

**Predicting academic competence with in-class and out-of-class engagement:  
Within and cross disciplinary differences**

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National Survey of Student Engagement (NSSE)

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# Research Questions, Sample, and Variables

## Research Questions

1. Are there disciplinary differences in perceived environmental support, academic challenge, co-curricular engagement, cognitive engagement, in-class and out-of-class academic engagement?
2. Are there cross disciplinary differences in the relationship of in-class and out-of-class engagement with growth in academic competence?
3. Are there within disciplinary differences in the relationship of in-class and out-of-class engagement with growth in academic competence?

## Data source and sample characteristics

Data for this study were collected from higher education institutions in the United States that participated in the National Survey of Student Engagement (NSSE) in 2010. NSSE collects data from undergraduate students regarding their academic engagement, campus environment, and other important characteristics of educational quality. NSSE is administered annually by the Center for Postsecondary Research at Indiana University. Since 2000, well over 1 million undergraduate students enrolled at more than 1,400 institutions have completed NSSE.

For this study, only data from full-time, senior students enrolled at US institutions were included. In addition, to examine differences in the development of academic competence between disciplines, this study categorized students into one of 5 broad disciplines based on their institution-reported major. The five disciplines included arts & humanities (AH), science (SC), business (BU), education (ED), and social science (SS). Students major that did not fit one of these categories or was missing were excluded from the study. This resulted in a total of 111,505 senior students enrolled at 569 higher education institutions included in the study. Table 1 shows a detailed description of the gender and race/ethnicity distribution by discipline.

**Table 1. Sample description: Gender and Race/ethnicity by discipline**

		<b>Arts &amp; humanities (AH)</b>	<b>Science (SC)</b>	<b>Business (BU)</b>	<b>Education (ED)</b>	<b>Social sciences (SS)</b>
		<b>19%</b>	<b>23%</b>	<b>24%</b>	<b>14%</b>	<b>20%</b>
<b>Female</b>	<b>63%</b>	33%	52%	44%	18%	29%
<b>Male</b>	<b>37%</b>	67%	48%	56%	82%	71%
<b>African American/Black</b>	<b>8%</b>	5%	6%	9%	7%	11%
<b>Asian/Pacific Islander</b>	<b>5%</b>	3%	8%	6%	2%	4%
<b>Caucasian/White</b>	<b>72%</b>	76%	70%	67%	80%	68%
<b>Hispanic</b>	<b>7%</b>	7%	7%	7%	7%	8%
<b>Other</b>	<b>8%</b>	8%	9%	11%	5%	8%

## Research Questions, Sample, and Variables

### *Dependent Variable*

The primary dependent variable of interest for this study is academic competence. This scale includes six items from NSSE 2010, asking students about the extent to which their institution contributed to their knowledge, skills, and personal development in the areas of “writing clearly and effectively”, “thinking critically and analytically”, “speaking clearly and effectively”, “analyzing quantitative problems”, “using computing and information technology”, and “acquiring a broad general education”.

### *Control Variables*

This study included 7 student-level control variables and 3 institution-level control variables. The student level control variables included SAT/ACT scores, gender, mother and father education, student age, race/ethnicity, and transfer status (native/transfer). Institutional level control variables include institutional type (public/private), institutional enrollment, and Barron’s selectivity.

### *Independent Variables*

1. Supportive Campus Environment scale: includes 6 items (e.g., “Providing the support you need to help you succeed academically”).
2. Institution emphasis: this item asks about students’ perception about the extent to which their institution emphasizes “spending significant amounts of time studying and on academic work.”
3. Involvement in co-curricular activities: one item measure asking students who many hours per week they spend in co-curricular activities.
4. Cognitive engagement scale: includes four items that measure the students’ perception that their coursework emphasized higher-order cognitive skills.
5. In-class engagement scale: created with 5 items (e.g., how often the student “asked questions in class or contributed to class discussions”).
6. Out-of-class academic engagement scale: includes seven items (e.g., how often the student “worked with classmates outside of class to prepare class assignments”).

**Table 2. Descriptive statistics for dependent and independent variables**

Variable name	$\alpha$	M	SD	Min	Max
Academic Competence (AC)	.85	3.2	0.62	1	4
Supportive Campus Environment (SCE)	.76	60.7	18.9	0	100
Institution emphasis on study/academic work (ENVSC)	--	3.2	0.76	1	4
Engagement in co-curricular activities (COC)	--	2.3	1.63	1	8
Cognitive Engagement (CE)	.81	73.9	21.2	0	100
Out-of-class academic engagement (OUT)	.68	50.4	17.4	0	100
In-class academic engagement (IN)	.64	63.0	18.4	0	100

## Analytic procedures

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For research question 1, group differences were analyzed using MANCOVA. The 10 control variables were included as covariates. The purpose for including covariates is to reduce the error term thereby increasing the sensitivity of the test of main effects and to adjust the mean scores on the dependent variables test by taking into account variability caused by the covariates (Tabachnick & Fidell, 2001). Planned contrasts were included to determine significant group (discipline) differences in adjusted mean scores on the dependent variables (academic competence).

