INTERNAL CONSISTENCY OF THE TEST OF WORKPLACE ESSENTIAL SKILLS (TOWES) ITEMS BASED ON THE LINKING STUDY DATA SET

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Executive Summary

This is the first of a series of reports associated with the psychometric assessment of the Test of Workplace Essential Skills (TOWES). In this report, the results of a series of analyses that were conducted to examine the internal consistency of TOWES items are reported. Specifically, internal consistency, item-to-total correlations, and confirmatory factor analyses were carried out.

A total of 2688 individuals took one of 15 test booklets containing a sample of the 304 TOWES items based on three subscales: Reading Text, Document Use, and Numeracy.

Using Cronbach's alpha the resulting internal consistencies were: 0.82 for Reading Text, 0.88 for Document Use, and 0.84 for Numeracy. These are certainly respectable internal consistencies, and with future revisions of the TOWES item bank these are expected to be higher.

Twenty-seven of the 304 items (9%) showed lower than expected corrected item-to-total correlations with their respective subscales. The findings from these more fine-grained analyses will assist the TOWES team to determine which of the items from this data set should be removed or revised in the future.

Confirmatory Factor Analyses (CFA) showed that 9 of the 304 items had lower than expected factor loadings on their respective subscales. In addition, the CFAs revealed that the subscales are highly correlated with one another.

Finally, a comparison of the proportion of individuals who made a correct response on the item with the items that had been dropped from an IRT analysis conducted earlier on this same data set was examined. It was concluded that about half of the items that had been dropped were very difficult. Some of the items that were dropped were the same ones that showed problems of internal consistency in the present sets of analyses.

In summary, most TOWES items demonstrated excellent internal structural relationships with the constructs they are intended to measure. The few problematic items are noted. These will be modified or dropped from further testing as TOWES continues to be subjected to rigorous psychometric assessment.

This section of analyses examined the internal structure of TOWES items. Specifically, internal consistency, item-to-total correlations, and confirmatory factor analyses were carried out. TOWES items are grouped two ways: 1) by three subscales (Reading Text, Document Use, and Numeracy), and 2) by twelve blocks (A1, A2, A3, B1, B2, B3, C1, C2, C3, D1, D2, and D3). Blocks of items are made up of items from the three subscales. Individual test booklets (15 in this data set) were created by selecting various combinations of blocks of items. A total of 2688 individuals took one of 15 test booklets. The distribution of items by Block and subscale are shown in Table 1. As can be seen, at least 500 participants responded to each item. The analyses were carried out "by Block" because the analyses need to have the same cases in each data set. As the purpose was to generalize findings from these analyses to the population of TOWES items, it was deemed most appropriate for the unit of analysis to the item Blocks.

Table 1: Number of Respondents and Subscales by Block.

BLOCK	Number of Respondents	Number of Reading Text Items	Number of Document Use Items	Number of Numeracy Items
A1	567	7	10	9
A2	506	7	7	5
A3	502	7	10	8
B1	508	6	10	9
B2	555	4	9	14
B3	514	6	9	16
C1	707	7	10	9
C2	500	10	15	7
C3	506	7	11	6
D1	502	6	13	8
D2	511	5	10	7
D3	555	7	8	5

The data that were used for these analyses included 2688 participants. Of these, 1141 participants had their responses scored by two of nine independent raters. Each of the raters scored between 6.7 and 15% of the booklets. The inter-rater reliability has been calculated to be 0.97 (Yamamoto & Kirsch, 2002). Thus, for purposes of this data set, a random deletion of one of the sets of scores for those booklets that were scored two times was carried out.

The first analyses to be carried out were a series of internal consistency (using Cronbach's alpha) assessments. Note that the internal consistencies were carried out by subscale and by block (see Table 2). For some analyses a large number of items were involved (e.g., Block B3 of the Numeracy items where 16 items were used) and for others a small number of items were used (e.g., Block B2 of the Reading Text items where 4 items were used). Internal consistency estimates of at least 0.70 are desirable for research purposes and of 0.90 or higher for tests to be used in making personnel decisions.

