Construct Validity
2013 FSSE Scales

Starting with FSSE 2013, sets of items were grouped within several scales. 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. A tenth scale, Effective Teaching Practices, was added to the FSSE scales in 2014. For details about the construct validity of this scale, see the FSSE Psychometric Portfolio. The purpose of this study was to evaluate the quality of these scales, with particular focus on their internal structure.

Data

Results for this study were 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%.

Methods

In preparation for the exploratory and confirmatory factor analyses, the FSSE 2013 dataset was randomly divided in half. Half of the sample was used in the exploratory factor analysis (EFA) and the other half was used in the confirmatory factor analysis (CFA).

First, a principle components exploratory factor analysis was used, in order to explore the factor structure that would emerge from the data. In order to allow for correlations between factors, a principal components analysis with an oblique, direct oblimin rotation was used. Factors with eigenvalues of 1 or greater were kept as potential components. All factor loadings of 0.4 or higher are reported.

In the second stage, a confirmatory factor analysis was done using the AMOS 22.0 statistical software program based on the results from the exploratory factor analysis. Separate confirmatory factor analyses were completed for all faculty members who teach lower-division courses and those who teach upper-division courses.

Results

The FSSE scales and component items that were created are presented in Table 1. The EFA suggested fourteen distinct components which explained 62% of the variance. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy was .88 indicating "meritorious" factorability of the items (Kaiser, 1974). Bartlett's Test of Sphericity was significant ($p < .001$) indicating that the correlations among items are appropriate for a factor analysis (Meyers, Gamst, & Guarino, 2006).

Both the structure (Table 2) and pattern matrix (Table 3) suggest the following parallel scales for further examination: Higher-Order Learning, Reflective and Integrative Learning, Learning Strategies, Quantitative Reasoning, Collaborative Learning, Diverse Discussions with Others, Student-Faculty Interaction, and Quality of Interactions and Supportive Environment. Factor loadings can be found in Tables 2 and 3.

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Table 1. FSSE scales and component items

Theme	Scale	Variable	Item
Academic Challenge	Higher-Order Learning	fHOapply	Applying facts, theories, or methods to practical problems or new situations
		fHOanalyze	Analyzing an idea, experience, or line of reasoning in depth by examining its parts
		fHOevaluate	Evaluating a point of view, decision, or information source
		fHOform	Forming a new idea or understanding from various pieces of information
	Reflective & Integrative Learning	fRIintegrate	Combine ideas from different courses when completing assignments
		fRIsocietal	Connect his or her learning to societal problems or issues
		fRIdiverse	Include diverse perspectives (political, religious, racial/ethnic, gender, etc.) in course discussions or assignments
		fRIownview	Examine the strengths and weaknesses of his or her own views on a topic or issue
		fRIperspect	Try to better understand someone else's views by imagining how an issue looks from his or her perspective
		fRInewview	Learn something that changes the way he or she understands an issue or concept
		fRIconnect	Connect ideas from your course to his or her prior experiences and knowledge
	Learning Strategies	fLSreading	Identify key information from reading assignments
		fLSnotes	Review notes after class
		fLSsummary	Summarize what has been learned from class or from course materials
	Quantitative Reasoning	fQRconclude	Reach conclusions based on his or her own analysis of numerical information (numbers, graphs, statistics, etc.)
		fQRproblem	Use numerical information to examine a real-world problem or issue (unemployment, climate change, public health, etc.)
		fQRevaluate	Evaluate what others have concluded from numerical information
Learning with Peers	Collaborative Learning	fCLaskhelp	Ask other students for help understanding course material
		fCLexplain	Explain course material to other students
		fCLstudy	Prepare for exams by discussing or working through course material with other students
		fCLproject	Work with other students on course projects or assignments
	Discussions with Diverse Others	fDDrace	People of a race or ethnicity other than their own
		fDDeconomic	People from an economic background other than their own
		fDDreligion	People with religious beliefs other than their own
		fDDpolitical	People with political views other than their own
Experiences with Faculty	Student-Faculty Interaction	fSFcareer	Talked about their career plans
		fSFotherwork	Worked on activities other than coursework (committees, student groups, etc.)
		fSFdiscuss	Discussed course topics, ideas, or concepts outside of class
		fSFperform	Discussed their academic performance
Campus Environment	Quality of Interactions	fQIstudent	Other students
		fQIadvisor	Academic advisors
		fQIfaculty	Faculty
		fQIstaff	Student services staff (career services, student activities, housing, etc.)
		fQIadmin	Other administrative staff and offices (registrar, financial aid, etc.)
	Supportive Environment	fSEacademic	Providing support to help students succeed academically
		fSElearnsup	Students using learning support services (tutoring services, writing center, etc.)
		fSEdiverse	Encouraging contact among students from different backgrounds (social, racial/ethnic, religious, etc.)
		fSEsocial	Providing opportunities for students to be involved socially
		fSEwellness	Providing support for students' overall well-being (recreation, health care, counseling, etc.)
		fSEnonacad	Helping students manage their non-academic responsibilities (work, family, etc.)
		fSEactivities	Students attending campus activities and events (performing arts, athletic events, etc.)
		fSEevents	Students attending events that address important social, economic, or political issues

