not attempted.



Tier 2

Showing 2 of 472 Tier 2 students with at least one item not attempted.



Mathematics

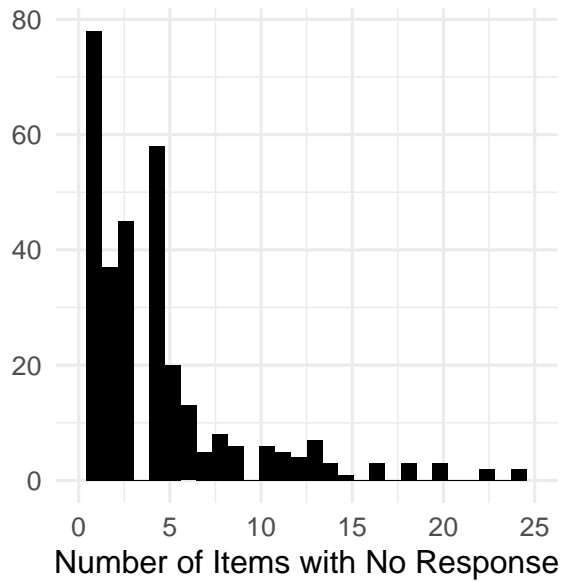
Grade 3 Tier - No Response

Figure 6.2.2.15

Math Grade 3: Histograms of Items with No Response

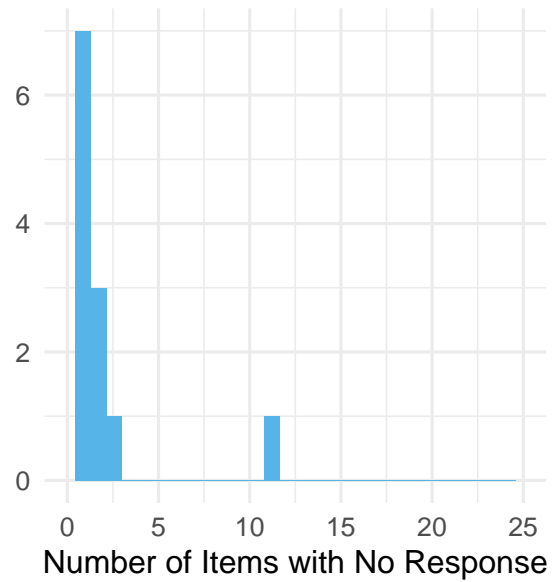
Tier 1

Showing 319 of 1248 Tier 1 students with at least one item with no response.



Tier 2

Showing 13 of 191 Tier 2 students with at least one item with no response.



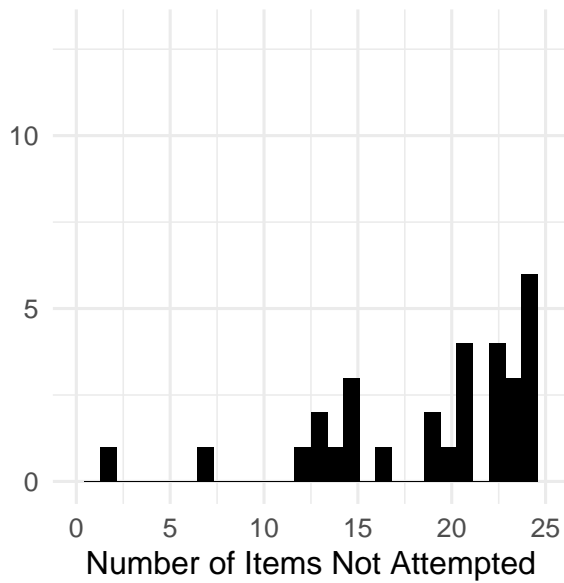
Grade 3 Tier - Not Attempted

Figure 6.2.2.16

Math Grade 3: Histograms of Items Not Attempted

Tier 1

Showing 113 of 1248 Tier 1 students with at least one item not attempted.



Tier 2

Zero Tier 2 students with at least one item not attempted.

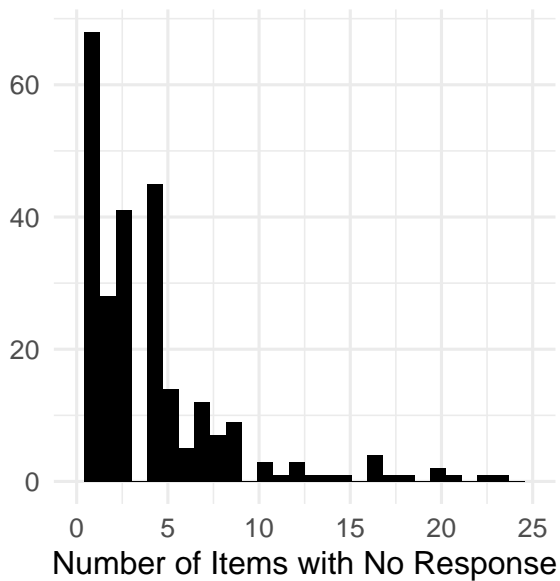
Grade 4 Tier - No Response

Figure 6.2.2.17

Math Grade 4: Histograms of Items with No Response

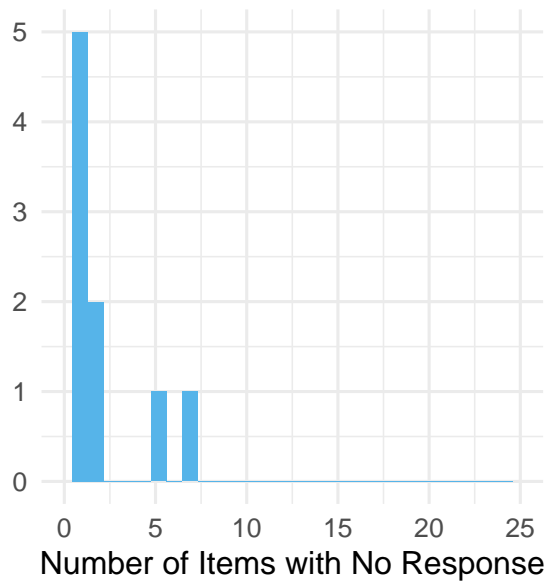
Tier 1

Showing 253 of 1227 Tier 1 students with at least one item with no response.