Table 2: Internal Consistency of Each Set of Subscales by Block

BLOCK	Internal Consistency of Reading Text Items	Internal Consistency of Document Use Items	Internal Consistency of Numeracy Items
A1	0.75	0.83	0.79
A2	0.71	0.80	0.56
A3	0.70	0.81	0.80
B1	0.72	0.83	0.75
B2	0.71	0.77	0.83
B3	0.67	0.73	0.86
C1	0.71	0.85	0.79
C2	0.76	0.79	0.66
C3	0.72	0.82	0.67
D1	0.65	0.77	0.84
D2	0.74	0.72	0.73
D3	0.57	0.70	0.53

The average internal consistency of Reading Text items was 0.70 (based on an average of 6.58 items), for Document Use was 0.79 (based on an average of 10.17 items), and for Numeracy was 0.73 (based on an average of 8.58 items). Because the internal consistency as evaluated by the Cronbach's alpha is highly related to the number of items (with more items resulting in higher alpha levels), and because the participants were administered at least two Blocks of items each, it is reasonable to use the Spearman-Brown prophecy formula to estimate the internal consistency for two times the number of items on which these alphas are based. The results were that for Reading Text items 0.82, for Document Use was 0.88, and for Numeracy was 0.84. These are certainly respectable internal consistencies, but should be higher for decision-making purposes. It is anticipated that the information from this report will be used in revising or dropping some of the items rendering higher internal consistencies in future versions of TOWES.

In an effort to determine what items might be potential problems for each block in terms of reducing the internal consistency, a series of item-to-total correlations were carried out within each block and by subscale. In boldface are the items that had lower than 0.30. This indicates that the item shares less than 9% of the variance with the other items in the set and it is worth examining the item for possible deletion or modification.

Table 3: Corrected Item-to-Total Correlations for Block A1

Item	Reading Text	Document Use	Numeracy
203B2	0.30		
301A1	0.58		
301A2	0.58		
301A3	0.57		
105A1	0.30		
105A2	0.50		
105A3	0.50		
203B1a		0.55	
203B1b		0.41	
205A1		0.39	
205A2		0.41	
109A1		0.50	
109A2		0.63	
109A3		0.61	
410B1		0.60	
410B3		0.54	
410B5a		0.53	
205A3a			0.36
205A3b			0.40
205A4			0.40
205A5			0.32
410B2			0.58
410B4			**0.13**
410B5b			0.67
410B5c			0.69
410B5d			0.68

Item 410B4 is clearly not contributing in a manner similar to the other items in the Numeracy A1 Block.

Table 4: Corrected Item-to-Total Correlations for Block A2

Item	Reading Text	Document Use	Numeracy
303A2	0.43		
413A1	0.63		
413A2	0.61		
413A3	0.56		
409B1	0.30		
409B2a	**0.17**		
409B2b	0.42		
106A1		0.51	
106A2		0.47	
106A3		0.44	
201A1		0.55	
201A2		0.66	
201A3		0.51	
201A4		0.61	
303A1			**0.26**
303A3			0.47
112A1			0.27
112A2			0.31
409B3			0.31

Item 409B2a is not contributing in a manner similar to the other items in the Reading Text A2 Block and item 303A1 is not contributing in a manner similar to the other items in the Numeracy A2 Block.

Table 5: Corrected Item-to-Total Correlations for Block A3

Item	Reading Text	Document Use	Numeracy
113B1a	0.51		
113B1b	0.45		
113B1c	0.44		
113B1d	0.47		
113B1e	**0.21**		
110A3	0.41		
110A4	0.40		
107B1		0.34	
107B2		0.37	
107B3		0.47	
107B4		0.56	
416A1a		0.54	
416A1b		0.59	
110A1		0.61	
110A2		0.63	
208B2		0.45	
410A1		0.52	
416A2a			0.31
416A2b			0.63
416A3a			0.60
416A3b			0.59
208B1			0.53
401B3			0.52
401A2			0.48
401A3			0.48

Item 113B1e is not contributing in a manner similar to the other items in the Reading Text A3 Block.