Table 2. Exploratory Factor Analysis Structure Matrix

	Component													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
fRIperspect	.818													
fRIownview	.797													
fRIdiverse	.779													
fRIsocietal	.756													
fRInewview	.717													
fRIconnect	.706													
fRIintegrate	.545													
faskquest	.457													
fCLexplain		.866												
fCLaskhelp		.866												
fCLstudy		.771												
fCLproject		.719												
fSEsocial			-.795											
fSEwellness			-.777											
fSEactivities			-.776											
fSEevents			-.729											
fSEdiverse			-.673											
fSEnonacad			-.665											
fQIadvisor				.832										
fQIstaff				.830										
fQIfaculty				.805										
fQIadmin				.802										
fQIstudent				.669										
fchallenge				.451										
fDDeconomic					-.912									
fDDpolitical					-.907									
fDDreligion					-.893									
fDDrace					-.883									
fQRproblem						-.921								
fQRevaluate						-.884								
fQRconclude						-.868								
fetorganize							.785							
fetgoals							.698							
fetexample							.668							
fetfeedback							.646							
fSFdiscuss								.812						
fSFcareer								.806						
fSFotherwork								.750						
fSFperform								.665						
fwrmed									.832					
fwrlong									.828					
fHOanalyze										-.809				
fHOform										-.767				
fHOevaluate	.438									-.729				
fHOapply										-.604				
fLSnotes											.806			
fLSsummary											.741			
fLSreading											.660			
fmemorize														
fSEacademic			-.474									.744		
fSElearnsup			-.476									.704		
fempstudy												.702		
fprepared												.439		
fdrafts													-.694	
fetdraftfb							.421						-.654	
fwrwriting														.636
fwrshort														.574

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Table 3. Exploratory Factor Analysis Pattern Matrix

	Component													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
fRIperspect	.755													
fRIownview	.726													
fRIsocietal	.717													
fRIdiverse	.711													
fRIconnect	.701													
fRInewview	.687													
fRIintegrate	.485													
faskquest														
fCLaskhelp		.880												
fCLexplain		.862												
fCLstudy		.717												
fCLproject		.687												
fSEsocial			-.794											
fSEactivities			-.771											
fSEwellness			-.746											
fSEevents			-.695											
fSEnonacad			-.632											
fSEdiverse			-.597											
fQIstaff				.847										
fQIadvisor				.833										
fQIadmin				.819										
fQIfaculty				.800										
fQIstudent				.663										
fchallenge														
fDDeconomic					-.917									
fDDpolitical					-.904									
fDDreligion					-.895									
fDDrace					-.894									
fQRproblem						-.917								
fQRevaluate						-.874								
fQRconclude						-.865								
fetorganize							.808							
fetgoals							.669							
fetexample							.657							
fetfeedback							.614							
fSFdiscuss								.800						
fSFcareer								.796						
fSFotherwork								.747						
fSFperform								.643						
fwrmed									.840					
fwrlong									.835					
fHOanalyze										-.772				
fHOform										-.696				
fHOevaluate										-.644				
fHOapply										-.588				
fLSnotes											.762			
fLSsummary											.690			
fLSreading											.620			
fmemorize														
fSEacademic												.688		
fempstudy												.681		
fSElearnsup												.636		
fprepared														
fdrafts													-.661	
fetdraftfb													-.622	
fwrwriting														.647
fwrshort														.570