Tier 2

Showing 9 of 276 Tier 2 students with at least one item with no response.



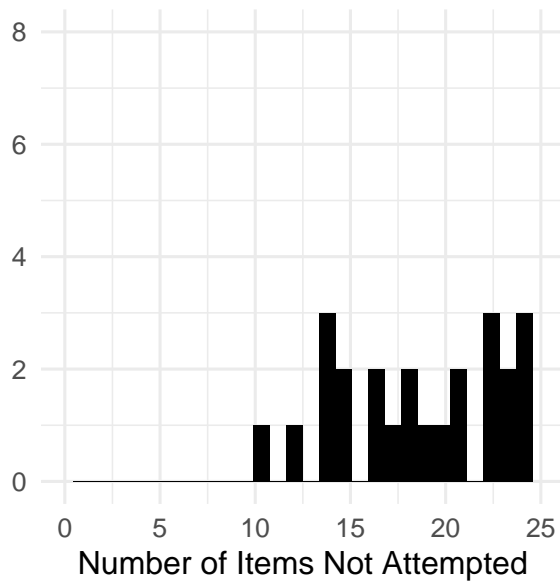
Grade 4 Tier - Not Attempted

Figure 6.2.2.18

Math Grade 4: Histograms of Items Not Attempted

Tier 1

Showing 95 of 1227 Tier 1 students with at least one item not attempted.



Tier 2

Zero Tier 2 students with at least one item not attempted.

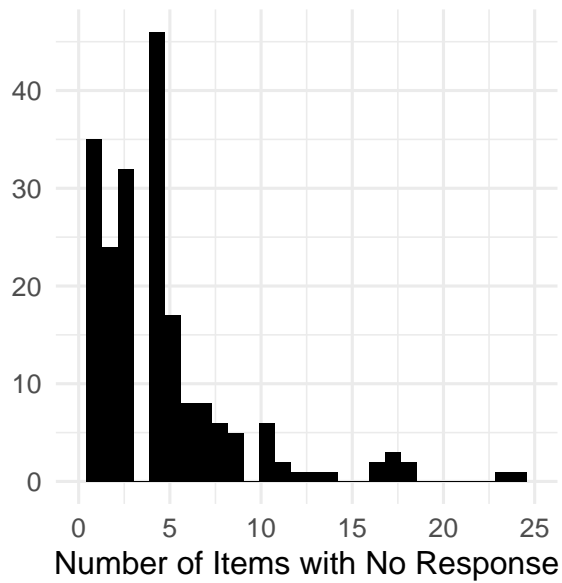
Grade 5 Tier - No Response

Figure 6.2.2.19

Math Grade 5: Histograms of Items with No Response

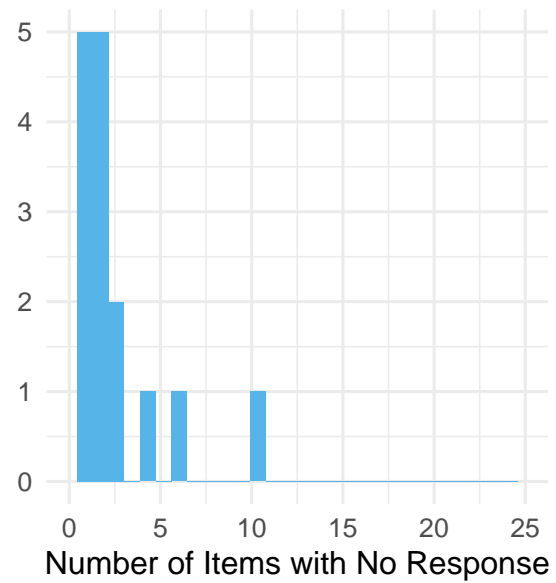
Tier 1

Showing 207 of 1015 Tier 1 students with at least one item with no response.



Tier 2

Showing 15 of 442 Tier 2 students with at least one item with no response.