Table 6: Corrected Item-to-Total Correlations for Block B1

Item	Reading Text	Document Use	Numeracy
209A1	0.35		
209A2	0.37		
209A3a	0.63		
209A3b	0.62		
209A3c	0.52		
405B4	**0.27**		
206A3		0.36	
211A1		0.43	
117A1		0.58	
117A2		0.40	
117A3		0.32	
405B1		0.64	
405B2		0.71	
405B3a		0.59	
405B3b		0.74	
405B3c		0.48	
206A1			**0.27**
206A2			0.33
211A2			0.53
211A3			0.53
211A4			0.48
408A1			0.43
408A2			0.45
408A3			0.38
408A4			0.45

Item 405B4 is not contributing in a manner similar to the other items in the Reading Text B1 Block and item 206A1 is not contributing in a manner similar to the other items in the Numeracy B1 Block.

Table 7: Corrected Item-to-Total Correlations for Block B2

Item	Reading Text	Document Use	Numeracy
414A1	0.50		
414A2	0.38		
414A3	0.56		
414A4	0.58		
108A1		0.37	
108A2		**0.26**	
213A1a		0.61	
213A1b		0.36	
213A1c		0.57	
213A1d		0.31	
213A1e		0.52	
213A1f		0.65	
213A1g		0.57	
102A1			0.35
412A1			0.38
412A2			0.36
412A3			0.42
412A4a			0.58
412A4b			0.66
412A4c			0.59
412A4d			0.65
412A4e			0.63
412A5			0.43
213A1h			0.34
212A1			0.34
212A2			0.37
212A3			0.36

Item 108A2 is not contributing in a manner similar to the other items in the Document Use B2 Block.

Table 8: Corrected Item-to-Total Correlations for Block B3

Item	Reading Text	Document Use	Numeracy
230A2	0.52		
230A3	0.35		
115B1a	0.45		
115B1b	0.43		
115B1c	0.48		
115B1d	**0.24**		
116A1		0.44	
116A2		0.45	
123A1		0.52	
123A2		0.51	
123A3		**0.21**	
123A4		**0.24**	
230A1		0.37	
214A1		0.49	
115B2		0.48	
202A1			0.37
202A2a			0.59
202A2b			0.45
202A3			0.32
417B1a			0.42
417B1b			0.42
417B2a			0.49
417B2b			0.61
417B2c			0.62
417B3			0.53
417B4			0.52
417B5			0.37
123A5			0.52
230A4			0.44
214A2			0.51
214A3			0.54

Item 115B1d is not contributing in a manner similar to the other items in the Reading Text B3 Block and Items 123A3 and 123A4 are not contributing in a manner similar to the other items in the Document Use B3 Block.

Table 9: Corrected Item-to-Total Correlations for Block C1

Item	Reading Text	Document Use	Numeracy
101A1a	0.31		
101A1b	0.46		
101A1c	0.49		
312A1	0.36		
114B1	0.40		
340B2	0.49		
340B3	0.46		
304B1		0.48	
304B2a		0.56	
304B2b		0.64	
304B2c		0.71	
304B2d		0.74	
304B2e		0.71	
312A2		0.44	
420B1		0.50	
420B2		0.47	
340B1		0.37	
304B2f			0.45
312A3			0.49
312A4			0.53
420B3			0.41
114B2			0.53
114B3			0.30
114B4			0.47
340B4			0.53
340B5			0.56

There are no apparent problem items in Block C1.

Table 10: Corrected Item-to-Total Correlations for Block C2

Item	Reading Text	Document Use	Numeracy
320B1	0.48		
320B3	0.47		
320B4a	0.53		
320B4b	**0.26**		
320B4c	0.43		
320B4d	0.50		
309A3	0.41		
425B1	0.41		
425B2	0.52		
425B3	0.30		
406B1		0.35	
406B2		0.59	
406B3a		0.37	
406B3b		0.36	
406B3c		0.44	
406B3d		0.53	
406B3e		0.57	
406B3f		0.55	
406B3g		0.42	
309A1		**0.24**	
309A2		0.39	
210B1		**0.29**	
210B2		0.30	
210B4		0.38	
313A1		**0.18**	
320B2			0.38
309A4			0.51
309A5			0.38
210B3			0.35
313A2			0.35
313A3			**0.27**
313A4			0.39

Item 320B4b is not contributing in a manner similar to the other items in the Reading Text C2 Block, Items 309A1, 210B1, and 313A1 are not contributing in a manner similar to the other items in the Document Use C2 Block, and Item 313A4 is not contributing in a manner similar to the other items in the Numeracy C2 Block.

