

One way to estimate reliability, specifically the internal consistency, of FSSE results is by calculating Cronbach's alphas and intercorrelations for the FSSE scales. Internal consistency is the extent to which a group of items measure the same construct, as evidenced by how well they vary together, or intercorrelate. A high degree of internal consistency enables the researcher to interpret the composite score as a measure of the construct (Henson, 2001). Assuming the FSSE scales effectively measure an underlying construct, we would expect to find high estimates of their internal consistency.

Data

The data for this study are drawn from the 2013 administration of the FSSE survey, with 18,133 faculty from 146 bachelor's-granting colleges and universities. Response rates at individual institutions ranged from 11% to 88%. The average institutional response rate was 49%. Forty-two survey items are included in these scales: Higher-Order Learning, Reflective and Integrative Learning, Learning Strategies, Quantitative Reasoning, Collaborative Learning, Discussions with Diverse Others, Student-Faculty Interaction, Quality of Interactions, and Supportive Environment.

Methods

Cronbach's alpha measures the internal consistency of a group of items by measuring the homogeneity of the group of items. "It is an indication of how well the different items complement each other in their measurement of different aspects of the same variable or quality" (Litwin, 2003, p. 22). Cronbach's alpha ranges in value between zero and one. Values closer to one indicate a higher internal consistency; values closer to zero indicate a lower internal consistency. McMillan and Schumacher (2001) suggest that groups of items with an alpha below .70 should be used with caution. The internal consistency of a scale can also be examined with item-to-scale correlations and intercorrelations of items within a scale (DeVellis, 2003). If a group of items measures a single latent construct, we would assume that each item alone correlates with the scale overall and that items within such a scale are positively correlated. According to Clark and Watson (1995), average inter-item correlations should fall somewhere between .15 and .50.

Internal consistency reliability for this study was measured in a variety of ways: Cronbach's alpha for each measure, Cronbach's alpha for a measure if a single item is removed, correlations between an item and the remaining items in the measure (called corrected item-scale correlations), the average inter-item correlation, the range of inter-item correlations, and the [individual inter-item correlations of the scale](#). All correlations are Pearson's *r* correlations. The criteria used are summarized in Table 1.

Table 1. Internal Consistency Criteria for This Study

Reliability Statistics	Criteria for a Good Scale
Cronbach's Alpha	Greater than or equal to .70
Range of inter-item correlations	between .15 and .85
Average inter-item correlation	Between .15 and .50
Range of corrected item-scale correlations	Greater than or equal .50
Range of Cronbach's alpha's if item deleted	Deleting any item would decrease the alpha

Results

Cronbach's alphas for the FSSE scales and average inter-item correlations by faculty who teach lower- and upper-division courses can be found in Table 2. The results in Table 2 suggest a high degree of internal consistency for all of the nine FSSE scales. Cronbach's alphas range between .74 and .93, all above our criteria of .70 and the inter-item correlations are all between .15 and .85 in all FSSE scales. Only the average inter-item correlations for High-Order Learning, Student-Faculty Interaction, and Supportive Environment were below the .50 indicator. Other average inter-item correlations were large, particularly for Quantitative Reasoning and Discussions with Diverse Others. This indicates that those scales contain items that are particularly intercorrelated, thus possibility having a more narrow focus.

Table 2. Scale Cronbach's Alphas by Course Division

FSSE scales	Cronbach's α		Inter-Item Correlation		Average Inter-Item Correlation	
	Lower-Division	Upper-Division	Lower-Division	Upper-Division	Lower-Division	Upper-Division
Higher-Order Learning	.74	.74	.16-.61	.21-.59	.42	.42
Reflective & Integrative Learning	.89	.87	.33-.77	.28-.74	.53	.49
Learning Strategies	.76	.76	.41-.60	.43-.61	.51	.52
Quantitative Reasoning	.89	.89	.66-.78	.68-.78	.73	.73
Collaborative Learning	.86	.83	.52-.77	.46-.77	.60	.56
Discussions with Diverse Others	.93	.93	.72-.85	.70-.83	.78	.76
Student-Faculty Interaction	.75	.78	.26-.51	.33-.53	.43	.47
Quality of Interactions	.86	.86	.38-.72	.40-.72	.54	.54
Supportive Environment	.86	.86	.27-.65	.28-.64	.44	.44

The range of each scale's overall Cronbach's alpha if individual items are removed and the range of corrected item-scale correlations by faculty who teach lower- and upper-division courses can be found in Table 3. Individual item-scale analyses by course division can be found in Table 4. These results additionally suggest that FSSE scales should be considered reliable. In Higher-Order Learning, one of the items (i.e., fHOapply) has lower corrected item-scale correlations and the overall Cronbach's alpha for the scale would be higher with the item removed, both for lower and upper-division faculty (Table 4). Conceptually, however, the item makes sense with the group and does not decrease the quality of the scale considerably. Except for the scale Higher-order Learning, the Cronbach's alphas if items are deleted for the remaining FSSE scales decreased alphas, implying that the internal consistency of these scales are high. (Table 3). Additionally, the corrected item-scale correlations are all greater than .50. Cronbach's alphas for upper-division faculty are similar to that for lower-division faculty across all FSSE scales.