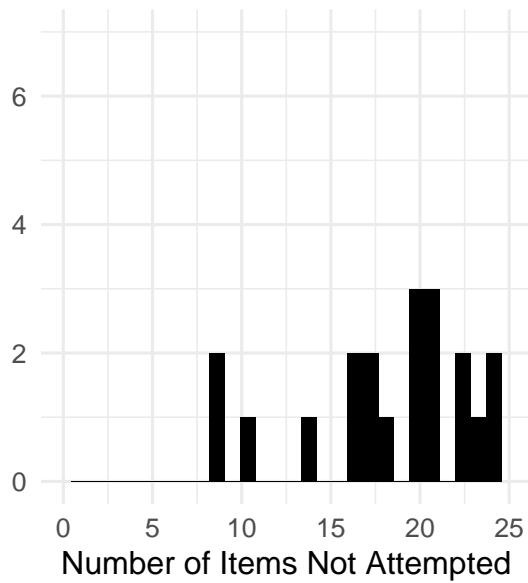
Grade 5 Tier - Not Attempted

Figure 6.2.2.20

Math Grade 5: Histograms of Items Not Attempted

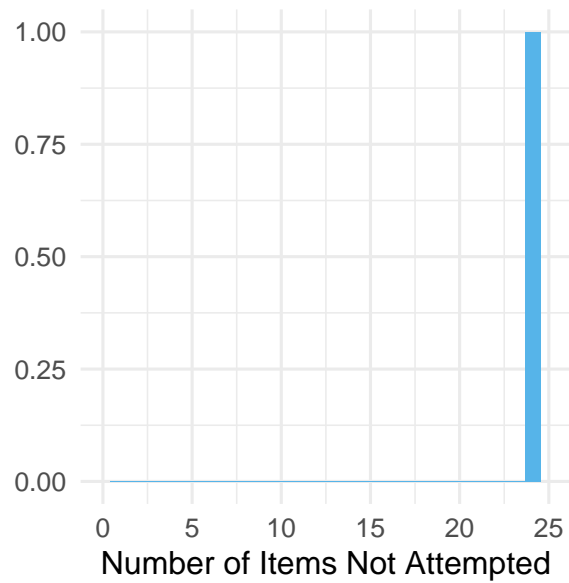
Tier 1

Showing 92 of 1015 Tier 1 students with at least one item not attempted.



Tier 2

Showing 2 of 442 Tier 2 students with at least one item not attempted.



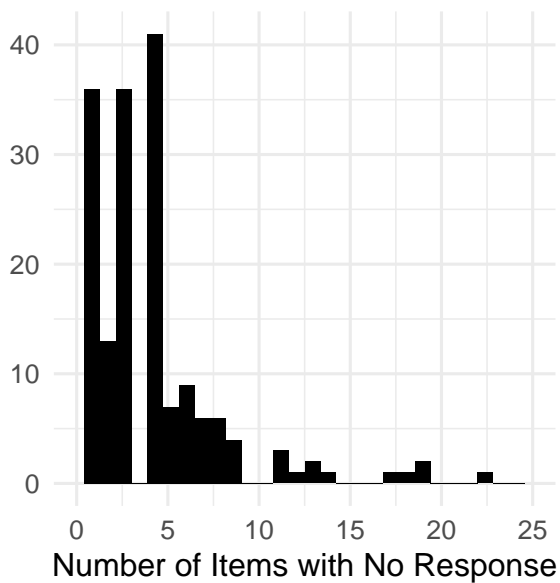
Grade 6 Tier - No Response

Figure 6.2.2.21

Math Grade 6: Histograms of Items with No Response

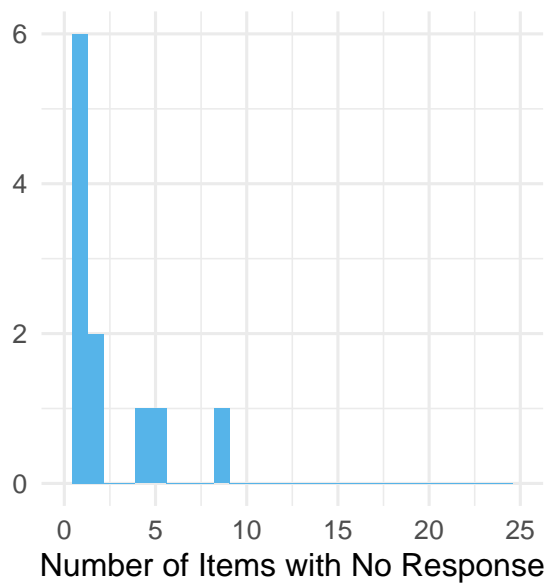
Tier 1

Showing 175 of 922 Tier 1 students with at least one item with no response.



Tier 2

Showing 11 of 507 Tier 2 students with at least one item with no response.



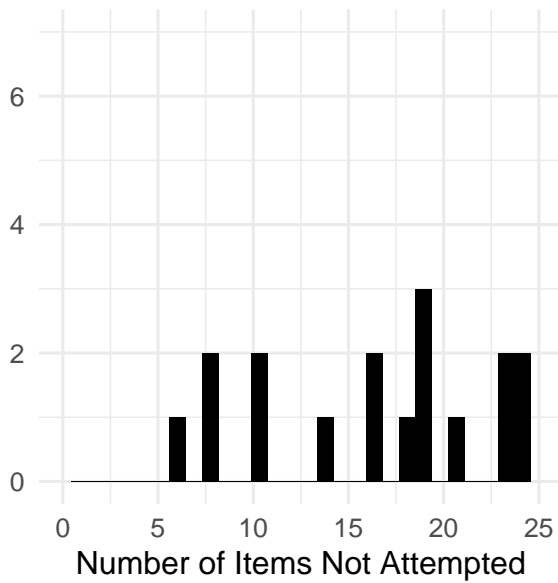
Grade 6 Tier - Not Attempted

Figure 6.2.2.22

Math Grade 6: Histograms of Items Not Attempted

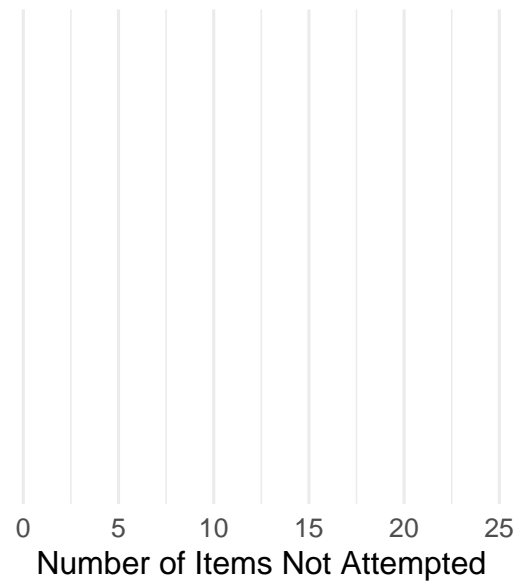
Tier 1

Showing 81 of 922 Tier 1 students with at least one item not attempted.