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

As shown in Table 4, both the second-order models fit very well for all faculty members who teach lower-division courses and those who teach upper-division courses (i.e., GFI > .95, CFI>.90, RMSEA < .06 and PCLOSE >.05).

Table 4. Summary of Fit Indices for Confirmatory Factor Analysis

	Upper Division					Lower Division				
	CMIN/ df	GFI	CFI	RMSEA	PCLOSE	CMIN/ df	GFI	CFI	RMSEA	PCLOSE
Academic Challenge	10.01	.97	.97	.05	.05	9.08	.98	.98	.05	.19
Learning With Peers	1.58	.99	1.00	.01	1.00	1.28	1.00	1.00	.01	1.00
Experiences with Faculty	.216	1.00	1.00	.00	.99	.216	1.00	1.00	.00	.99
Campus Environment	3.240	.99	.99	.03	1.00	5.023	.99	.99	.04	1.00

Finally, table 5 presents the standardized regression weights from the confirmatory factor analysis. The standardized regression weights showed good strength of factor loadings for all scales for both lower-division faculty and upper-division faculty except for the item (fHOapply) "*Applying facts, theories, or methods to practical problems or new situations*" in the High-order Learning scale. Overall, the fit indices, factor correlations, and regression weights suggest good subscales in the FSSE survey. See figures of the path models in the Appendix.

Table 5 Standardized Regression Weights

			Upper Division	Lower Division
Academic Challenge	Higher-Order Learning	fHOapply	0.262	0.169
		fHOanalyze	0.672	0.560
		fHOevaluate	0.839	0.920
		fHOform	0.707	0.658
	Reflective & Integrative Learning	fRIintegrate	0.455	0.547
		fRIsocietal	0.693	0.742
		fRIdiverse	0.800	0.752
		fRIownview	0.799	0.883
		fRIperspect	0.912	0.882
		fRInewview	0.611	0.617
		fRIconnect	0.530	0.555
	Quantitative Reasoning	fQRconclude	0.793	0.807
		fQRproblem	0.909	0.930
		fQRevaluate	0.854	0.824
	Learning Strategies	fLSreading	0.618	0.637
		fLSnotes	0.706	0.699
		fLSsummary	0.855	0.865
Learning with Peers	Collaborative Learning	fCLaskhelp	0.842	0.864
		fCLexplain	0.909	0.870
		fCLstudy	0.659	0.704
		fCLproject	0.496	0.587
	Discussions with Diverse Others	fDDrace	0.928	0.937
		fDDeconomic	0.906	0.911
		fDDreligion	0.827	0.831
		fDDpolitical	0.754	0.776
Experiences with Faculty	Student-Faculty Interaction	fSFcareer	0.724	0.724
		fSFotherwork	0.637	0.637
		fSFdiscuss	0.702	0.702
		fSFperform	0.632	0.632
Campus Environment	Quality of Interactions	fQIstudent	0.589	0.573
		fQIadvisor	0.818	0.825
		fQIfaculty	0.794	0.766
		fQIstaff	0.711	0.742
		fQIadmin	0.675	0.703
	Supportive Environment	fSEacademic	0.476	0.472
		fSElearnsup	0.491	0.476
		fSEdiverse	0.607	0.643
		fSEsocial	0.792	0.803
		fSEwellness	0.792	0.779
		fSEnonacad	0.709	0.711
		fSEactivities	0.637	0.659
		fSEevents	0.569	0.602