Overall, these nine FSSE scales show high levels of internal consistency. Results suggest that Quantitative Reasoning and Discussions with Diverse Others have more narrowly focused items, and researchers wanting the most internally consistent scales may want to consider the removal of one item from Higher-Order Learning. Overall results suggest, however, that these nine FSSE scales can be considered reliable measures of faculty involvement in and perceptions of undergraduate student student engagement.

Table 3. Scale Item-Scale Analyses by Course Division

FSSE scales	Cronbach's α If Item Deleted		Corrected Item- Scale Correlation	
	Lower-Division	Upper-Division	Lower-Division	Upper-Division
Higher-Order Learning	.62-.79	.62-.78	.33-.66	.34-.64
Reflective & Integrative Learning	.85-.89	.83-.88	.49-.80	.42-.78
Learning Strategies	.58-.75	.60-.75	.52-.67	.52-.66
Quantitative Reasoning	.80-.88	.81-.88	.75-.83	.75-.83
Collaborative Learning	.79-.85	.75-.85	.61-.75	.53-.74
Discussions with Diverse Others	.91-.92	.90-.91	.82-.86	.80-.86
Student-Faculty Interaction	.65-.73	.69-.75	.47-.62	.53-.64
Quality of Interactions	.81-.86	.81-.86	.52-.73	.54-.73
Supportive Environment	.84-.86	.84-.86	.53-.70	.53-.70

Table 4. Item-Scale Analyses by Course Division

Content Area	Scale	Items	Cronbach's α If Item Deleted		Corrected Item- Scale Correlation	
			Lower-Division	Upper-Division	Lower-Division	Upper-Division
Academic Challenge	Higher-Order Learning	fHOapply	.79	.78	.33	.34
		fHOanalyze	.62	.62	.66	.64
		fHOevaluate	.67	.66	.56	.58
		fHOform	.64	.65	.62	.59
	Reflective and Integrative Learning	fRIintegrate	.89	.88	.49	.42
		fRIsocietal	.86	.84	.75	.72
		fRIdiverse	.86	.84	.77	.75
		fRIlowview	.86	.84	.77	.74
		fRIperspect	.86	.83	.80	.78
		fRInewview	.88	.86	.61	.61
		fRIconnect	.88	.87	.59	.55
		fRIanalyze	.88	.87	.59	.55
	Quantitative Reasoning	fQRconclude	.88	.88	.75	.75
		fQRproblem	.80	.81	.83	.83
		fQRevaluate	.85	.85	.77	.78
	Learning Strategies	fLSreading	.75	.75	.52	.52
fLSnotes		.69	.68	.58	.60	
fLSsummary		.58	.60	.67	.66	

Table 4. Item-Scale Analyses by Course Division (continued)

Content Area	Scale	Items	Cronbach's α If Item Deleted		Corrected Item- Scale Correlation	
			Lower-Division	Upper-Division	Lower-Division	Upper-Division
Learning with Peers	Collaborative Learning	fCLaskhelp	.80	.76	.75	.73
		fCLexplain	.79	.75	.75	.74
		fCLstudy	.82	.79	.69	.66
		fCLproject	.85	.85	.61	.53
	Discussions with Diverse Others	fDDrace	.92	.91	.82	.80
		fDDeconomic	.91	.90	.86	.86
		fDDreligion	.91	.91	.84	.83
Experiences with Faculty	Student-Faculty Interaction	fSFcareer	.65	.70	.63	.63
		fSFotherwork	.73	.75	.50	.54
		fSFdiscuss	.66	.69	.61	.65
		fSFperform	.73	.75	.47	.53
Supportive Campus Environment	Quality of Interactions	fQIstudent	.86	.86	.52	.54
		fQIadvisor	.81	.82	.72	.71
		fQIfaculty	.82	.82	.67	.69
		fQIstaff	.81	.81	.73	.73
		fQIadmin	.82	.82	.70	.68
	Supportive Environment	fSEacademic	.86	.86	.53	.53
		fSElearnsup	.86	.86	.53	.54
		fSEdiverse	.85	.85	.63	.61
		fSEsocial	.84	.84	.68	.68
		fSEwellness	.84	.84	.70	.70
		fSEnonacad	.85	.85	.60	.61
fSEactivities	.85	.85	.64	.63		
fSEevents	.85	.85	.62	.61		

References

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