Tier 2

Showing 1 of 507 Tier 2 students with at least one item not attempted.



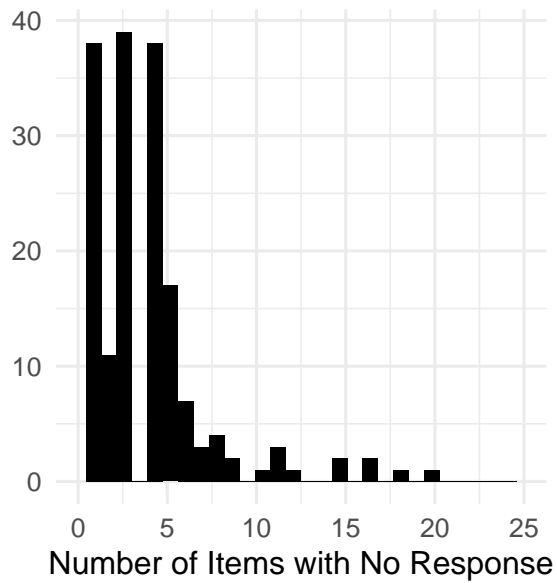
Grade 7 Tier - No Response

Figure 6.2.2.23

Math Grade 7: Histograms of Items with No Response

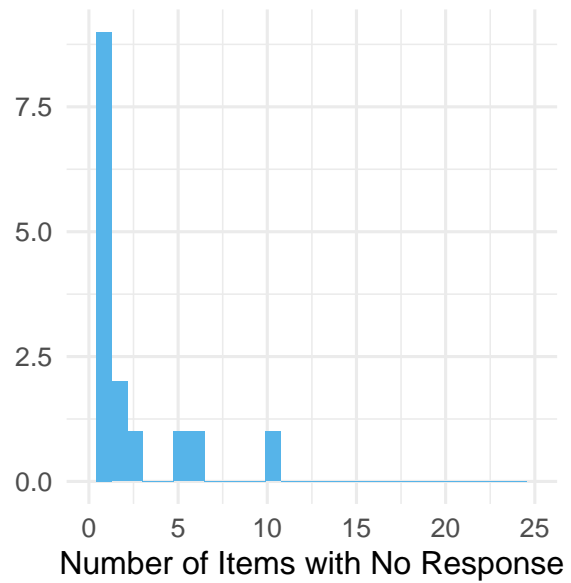
Tier 1

Showing 176 of 878 Tier 1 students with at least one item with no response.



Tier 2

Showing 15 of 628 Tier 2 students with at least one item with no response.



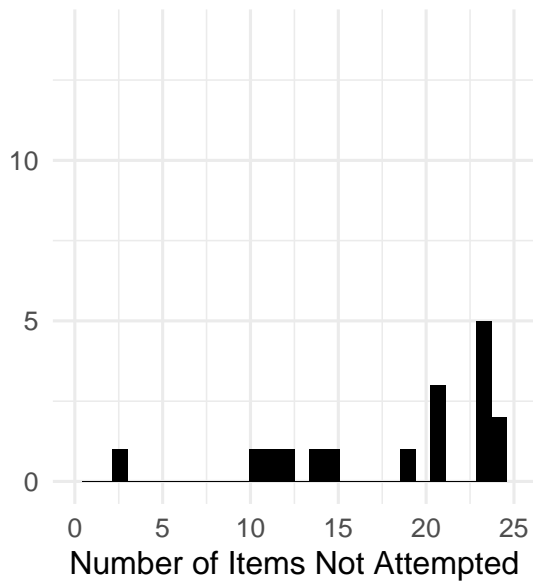
Grade 7 Tier - Not Attempted

Figure 6.2.2.24

Math Grade 7: Histograms of Items Not Attempted

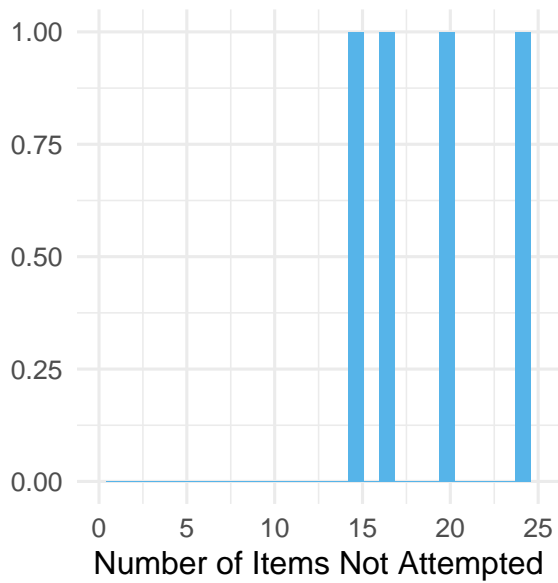
Tier 1

Showing 89 of 878 Tier 1 students with at least one item not attempted.



Tier 2

Showing 4 of 628 Tier 2 students with at least one item not attempted.



