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Student Self-Reported Gains Attributed to College Attendance: Comparing Two-Year and Four-Year Students

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Abstract

As more students enroll at community colleges, questions are raised about whether learning is the same in the two- and four-year sectors, both overall and for sub-groups, and whether effects of student backgrounds and college experiences on learning are similar. This study used structural equation modeling with CCSSE and NSSE data from a sample of first- and second-year students at 18 institutions and concluded that mean self-reported academic and personal–social gains attributed to college attendance were significantly less for students at two-year colleges. These results were the same for demographic sub-groups, and also for two additional samples, including one with NSSE data only for students who reported their age as between 18 and 24 and CCSSE data only for students who reported their age as 18–24, their highest current educational credential as a high school diploma or GED, and their educational goal as transfer to a four-year institution; and a second additional sample with all two-year students and four-year students who attended a university with a large percentage of transfer students.

key words: learning, involvement, educational environment, NSSE, CCSSE, structural equation modeling, 2-year institutions, 4-year institutions

Student Self-Reported Gains Attributed to College Attendance: Comparing Two-Year and Four-Year Institutions

An increasingly large share of post-secondary enrollments is in two-year colleges (Cohen & Brawer, 2003). There is some evidence that an increasingly large portion of traditional college-age students are

attending two-year colleges and attending full-time. In Connecticut, for example, the number of traditional-age students attending community colleges has increased by 56% since 1999 (Coperthwaite, 2002, 2003, 2004, 2005). Many students attend a community college primarily because of cost and location. Most of them are working 20 hours or more per week and attempting to juggle family, finances, and other responsibilities (Dougherty, 1987). Implicit in the decision of students who could enroll in four-year institutions to attend two-year colleges instead is the assumption that student learning within the two sectors is equal. Important policy and practice questions include (a) how institutional experiences affect learning in the two sectors and (b) whether the magnitude of effects upon learning in the two sectors is the same for students in various sub-populations. The purpose of this study is to contribute to the small but growing body of evidence concerning cognitive effects of student attendance at two- and four-year institutions.

Pascarella and Terenzini (1991), in their meta-analysis college-student impact studies, reached a conclusion that is eloquently stated by Kuh (2001): "What students do during college counts more in terms of desired outcomes than who they are or even where they go to college" (page 1). This result was tempered by the caveat that relatively few methodologically rigorous studies of effects on student learning took differences in students' backgrounds into account and were carried out across a diverse array of students and institutions. Another concern was that few studies have explored the specific ways that student backgrounds combine with institutional experiences to affect student learning and development, as suggested in models by theorists such as Astin, (1984), Pace (1979), and Pascarella (1985). Fortunately, however, a number of the studies called for by Pascarella and Terenzini have taken place in the decades of the 1990s and 2000s at both four-year and two-year institutions.

Four-Year Institutions

Davis and Murrell (1993) used Pace's (1979) conceptual model and a data set of College Student Experience Questionnaire (CSEQ) responses from Kuh, Schuh, Whitt, and Associates' (1991) "involving institutions" (11 four-year institutions, $n = 2,271$) to develop a structural model of the effects of student background characteristics, majors, perceptions of the institutional environment, and academic and social effort on self-reported gains in general education, personal, and vocational skills. Pike (1999) developed a path analysis model with CSEQ plus campus data for 626 first-year students at a Midwestern research university to explore relationships between background characteristics, involvement, interaction, integration, and self-reported gains. Pike (2000) used existing campus data plus survey results from 827 students at a Midwestern research university to develop a model of the relationships between background characteristics, students' academic and social involvement, and their self-reported gains. Pike and Killian (2001) developed a similar structural model using CSEQ data from 598 students at the same university. Pike, Kuh, and Gonyea (2003) developed a model based on 1,500 student CSEQ responses across six types of institutions as defined by the 2000 Carnegie Classification; while the magnitudes of gains were significantly different across institutional types, the structural model of gains was stable.

Two-Year Institutions

Within the two-year college sector, Knight (1994) used Community College Student Experience Questionnaire (CCSEQ) data from 1,062 students at seven regional campuses of a Midwestern university to develop path analysis models to explore relationships between student background characteristics, academic goals, and quality of effort and self-reported gains in six areas. Glover and Murrell (1998) used CCSEQ data from 4,210 students at nine colleges to develop multiple regression models that highlighted relationships between student background characteristics, quality of effort, perceptions of the institutional environment and self-reported general education and personal–social gains. Swigart (2000) used a similar approach, but with a single variable to measure gains, using CCSEQ data from 7,734 students who reported their intended academic goal as transferring to a four-year institution. Similarly, Swigart and Murrell (2000), using CCSEQ responses, found significantly greater self-reported growth for African-American ($n = 268$) than Caucasian ($n = 284$) students.