Table 11: Corrected Item-to-Total Correlations for Block C3

Item	Reading Text	Document Use	Numeracy
426A1	0.40		
426A2	**0.29**		
426A3	0.48		
402B1a	0.54		
402B1b	0.35		
402B2	0.44		
402B3	0.50		
118A1		0.51	
118A2		0.56	
118A3		0.41	
423A1		0.63	
423A2		0.59	
423A3		0.58	
423A4		0.53	
402B4		**0.28**	
319A1		0.54	
207A1		0.44	
207A3		0.41	
311B1			0.38
311B2			0.45
311B3			**0.29**
311B4			0.50
319A2			0.44
207A2			0.33

Item 426A2 is not contributing in a manner similar to the other items in the Reading Text C3 Block, Item 402B4 is not contributing in a manner similar to the other items in the Document Use C3 Block, and Item 311B3 is not contributing in a manner similar to the other items in the Numeracy C3 Block.

Table 12: Corrected Item-to-Total Correlations for Block D1

Item	Reading Text	Document Use	Numeracy
321A1	0.43		
321A2	0.49		
321A3	0.37		
321A4	0.51		
103B1	0.31		
103B2	**0.26**		
322B1		**0.28**	
322B2		0.38	
314A1		0.41	
314A2		0.43	
314A3		0.36	
407A6		0.52	
407A7a		0.43	
407A7b		0.44	
317A1		0.40	
317A2		**0.29**	
317A3		0.44	
315A1		0.44	
315A2		0.48	
322B3			0.46
314A4			0.41
407A1			0.56
407A2			0.70
407A3			0.65
407A4			0.67
407A5			0.59
3177A4			0.57

Item 103B2 is not contributing in a manner similar to the other items in the Reading Text D1 Block and Items 322B1 and 317A2 are not contributing in a manner similar to the other items in the Document Use D1 Block.

Table 13: Corrected Item-to-Total Correlations for Block D2

Item	Reading Text	Document Use	Numeracy
316B1	0.50		
316B2	0.44		
316B3	0.52		
324B1	0.54		
324B3	0.52		
427A1		0.37	
427A3		0.39	
318B1		0.46	
318B2		0.48	
411B1		0.40	
411B2		0.33	
411B3		**0.18**	
424B1		0.30	
424B2		0.50	
424B3		0.35	
421B1			0.56
421B2			0.53
421B3			0.41
427A2			0.43
318B3			0.47
318B4			0.44
324B2			**0.27**

Item 411B3 is not contributing in a manner similar to the other items in the Document Use D2 Block and Item 324B2 is not contributing in a manner similar to the other items in the Numeracy D2 Block.

Table 14: Corrected Item-to-Total Correlations for Block D3

Item	Reading Text	Document Use	Numeracy
337A1	0.43		
337A2	0.46		
337A3	0.33		
337A4	0.27		
128A1	0.26		
128A2	**0.23**		
128A4	**0.17**		
302A1		0.41	
302A2		0.51	
302A3		0.33	
404A1		0.41	
404A2		0.39	
404A3		0.47	
404A4		**0.29**	
128A3		0.40	
302A4			**0.14**
302A5			0.32
422A1			0.40
422A2			0.30
404A5			0.31

Items 128A2 and 128A4 are not contributing in a manner similar to the other items in the Reading Text D2 Block, Item 404A4 is not contributing in a manner similar to the other items in the Document Use D3 Block, and Item 302A4 is not contributing in a manner similar to the other items in Numeracy D3 Block.

The next analyses carried out were confirmatory factor analyses by Block. For each Block of items a 3-factor model was specified, with the expectation that the Reading Text items would load onto a Reading Text latent construct, the Document Use items would load onto a Document Use latent construct, and the Numeracy items would load onto a Numeracy latent construct. An initial assessment of the reasonableness of a model is how many iterations it took for the computer to converge on a solution. Better-fitting models converge with fewer than 20 iterations. Blocks A3, B2, C3, D1 and D2 did not converge as easily as did the other Blocks (see Table 15).