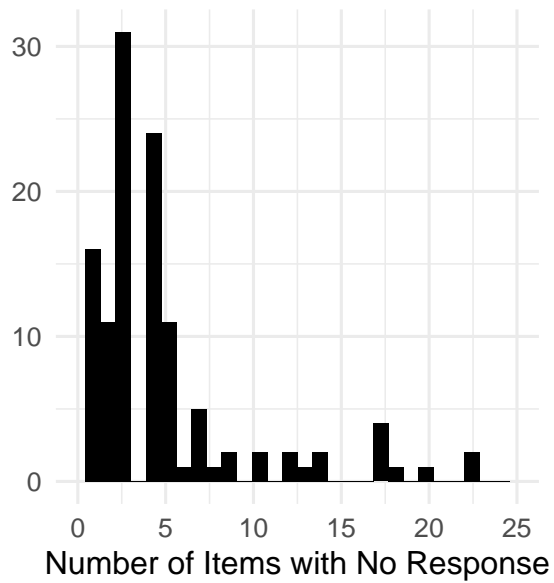
Grade 8 Tier - No Response

Figure 6.2.2.25

Math Grade 8: Histograms of Items with No Response

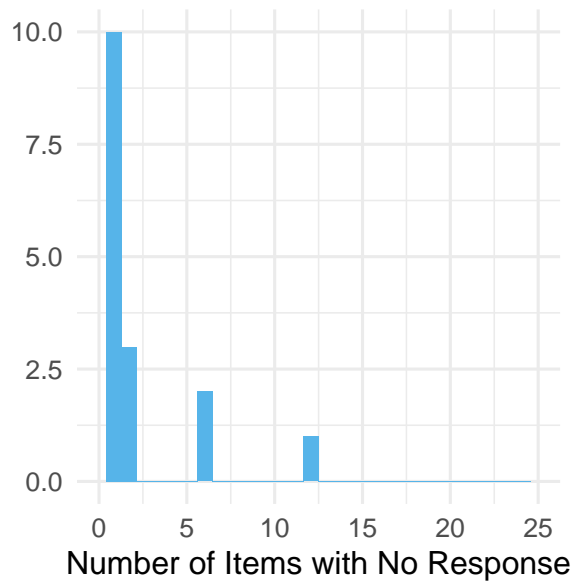
Tier 1

Showing 123 of 709 Tier 1 students with at least one item with no response.



Tier 2

Showing 16 of 660 Tier 2 students with at least one item with no response.



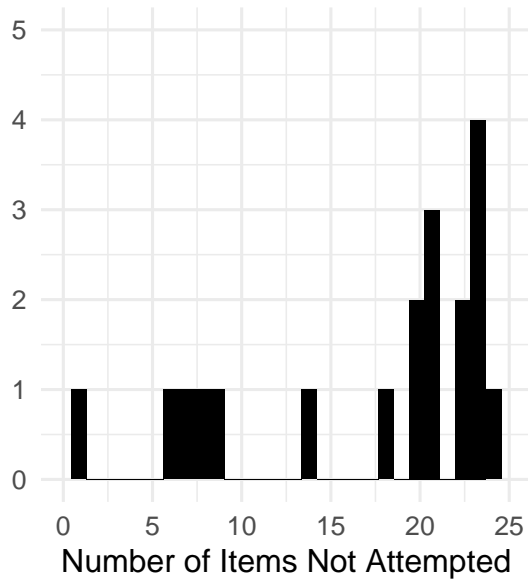
Grade 8 Tier - Not Attempted

Figure 6.2.2.26

Math Grade 8: Histograms of Items Not Attempted

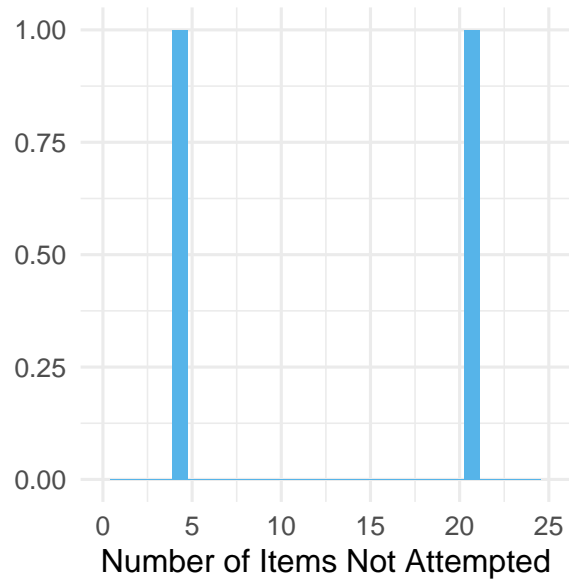
Tier 1

Showing 69 of 709 Tier 1 students with at least one item not attempted.



Tier 2

Showing 3 of 660 Tier 2 students with at least one item not attempted.