For research questions 2 and 3, hierarchical regression was used to examine disciplinary differences in the relationships between the independent variables and development of academic competence. The 7 student-level control variables were included (level 1), as well as the 3 institutional level variables (level 2). The two environment variables (Supportive Campus Environment and Institution emphasis on study/academic work) were included level 3. Level 4 included Co-curricular engagement, Cognitive engagement, In-class engagement, and out-of-class engagement. The dependent variable was academic competence.

In addition, for research question 2, across disciplinary differences were examined by comparing total adjusted  $R^2$ , as well as the individual contribution of in-class and out-of-class engagement on the dependent variable. For research questions 3, within disciplinary differences were examined by comparing the relative contribution of in-class and out-of-class engagement on academic competence within each discipline. The following t-test (Figure 1) was used to determine if there was any significant difference in the estimated unstandardized coefficients for in-class and out-of-class engagement on academic competence (Toutkoushian & Conley, 2005). To reduce the possibility of a Type I error, the t critical value was adjusted using the Sidak-Bonferroni adjustment (Keppel & Wickens, 2004).

**Figure 1. Formula for two sample t-test.**

$$t(df_1 + df_2) = \frac{\hat{\delta}_1 - \hat{\delta}_2}{\sqrt{s_1^2 + s_2^2}}$$

## Results Summary

**Table 3. Adjusted mean scores by discipline and engagement**

		AH	SC	BU	ED	SS
Campus environment	Adj Mean	60.10	60.36	61.83	63.56	60.48
	AH	-	-.26	<b>-1.73***</b>	<b>-3.46***</b>	-.38
	SC	<b>.22***</b>	-	<b>-1.47***</b>	<b>-3.20***</b>	-.12
	BU	<b>.05***</b>	<b>-.17***</b>	-	<b>-1.73***</b>	<b>1.35***</b>
	ED	.00	<b>-.22***</b>	<b>-.05***</b>	-	<b>3.08***</b>
	SS	-.01	<b>-.23***</b>	<b>-.06***</b>	-.01	-
Institution emphasis	Adj Mean	3.11	3.33	3.16	3.11	3.10
		AH	SC	BU	ED	SS
Co-curricular engagement	Adj Mean	2.47	2.49	2.70	2.47	2.57
	AH	-	-.02	<b>-.23***</b>	.00	<b>-.11***</b>
	SC	.18	-	<b>-.21***</b>	.02	<b>-.08**</b>
	BU	<b>-1.50***</b>	<b>-1.68***</b>	-	<b>-.23***</b>	<b>-.12***</b>
	ED	.59	.40	<b>2.08***</b>	-	<b>.11***</b>
	SS	.63	.45	<b>2.13***</b>	.05	-
Cognitive engagement	Adj Mean	73.96	74.14	72.46	74.55	74.59
		AH	SC	BU	ED	SS
Out-of-class engagement	Adj Mean	50.65	50.39	50.98	53.05	50.88
	AH	-	.26	-.33	<b>-2.40***</b>	-.23
	SC	<b>-7.06***</b>	-	-.59*	<b>-2.66***</b>	-.049
	BU	<b>.91***</b>	<b>7.97***</b>	-	<b>-2.07***</b>	.10
	ED	<b>4.83***</b>	<b>11.89***</b>	<b>3.92***</b>	-	<b>2.17***</b>
	SS	<b>-.71*</b>	<b>6.35***</b>	<b>-1.62***</b>	<b>-5.54***</b>	-
In-class engagement	Adj Mean	63.48	56.42	64.39	68.31	62.77
		AH	SC	BU	ED	SS

Covariates included SAT/ACT scores, gender, mother and father education level, student age, race (White=1; other=0), transfer status (native vs transfer), public/private institution, undergraduate enrollment, and Barron's selectivity index rating. The variance ratio and/or Levene's test were all adequate for ANCOVA procedure.

\*p<.05; \*\* p<.01; \*\*\* p<.001

## Results Summary

**Table 4. Predicting academic competence by discipline (unstandardized & standardized coefficients)**

Major =AH                      Total adj R<sup>2</sup>:     .415

	Unst Coeff	SE	St Coeff	Sig
1 SAT_ACT	.000	.000	-.050	<b>.000</b>
Gender	-.005	.009	-.004	.605
Father education	-.008	.003	-.023	.007
Mother education	-.009	.003	-.024	<b>.005</b>
Age	.002	.001	.021	.008
Race/ethnicity	-.006	.011	-.004	.572
Transfer status	-.043	.010	-.032	<b>.000</b>
2 Public/private	-.021	.011	-.017	.051
Enrollment	.001	.001	.015	.081
Barrons	.019	.004	.040	<b>.000</b>
3 Campus environment	.011	.000	.334	<b>.000</b>
Institution emphasis	.137	.006	.170	<b>.000</b>
4 Co-curricular engagement	-.007	.003	-.019	.013
Cognitive engagement	.007	.000	.251	<b>.000</b>
Out-of-class engagement	.002	.000	.062	<b>.000</b>
In-class engagement	.003	.000	.084	<b>.000</b>