In addition, the minimum fit χ-square value is non-significant in exceptionally well-fitting models. However, this is not usually the case. One way to determine the degree of fit of the model is to test the difference between the χ-square for independence and the χ-square for the minimum fit and determine if there is a significant improvement in fit via a test of the significance of the drop in χ-square. The drop in χ-square values from models of independence to the specified models indicates that for all Blocks there is a significant improvement in fit of the data as specified in the models (see Table 15).

Table 15: χ-Square Values for Confirmatory Factor Analyses by Block

BLOCK	Number of Iterations to Converge	Minimum fit χ-square value (Degrees of freedom)	Independence χ-square value (Degrees of freedom)	Drop in χ-square value (Degrees of freedom)
A1	19	634 (296)	3588 (325)	2954 (29)
A2	11	309 (149)	1964 (171)	1655 (22)
A3	30	1250 (272)	3600 (300)	2350 (28)
B1	16	711 (272)	2801 (300)	2090 (28)
B2	21	746 (321)	3556 (351)	2810 (30)
B3	16	835 (431)	3800 (465)	2965 (34)
C1	19	1570 (296)	5025 (325)	3455 (29)
C2	19	777 (461)	3169 (496)	2392 (35)
C3	30	2536 (249)	8264 (276)	5728 (27)
D1	47	5577 (321)	12102 (351)	6525 (30)
D2	46	2545 (206)	7275 (231)	4730 (15)
D3	18	551 (167)	1932 (190)	1381 (23)

Additional fit indices include the Goodness of Fit and Adjusted Goodness of Fit. Both are above 0.90 in well-fitting models (the range is 0.00 – 1.00). The Standardized Root Mean Square Residual is also a test of fit. In this case the smaller the value the better – and in particular values below 0.10 indicate well-fitting models (the range is 0.00 – 1.00). Table 16 shows that Blocks A3, B2, C3, D1 and D2 did not have as good a set of fit indices as did the other Blocks, which is consistent with the previous findings from Table 15. Again, action to revise or drop items from TOWES in the future should ensure that all fit indices from all Blocks are excellent.

Table 16: Goodness of Fit Indices for Confirmatory Factor Analyses by Block

BLOCK	Goodness of Fit Index	Adjusted Goodness of Fit	Standardized Root Mean Square Residual
A1	0.91	0.90	0.05
A2	0.93	0.92	0.05
A3	0.88	0.86	0.06
B1	0.91	0.89	0.05
B2	0.89	0.87	0.06
B3	0.90	0.88	0.05
C1	0.90	0.88	0.05
C2	0.91	0.90	0.04
C3	0.74	0.69	0.06
D1	0.70	0.64	0.07
D2	0.76	0.70	0.08
D3	0.93	0.91	0.05

Next, the standardized loadings from each construct to its respective items are shown by Block. These values can range from 0.00 – 1.00. It is expected that loadings should be 0.40 or more. In boldface are the items with poorer loadings. In addition, the standardized correlations between the constructs are noted.

Table 17: Block A1 Standardized Loadings

Item	Reading Text Loadings	Document Use Loadings	Numeracy Loadings
203B2	0.49		
301A1	0.85		
301A2	0.85		
301A3	0.90		
105A1	0.55		
105A2	0.67		
105A3	0.75		
203B1a		0.74	
203B1b		0.61	
205A1		0.61	
205A2		0.69	
109A1		0.60	
109A2		0.76	
109A3		0.74	
410B1		0.83	
410B3		0.76	
410B5a		0.86	
205A3a			0.72
205A3b			0.69
205A4			0.64
205A5			0.57
410B2			0.81
410B4			**0.36**
410B5b			0.87
410B5c			0.86
410B5d			0.85

Table 18: Block A1 Correlations Among Constructs

	Reading Text Construct	Document Use Construct	Numeracy Construct
Reading Text Construct			
Document Use Construct	0.88		
Numeracy Construct	0.83	0.91	

Table 19: Block A2 Standardized Loadings

Item	Reading Text Loadings	Document Use Loadings	Numeracy Loadings
303A2	0.74		
413A1	1.00		
413A2	0.85		
413A3	0.84		
409B1	0.61		
409B2a	**0.26**		
409B2b	0.66		
106A1		0.77	
106A2		0.71	
106A3		0.66	
201A1		0.75	
201A2		0.87	
201A3		0.73	
201A4		0.83	
303A1			0.66
303A3			0.71
112A1			0.44
112A2			0.45
409B3			0.74