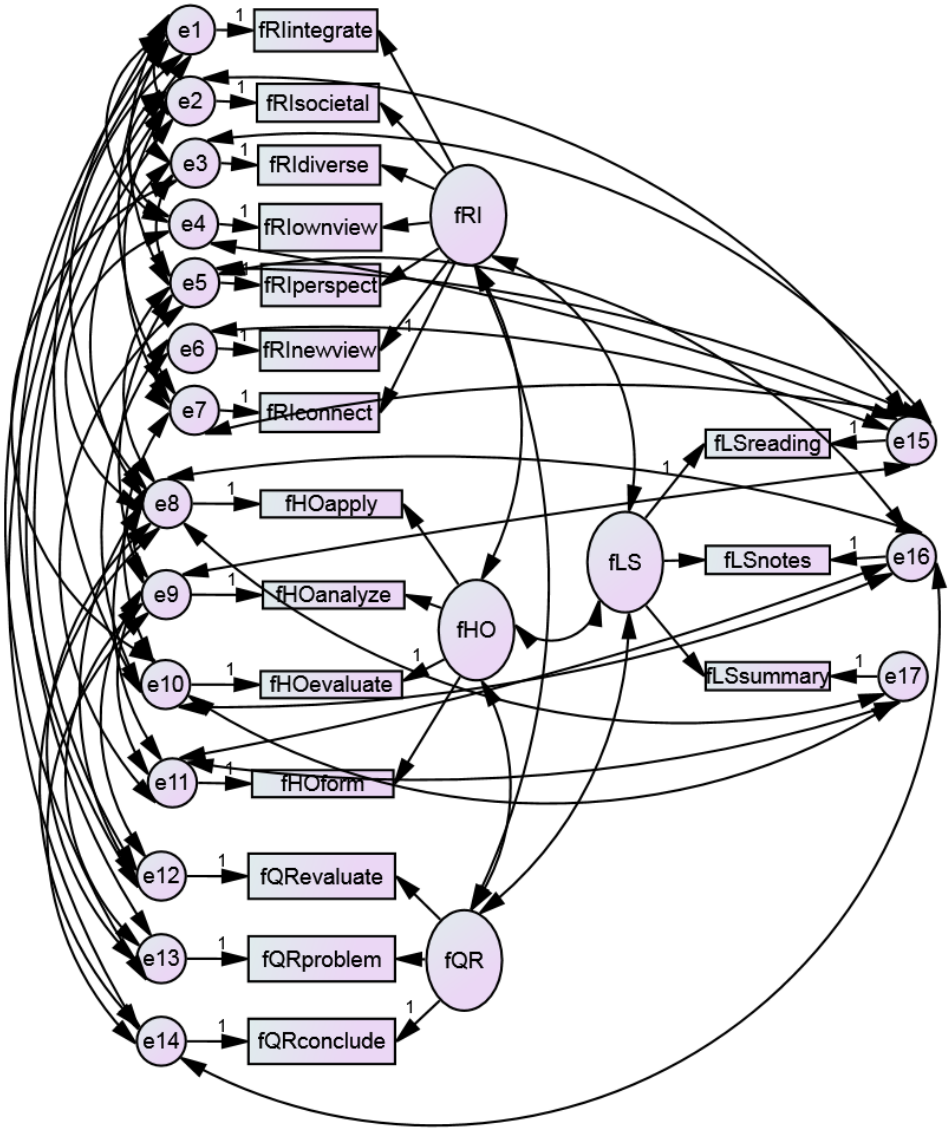
References

Kaiser, H. F. & Rice, J. (1974). Little Jiffy, Mark IV. *Educational and Psychological Measurement*, *34*, 111-117.