Major =SC                      Total adj R<sup>2</sup>:     .423

	Unst Coeff	SE	St Coeff	Sig
1 SAT_ACT	.000	.000	-.019	<b>.004</b>
Gender	-.031	.007	-.026	<b>.000</b>
Father education	-.005	.002	-.015	.045
Mother education	-.004	.003	-.012	.109
Age	.001	.001	.004	.543
Race/ethnicity	.011	.008	.008	.185
Transfer status	-.063	.009	-.047	<b>.000</b>
2 Public/private	.003	.009	.002	.792
Enrollment	.001	.000	.019	.012
Barrons	.011	.003	.022	<b>.001</b>
3 Campus environment	.011	.000	.344	<b>.000</b>
Institution emphasis	.137	.005	.169	<b>.000</b>
4 Co-curricular engagement	-.012	.002	-.033	<b>.000</b>
Cognitive engagement	.007	.000	.260	<b>.000</b>
Out-of-class engagement	.002	.000	.054	<b>.000</b>
In-class engagement	.003	.000	.099	<b>.000</b>

## Results Summary

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Major =BU                      Total adj R<sup>2</sup>: .429

	Unst Coeff	SE	St Coeff	Sig
1 SAT_ACT	.000	.000	.005	.474
Gender	.019	.008	.015	.024
Father education	-.008	.003	-.022	.007
Mother education	-.004	.003	-.010	.215
Age	.003	.001	.035	<b>.000</b>
Race/ethnicity	.003	.009	.002	.762
Transfer status	-.040	.009	-.031	<b>.000</b>
2 Public/private	-.014	.009	-.011	.129
Enrollment	.002	.000	.044	<b>.000</b>
Barrons	.004	.004	.008	.276
3 Campus environment	.012	.000	.354	<b>.000</b>
Institution emphasis	.142	.006	.171	<b>.000</b>
4 Co-curricular engagement	-.019	.003	-.051	<b>.000</b>
Cognitive engagement	.008	.000	.259	<b>.000</b>
Out-of-class engagement	.001	.000	.033	<b>.000</b>
In-class engagement	.003	.000	.089	<b>.000</b>

Major =Ed                      Total adj R<sup>2</sup>: .413

	Unst Coeff	SE	St Coeff	Sig
1 SAT_ACT	.000	.000	-.054	<b>.000</b>
Gender	.015	.014	.008	.313
Father education	-.009	.004	-.024	.016
Mother education	-.012	.004	-.030	<b>.003</b>
Age	.002	.001	.020	.035
Race/ethnicity	-.009	.015	-.006	.525
Transfer status	-.013	.012	-.010	.295
2 Public/private	.023	.013	.016	.086
Enrollment	.002	.001	.035	<b>.000</b>
Barrons	-.011	.005	-.019	.037
3 Campus environment	.013	.000	.373	<b>.000</b>
Institution emphasis	.126	.008	.145	<b>.000</b>
4 Co-curricular engagement	-.011	.004	-.027	<b>.003</b>
Cognitive engagement	.007	.000	.230	<b>.000</b>
Out-of-class engagement	.001	.000	.031	.006
In-class engagement	.003	.000	.094	<b>.000</b>

## Results Summary

Major =SS                      Total adj R<sup>2</sup>: .432

	Unst Coeff	SE	St Coeff	Sig
1 SAT_ACT	.000	.000	-.023	<b>.004</b>
Gender	-.004	.010	-.003	.648
Father education	-.010	.003	-.031	<b>.000</b>
Mother education	-.006	.003	-.016	.072
Age	.003	.001	.032	<b>.000</b>
Race/ethnicity	-.004	.010	-.003	.704
Transfer status	-.026	.010	-.020	.011
2 Public/private	.004	.010	.003	.681
Enrollment	.002	.000	.034	<b>.000</b>
Barrons	.006	.004	.013	.108
3 Campus environment	.011	.000	.355	<b>.000</b>
Institution emphasis	.138	.006	.171	<b>.000</b>
4 Co-curricular engagement	-.016	.003	-.041	<b>.000</b>
Cognitive engagement	.007	.000	.253	<b>.000</b>
Out-of-class engagement	.002	.000	.054	<b>.000</b>
In-class engagement	.003	.000	.079	<b>.000</b>

**Table 5. Within-disciplinary differences between in class and out of class engagement: t-test results**

Within Disciplinary Differences between in-class and out-of-class engagement

	AH	SC	BU	ED	SS
<i>t</i>	-1.583	<b>-3.442</b>	<b>-4.208</b>	<b>-3.889</b>	-1.821

Across Disciplinary Differences between for in-class and out-of-class engagement

		AH	SC	BU	ED	SS
Out-of-class	<b>AH</b>	-	0.863	0.731	<b>2.112</b>	0.731
	<b>SC</b>	-0.511	-	1.593	1.402	-0.080
	<b>BU</b>	0.026	-0.577	-	0.026	-1.553
	<b>ED</b>	-0.674	-0.577	0.731	-	-1.390
In-class	<b>SS</b>	0.552	-1.122	-0.560	1.184	-



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