Table 20: Block A2 Correlations Among Constructs

	Reading Text Construct	Document Use Construct	Numeracy Construct
Reading Text Construct			
Document Use Construct	0.80		
Numeracy Construct	0.87	0.84	

Table 21: Block A3 Standardized Loadings

Item	Reading Text Loadings	Document Use Loadings	Numeracy Loadings
113B1a	0.56		
113B1b	0.59		
113B1c	0.55		
113B1d	0.53		
113B1e	**0.26**		
110A3	0.89		
110A4	0.85		
107B1		0.48	
107B2		0.59	
107B3		0.63	
107B4		0.78	
416A1a		0.91	
416A1b		0.84	
110A1		0.81	
110A2		0.81	
208B2		0.70	
410A1		0.75	
416A2a			0.53
416A2b			0.85
416A3a			0.86
416A3b			0.81
208B1			0.72
401B3			0.71
401A2			0.69
401A3			0.64

Table 22: Block A3 Correlations Among Constructs

	Reading Text Construct	Document Use Construct	Numeracy Construct
Reading Text Construct			
Document Use Construct	0.93		
Numeracy Construct	0.77	0.90	

Table 23: Block B1 Standardized Loadings

Item	Reading Text Loadings	Document Use Loadings	Numeracy Loadings
209A1	0.67		
209A2	0.65		
209A3a	0.57		
209A3b	0.61		
209A3c	0.73		
405B4	0.58		
206A3		0.69	
211A1		0.65	
117A1		0.95	
117A2		0.64	
117A3		0.59	
405B1		0.76	
405B2		0.70	
405B3a		0.76	
405B3b		0.77	
405B3c		0.76	
206A1			**0.39**
206A2			0.51
211A2			0.74
211A3			0.78
211A4			0.78
408A1			0.70
408A2			0.69
408A3			0.65
408A4			0.69

Table 24: Block B1 Correlations Among Constructs

	Reading Text Construct	Document Use Construct	Numeracy Construct
Reading Text Construct			
Document Use Construct	0.89		
Numeracy Construct	0.76	0.85	

Table 25: Block B2 Standardized Loadings

Item	Reading Text Loadings	Document Use Loadings	Numeracy Loadings
414A1	0.79		
414A2	0.73		
414A3	0.88		
414A4	0.86		
108A1		0.60	
108A2		0.45	
213A1a		0.84	
213A1b		0.52	
213A1c		0.80	
213A1d		0.55	
213A1e		0.80	
213A1f		1.00	
213A1g		0.85	
102A1			0.59
412A1			0.64
412A2			0.72
412A3			0.74
412A4a			0.72
412A4b			0.81
412A4c			0.73
412A4d			0.81
412A4e			0.76
412A5			0.68
213A1h			0.66
212A1			0.72
212A2			0.52
212A3			0.56

Table 26: Block B2 Correlations Among Constructs

	Reading Text Construct	Document Use Construct	Numeracy Construct
Reading Text Construct			
Document Use Construct	0.66		
Numeracy Construct	0.74	0.81	

Table 27: Block B3 Standardized Loadings

Item	Reading Text Loadings	Document Use Loadings	Numeracy Loadings
230A2	1.00		
230A3	0.71		
115B1a	0.66		
115B1b	0.61		
115B1c	0.73		
115B1d	**0.36**		
116A1		0.68	
116A2		0.64	
123A1		0.75	
123A2		0.71	
123A3		**0.33**	
123A4		0.53	
230A1		0.56	
214A1		0.75	
115B2		0.83	
202A1			0.55
202A2a			0.71
202A2b			0.60
202A3			0.54
417B1a			0.79
417B1b			0.58
417B2a			0.89
417B2b			0.84
417B2c			0.80
417B3			0.69
417B4			0.64
417B5			0.65
123A5			0.76
230A4			0.79
214A2			0.60
214A3			0.63

Table 28: Block B3 Correlations Among Constructs

	Reading Text Construct	Document Use Construct	Numeracy Construct
Reading Text Construct			
Document Use Construct	0.98		
Numeracy Construct	0.79	0.95	