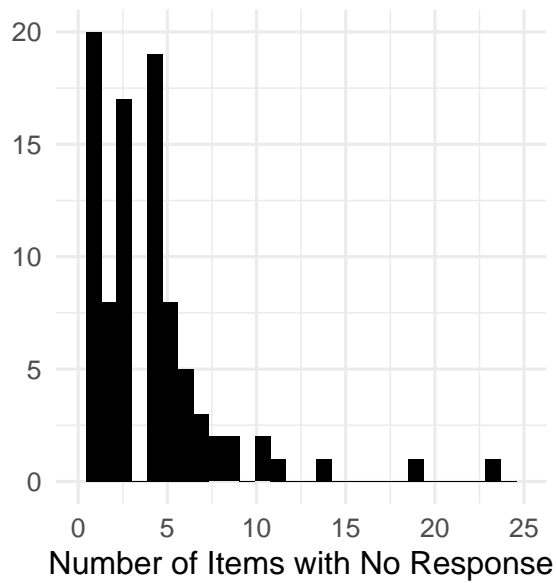
Grade 11 Tier - No Response

Figure 6.2.2.27

Math Grade 11: Histograms of Items with No Response

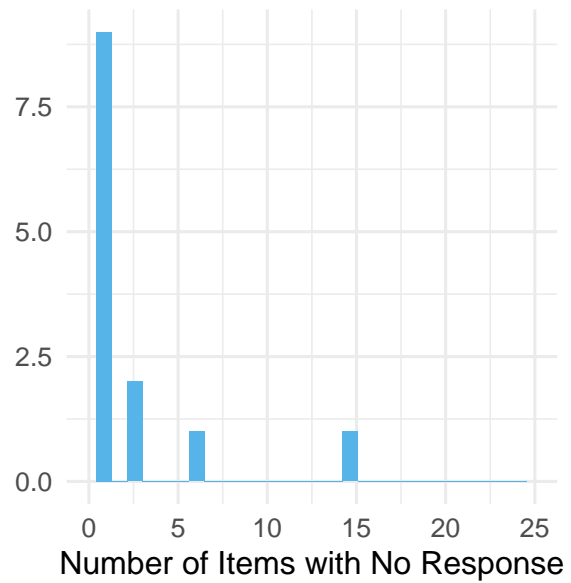
Tier 1

Showing 91 of 609 Tier 1 students with at least one item with no response.



Tier 2

Showing 13 of 428 Tier 2 students with at least one item with no response.



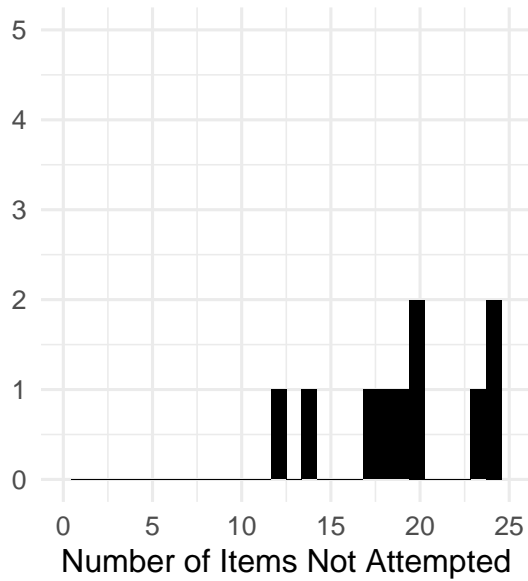
Grade 11 Tier - Not Attempted

Figure 6.2.2.28

Math Grade 11: Histograms of Items Not Attempted

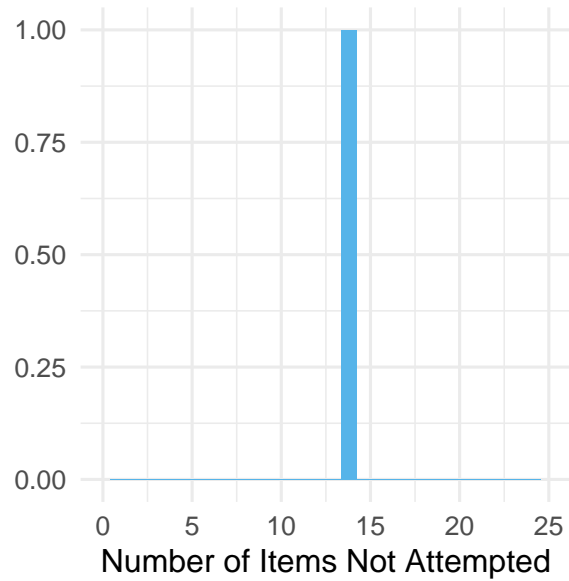
Tier 1

Showing 44 of 609 Tier 1 students with at least one item not attempted.



Tier 2

Showing 1 of 428 Tier 2 students with at least one item not attempted.



Science

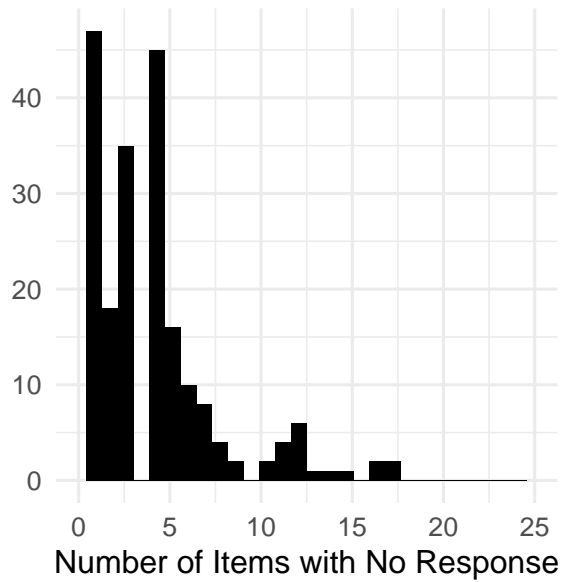
Grade 4 Tier - No Response

Figure 6.2.2.29

Science Grade 4: Histograms of Items with No Response

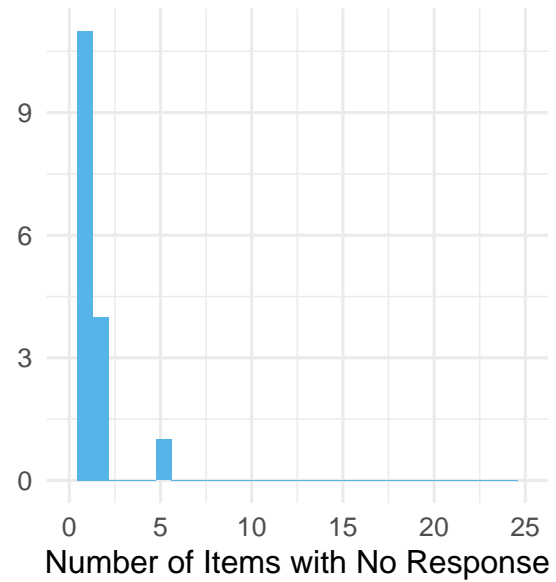
Tier 1

Showing 208 of 571 Tier 1 students with at least one item with no response.