The Community College Survey of Student Engagement (CCSSE) validation study (McClenney & Marti, 2006) reported on three studies that related engagement indicators to student success variables. Significant relationships were found between CCSSE engagement results

and grade-point average, degree completion, success in "gatekeeper" and general education courses, and fulfillment of general education requirements after controlling for student background characteristics and academic ability using data from the Florida Community College System (28 institutions and three samples ranging from 1,958 to 5,468). A study carried out with 24 institutions (n = 1,623) participating in the Achieving the Dream project found relationships between CCSSE engagement data and course completion, grade-point average, and retention. Student engagement was determined to be related to both self-reported gains and grade-point average, student credit hours completed, and retention in a study that used data from 16 institutions (n = 2,778) that were designated as Hispanic-Serving or were members of the Hispanic Association of Colleges and Universities.

Comparing Student Learning in Two-Year and Four-Year Institutions

Only four studies were located that compared the magnitude of student learning between two- and four-year institutions and/or examined relationships between student characteristics, experiences, and growth between the two sectors. Bohr and Pascarella (1994), using data from 204 students at one two-year and one four-year institution, found no significant differences in gains on ACT Collegiate Assessment of Academic Proficiency (CAAP) reading comprehension, mathematics, or critical thinking measures after age, credit hours, and family responsibilities were controlled. Pascarella, Bohr, Nora, and Terenzini (1995) expanded the earlier study to 2,685 students at six four-year and five two-year institutions using similar variables and techniques and found no significant differences in the three CAAP modules or composite achievement, but they did find that men and minority students benefited more from two-year colleges, while women and Caucasian students realized greater gains at four-year institutions. Strauss and Volkwein (2002) used a dataset from 7,658 sophomores at 51 institutions in the SUNY (State University of New York) system to examine the effects of student background characteristics, financial aid/need, goal clarity, academic experiences and interactions with agents of socialization, perceptions of the institutional climate, student involvement, and institutional commitment on grade-point averages and a self-reported intellectual scale—and to determine how these varied by sector. They found differences in both the magnitude and patterns of influences between students at two-year and four-year colleges. Controlling for other factors, students at two-year colleges received higher grades, while those at four-year institutions reported greater growth. While pre-college academic achievement was a better predictor of college GPA at four-year institutions, student effort was a better predictor of GPA at two-year institutions. No meaningful sector differences were found in predictors of the self-reported intellectual scale. Finally, Pierson, Wolniak, Pascarella, and Flowers (2003), using data from 205 students at one two-year and one four-year institution, determined that, after controlling for an array of confounding variables, students at two-year colleges showed greater gains in three learning orientations characterized as Openness to Diversity/Challenge, Learning for Self-Understanding, and Internal Locus of Attribution for Academic Success. There were significant conditional effects for these gains across gender, race, and pre-college academic ability groups.

Given the enrollment trends, the accompanying policy and practice questions, and the paucity of literature on the topic, this study used data from similar instruments with a variety of two-year and four-year institutions to examine magnitude of and effects upon perceived learning gains in the two sectors. The primary research questions were (a) whether there was a significant difference between the learning gains in the two sectors, and (b) whether there were significant conditional effects upon learning gains in the two sectors. The research methods also required two preliminary research questions to be addressed: (a) whether it was possible to develop a structural and measurement model using data from both two- and four-year institutions that accurately represents the relationships between students' self-reported learning gains, involvement, perceptions of the educational environment, and background variables, and (b) whether the research model was the same (invariant) between the two- and four-year sectors.

Method

Conceptual Model

The conceptual model underlying this study falls into the college impact family of models typified by Astin's (1984, 1993) I-E-O theory of involvement, Pace's (1979, 1984) theory of quality of effort, and

Pascarella's (1985) General Model for Assessing Change. The models posit that student background variables and institutional characteristics influence and combine with perceptions of the educational environment to influence quality of effort or involvement and, ultimately, learning and development.