Table 29: Block C1 Standardized Loadings

Item	Reading Text Loadings	Document Use Loadings	Numeracy Loadings
101A1a	0.42		
101A1b	0.58		
101A1c	0.61		
312A1	0.63		
114B1	0.69		
340B2	0.74		
340B3	0.76		
304B1		0.77	
304B2a		0.76	
304B2b		0.85	
304B2c		0.69	
304B2d		0.71	
304B2e		0.70	
312A2		0.72	
420B1		0.84	
420B2		0.74	
340B1		0.63	
304B2f			0.68
312A3			0.67
312A4			0.73
420B3			0.69
114B2			0.75
114B3			0.55
114B4			0.69
340B4			0.72
340B5			0.79

Table 30: Block C1 Correlations Among Constructs

	Reading Text Construct	Document Use Construct	Numeracy Construct
Reading Text Construct			
Document Use Construct	0.91		
Numeracy Construct	1.00	0.94	

Table 31: Block C2 Standardized Loadings

Item	Reading Text Loadings	Document Use Loadings	Numeracy Loadings
320B1	0.77		
320B3	0.73		
320B4a	0.74		
320B4b	**0.36**		
320B4c	0.67		
320B4d	0.70		
309A3	0.68		
425B1	0.67		
425B2	0.74		
425B3	0.52		
406B1		0.69	
406B2		0.81	
406B3a		0.50	
406B3b		0.53	
406B3c		0.58	
406B3d		0.71	
406B3e		0.74	
406B3f		0.72	
406B3g		0.57	
309A1		0.45	
309A2		0.63	
210B1		0.59	
210B2		0.69	
210B4		0.62	
313A1		**0.34**	
320B2			0.62
309A4			0.87
309A5			0.70
210B3			0.57
313A2			0.63
313A3			0.60
313A4			0.64

Table 32: Block C2 Correlations Among Constructs

	Reading Text Construct	Document Use Construct	Numeracy Construct
Reading Text Construct			
Document Use Construct	0.88		
Numeracy Construct	0.83	0.87	

Table 33: Block C3 Standardized Loadings

Item	Reading Text Loadings	Document Use Loadings	Numeracy Loadings
426A1	0.56		
426A2	0.48		
426A3	0.71		
402B1a	0.76		
402B1b	0.59		
402B2	0.73		
402B3	0.82		
118A1		0.71	
118A2		0.73	
118A3		0.55	
423A1		0.91	
423A2		0.92	
423A3		0.88	
423A4		0.79	
402B4		0.51	
319A1		0.82	
207A1		0.62	
207A3		0.60	
311B1			0.67
311B2			0.69
311B3			0.52
311B4			0.76
319A2			0.67
207A2			0.62

Table 34: Block C3 Correlations Among Constructs

	Reading Text Construct	Document Use Construct	Numeracy Construct
Reading Text Construct			
Document Use Construct	0.90		
Numeracy Construct	0.86	0.93	

Table 35: Block D1 Standardized Loadings

Item	Reading Text Loadings	Document Use Loadings	Numeracy Loadings
321A1	0.84		
321A2	0.85		
321A3	0.62		
321A4	0.77		
103B1	0.55		
103B2	0.46		
322B1		0.46	
322B2		0.60	
314A1		0.58	
314A2		0.68	
314A3		0.56	
407A6		0.81	
407A7a		0.72	
407A7b		0.72	
317A1		0.77	
317A2		0.45	
317A3		0.80	
315A1		0.61	
315A2		0.65	
322B3			0.67
314A4			0.61
407A1			0.76
407A2			0.93
407A3			0.84
407A4			0.87
407A5			0.83
3177A4			0.77

Table 36: Block D1 Correlations Among Constructs

	Reading Text Construct	Document Use Construct	Numeracy Construct
Reading Text Construct			
Document Use Construct	0.90		
Numeracy Construct	0.80	0.92	