Tier 2

Showing 16 of 841 Tier 2 students with at least one item with no response.



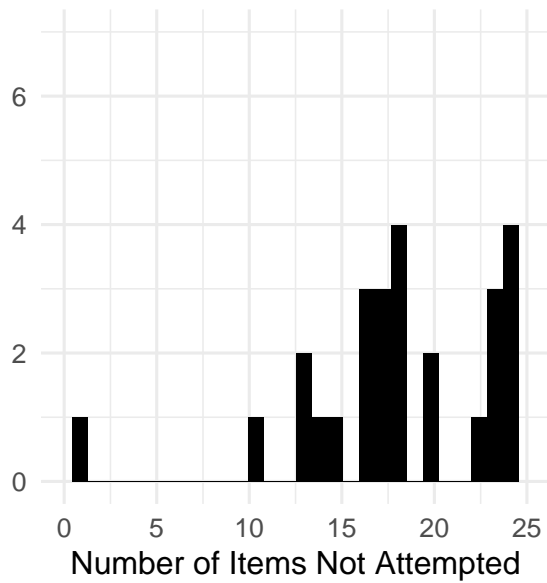
Grade 4 Tier - Not Attempted

Figure 6.2.2.30

Science Grade 4: Histograms of Items Not Attempted

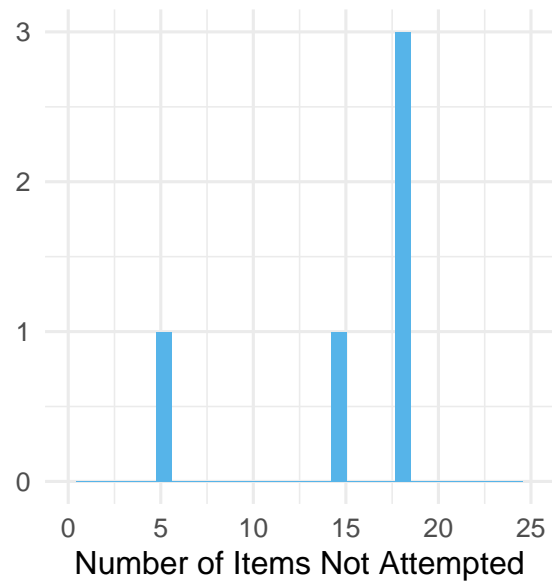
Tier 1

Showing 92 of 571 Tier 1 students with at least one item not attempted.



Tier 2

Showing 5 of 841 Tier 2 students with at least one item not attempted.



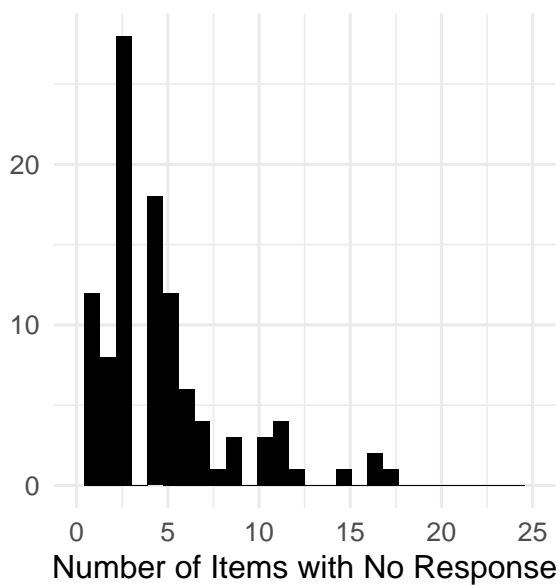
Grade 8 Tier - No Response

Figure 6.2.2.31

Science Grade 8: Histograms of Items with No Response

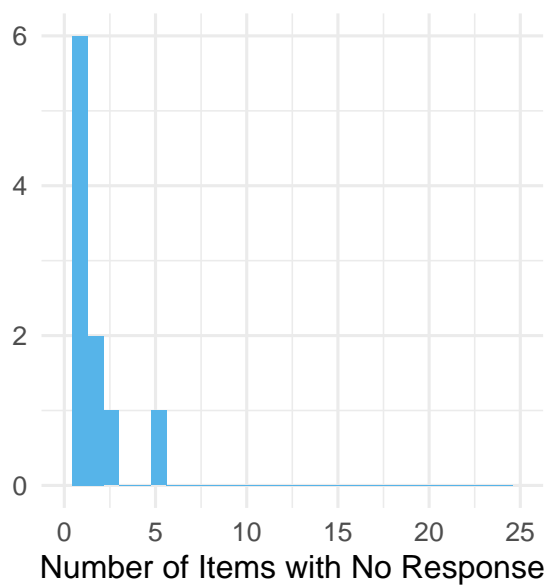
Tier 1

Showing 108 of 415 Tier 1 students with at least one item with no response.



Tier 2

Showing 10 of 893 Tier 2 students with at least one item with no response.