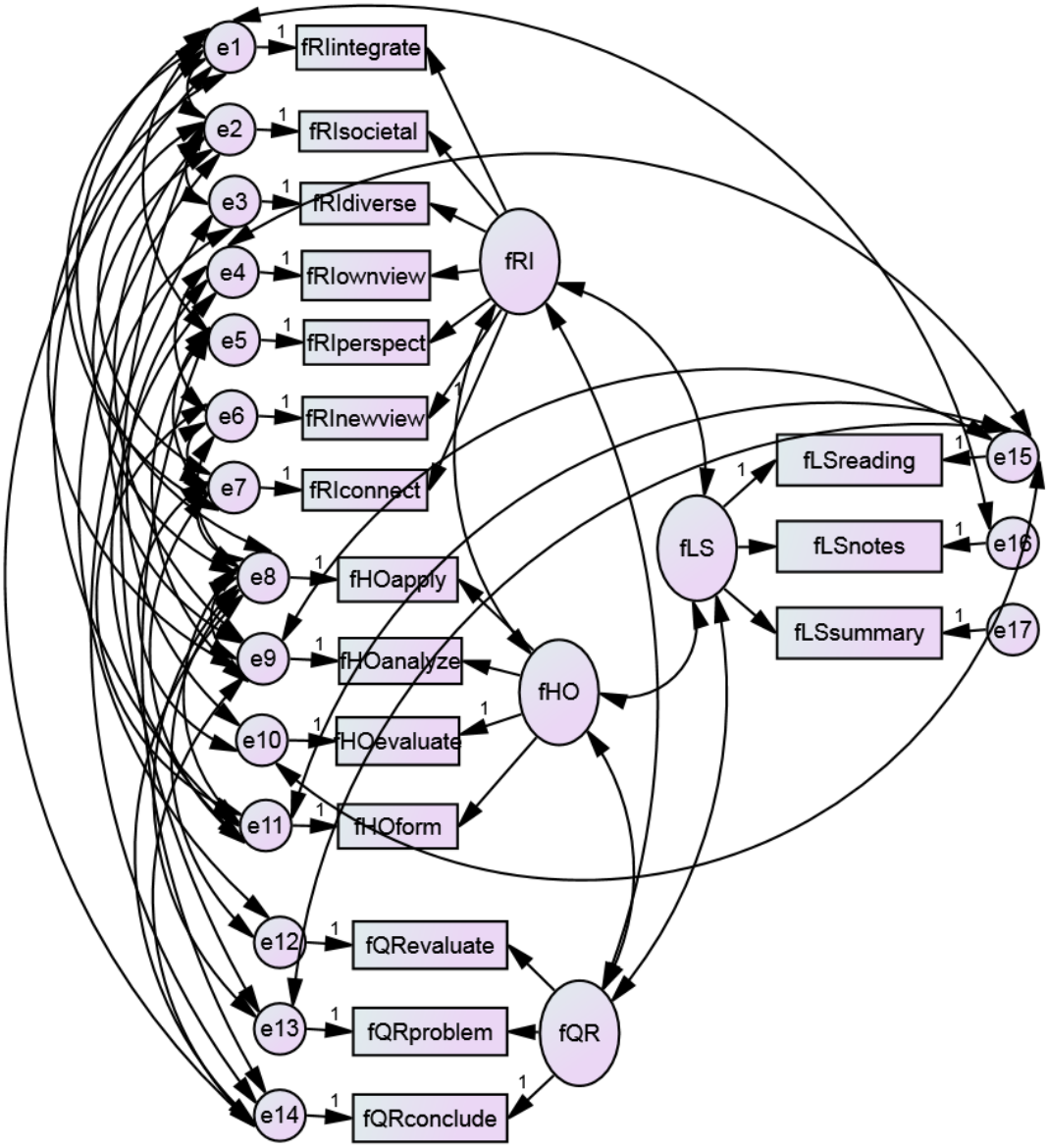
Meyers, L. S., Gamst, G., & Guarino, A. J. (2006). *Applied Multivariate Research: Design and Interpretation*. Thousand Oaks, CA: Sage Publications.