Table 37: Block D2 Standardized Loadings

Item	Reading Text Loadings	Document Use Loadings	Numeracy Loadings
316B1	0.74		
316B2	0.67		
316B3	0.76		
324B1	0.81		
324B3	0.85		
427A1		0.67	
427A3		0.62	
318B1		0.75	
318B2		0.73	
411B1		0.70	
411B2		0.54	
411B3		0.40	
424B1		0.44	
424B2		0.73	
424B3		0.58	
421B1			0.92
421B2			0.85
421B3			0.63
427A2			0.68
318B3			0.70
318B4			0.67
324B2			0.44

Table 38: Block D2 Correlations Among Constructs

	Reading Text Construct	Document Use Construct	Numeracy Construct
Reading Text Construct			
Document Use Construct	0.96		
Numeracy Construct	0.76	0.88	

Table 39: Block D3 Standardized Loadings

Item	Reading Text Loadings	Document Use Loadings	Numeracy Loadings
337A1	0.92		
337A2	0.88		
337A3	0.61		
337A4	0.56		
128A1	0.44		
128A2	0.41		
128A4	**0.24**		
302A1		0.64	
302A2		0.91	
302A3		0.53	
404A1		0.74	
404A2		0.56	
404A3		0.70	
404A4		0.52	
128A3		0.63	
302A4			0.58
302A5			0.54
422A1			0.74
422A2			0.49
404A5			0.55

Table 40: Block D3 Correlations Among Constructs

	Reading Text Construct	Document Use Construct	Numeracy Construct
Reading Text Construct			
Document Use Construct	0.91		
Numeracy Construct	0.81	0.93	

The findings from the standardized loadings indicated that by and large most of the items were highly related to their respective constructs. The exceptions are as noted in Table 41.

Table 41: Items not Loading onto Constructs above 0.40.

Block	Item Number	Subscale
A1	410B4	Numeracy
A2	409B2a	Reading Text
A3	113B1e	Reading Text
B1	206A1	Numeracy
B3	115B1d	Reading Text
B3	123A3	Document Use
C2	320B4b	Reading Text
C2	313A1	Document Use
D3	128A4	Reading Text

The findings from the correlations among constructs demonstrated that the constructs were highly correlated with one another. The degree to which the construct differentially correlates with other variables will be another step in the analysis of this data set.

In summary, most TOWES items demonstrated excellent internal structural relationships with the constructs they are intended to measure. The few problematic items have been noted. These will be modified or dropped from further testing as TOWES continues to be subjected to rigorous psychometric assessment.

In addition to these analyses, a simple proportion ("p") of individuals who successfully passed the items that were deemed to be problematic by Yamamoto and Kirsch (2002) when they ran the IRT analyses linking TOWES and IALS items, are noted in the following table.

Table 42: Items Dropped in the IRT Linking between the IALS and TOWES

Type of Item	Item Number	Block	"p" level
Reading Text	113B1e	A3	0.543
Reading Text	128A4	D3	0.117
Reading Text	409B2a	A2	0.520
Document Use	123A3	B3	0.358
Document Use	304B2c	C1	0.481
Document Use	304B2d	C1	0.537
Document Use	304B2e	C1	0.475
Numeracy	102A1	B2	0.142
Numeracy	114B3	C1	0.100
Numeracy	202A3	B3	0.146
Numeracy	205A5	A1	0.118
Numeracy	212A3	B2	0.156
Numeracy	410B4	A1	0.040
Numeracy	417B5	B3	0.345

Five of these items also demonstrated problems in the internal consistency analyses I conducted (items: 113B1e, 128A4, 409B2a, 123A3, 410B4). The discontinued use of these identified five items is certainly an appropriate strategy.

The problem with items 304B2c 304B2d and 304B2e stems from the fact that they all seem to measure exactly the same thing. That is, if an individual gets one right, they get them all right and if an individual gets one incorrect, they get them all incorrect. Rather than discarding all of them, using one rather than three would be an appropriate solution.

For items 102A1, 114B3, 202A3, 202A5 and 212A3, they are very difficult items. Re-labeling them to be "level 6" rather than 4 or 5 might be appropriate. Revising the items to provide more information to the respondent is also another strategy that could be adopted to make the items slightly easier.

Item 417B5 poses an interesting problem. It has neither low internal consistency, nor is it overly difficult. Why it was excluded from the Yamamoto and Kirsch (2002) IRT analyses is not clear. Further investigation of this item is warranted before its removal or revision.