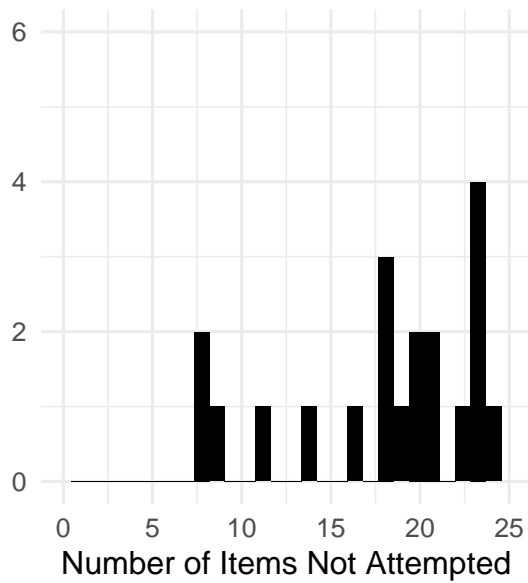
Grade 8 Tier - Not Attempted

Figure 6.2.2.32

Science Grade 8: Histograms of Items Not Attempted

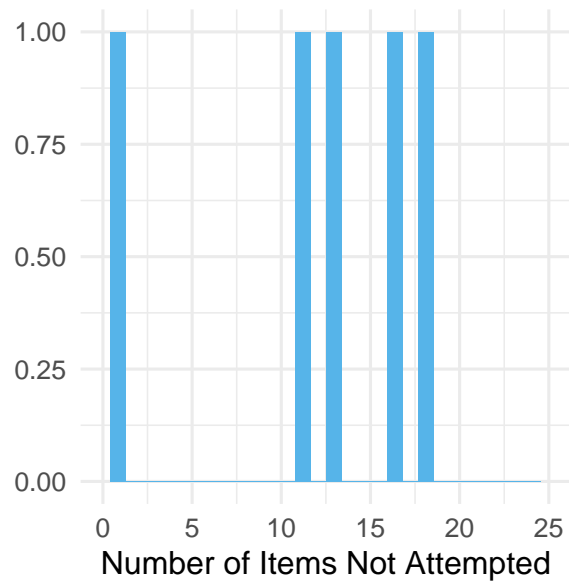
Tier 1

Showing 64 of 415 Tier 1 students with at least one item not attempted.



Tier 2

Showing 5 of 893 Tier 2 students with at least one item not attempted.



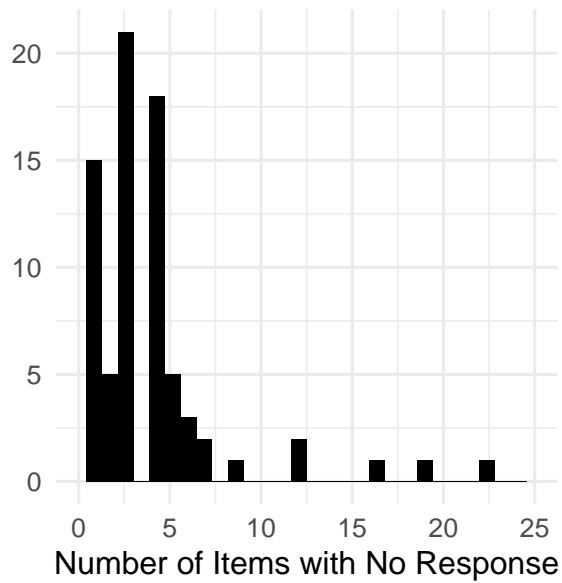
Grade 11 Tier - No Response

Figure 6.2.2.33

Science Grade 11: Histograms of Items with No Response

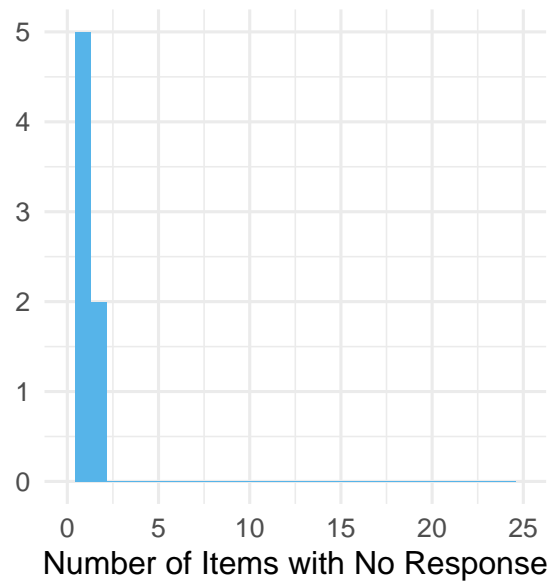
Tier 1

Showing 77 of 308 Tier 1 students with at least one item with no response.



Tier 2

Showing 7 of 706 Tier 2 students with at least one item with no response.



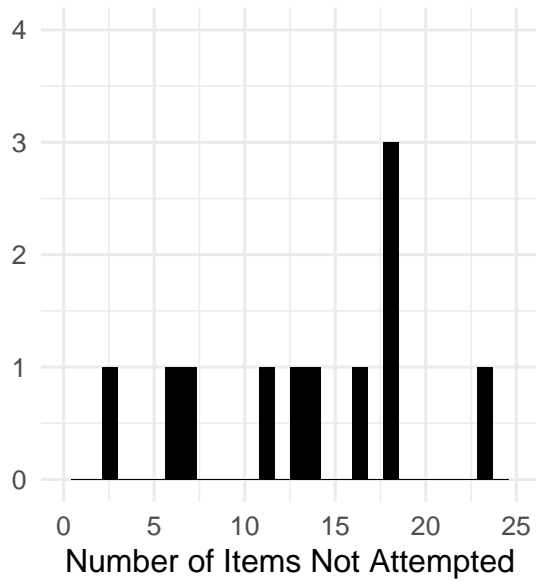
Grade 11 Tier - Not Attempted

Figure 6.2.2.34

Science Grade 11: Histograms of Items Not Attempted

Tier 1

Showing 48 of 308 Tier 1 students with at least one item not attempted.



Tier 2

Showing 3 of 706 Tier 2 students with at least one item not attempted.