Appendix

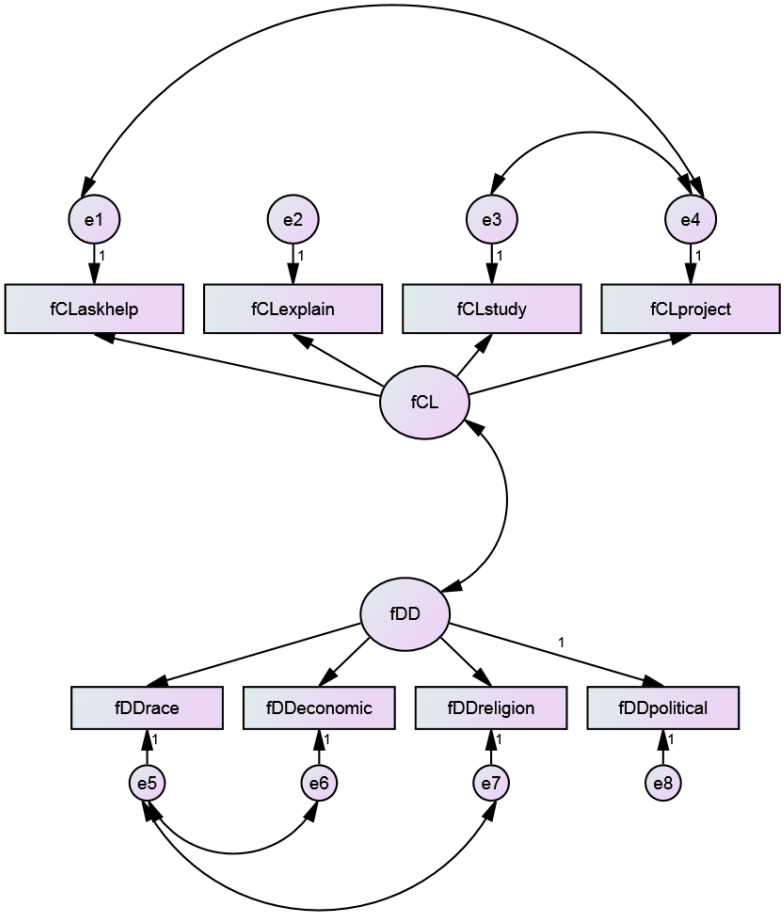
Confirmatory Factor Analysis Models
Higher-Order Learning-Lower-Division



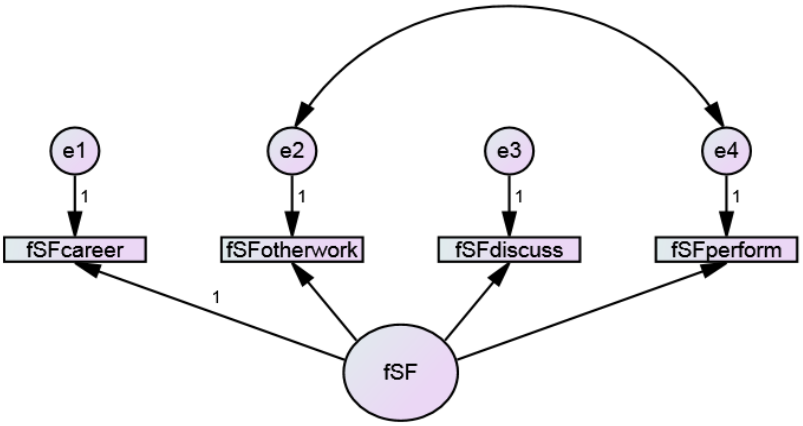
Higher-Order Learning-Upper-Division



Learning with Peers (Lower and upper division)



Experiences with Faculty (Lower and upper division)



Campus Environment (Lower and upper division)