Measures

All data for the study were obtained from the National Survey of Student Engagement (for students at four-year institutions) or the Community College Survey of Student Engagement (for students at two-year colleges). The NSSE was ". . . specifically designed to assess the extent to which students are engaged in empirically derived good educational practices and what they gain from their college experience" (Kuh, 2001, page 2). The NSSE items relate to practices shown to facilitate engagement or quality of effort (Astin, 1991; Chickering & Reisser, 1993; Kuh et al., 1991; Pascarella & Terenzini, 1991). Several studies have documented significant relationships between student engagement as reported by NSSE and direct measures of cognitive growth as measured by the ACT CAAP as well as student's grades (Ewell, 2002; Hughes & Pace, 2003; Carni, Kuh, & Klein, 2006). The CCSSE was developed from the NSSE for use in two-year colleges; there is a high degree of correspondence between them (Marti, n.d.).

The dependent variables in this study were self-reported student gains. The validity of self-reports has been heavily studied; they are likely to be valid when (a) the information requested is known to the participants; (b) the questions are phrased clearly and unambiguously; (c) the questions refer to recent activities; (d) participants think the questions merit a serious and thoughtful response; and (e) the questions do not threaten, embarrass, or violate the privacy of the participant or encourage the participant to respond in socially desirable ways (Brandt, 1958; DeNisi & Shaw, 1977; Hansford & Hattie, 1982; Laing, Swayer, & Noble, 1989; Lowman & Williams, 1987; Pace, 1985; Pike, 1995). The NSSE "was intentionally designed to satisfy all these conditions" (Kuh, 2001, page 4).

NSSE and CSSE data were merged into a single data set that contained only items that were phrased in the same way in both instruments and across years. Factor analysis results (see Appendix 1) were used to sum items into scales. Learning gains were represented by two scales: Academic Gains and Personal–Social Gains. Each of the items for these scales were scored as 1 = *Very Little* to 4 = *Very Much*. Perceptions of the Educational Environment were represented by two scales: Campus Climate (scored as 1 = *Very Little* to

Appendix 1

Factor Analysis Results

	Gains Items	
	Academic Gains	Personal-Social Gains
General Education	.59	.06
Work	.39	.18
Writing	.82	-.04
Speaking	.72	.09
Analyzing	.79	-.01
Solving Quantitative Problems	.60	.00
Computers	.49	.14
Understanding Yourself	.14	.66
Diversity	.01	.80
Ethics	-.02	.89
Communications	.05	.65
% Variance Explained	45%	6%
	Factor Correlations	
Academic Gains	--	
Personal–Social Gains	.71	--

Appendix 1 *(continued)*

	Perceptions of the Environment Items	
	Campus Climate	Relational Env.
Env: Diversity	.76	.03
Env: Academic	.86	-05
Env: Social	.85	.00
Env: Scholarly	.51	.06
Env: Students	-.01	.76
Env: Faculty	.00	.82
Env: Administration	.03	.79
% Variance Explained	12%	6%
	Factor Correlations	
Campus Climate	--	--
Relational Env.	.41	--

	Student Involvement Items					
	Student-Faculty	Active Learning	Diversity	Academic	Info. Tech.	Class Prep.
Faculty Ideas	.51	.36	-.04	-.09	.01	-.05
Faculty Grade	.49	.00	.00	-.03	.33	-.03
Faculty Plans	.48	.22	-.05	-.05	.11	.01
Faculty Feedback	.51	-.05	.02	.04	.03	-.03
Questions in Class	.40	.03	.06	.11	-.09	-.02
Ideas Outside of Class	.40	.00	.22	.06	-.06	.03
Work Hard	.46	-.04	.00	.14	-.03	.18
Hrs/Wk Co-Curricular	-.22	.49	.03	-.07	.10	.44
Community Projects	-.06	.56	-.02	.07	-.03	.06
Tutor	.06	.50	.04	.01	-.08	.07
Faculty Other	.20	.58	-.04	-.07	-.04	-.02
Worked/Classmates Outside/Class	.01	.46	.02	.29	-.04	-.01
Diverse Students	.08	-.01	.81	-.01	-.03	-.01
Different Students	.00	.01	.89	-.03	.03	.02
Class Presentations	.01	.23	-.04	.42	.00	-.05
Worked/Classmates In Class	.05	.21	.01	.41	-.02	-.19
Integrate	.01	-.08	.01	.67	.10	.11
Rewrote Papers	.13	-.05	-.07	.46	-.02	.24
Email	.02	-.05	-.01	.02	.79	.06
Used E-Medium for Class	.05	-.12	.02	.27	.38	-.07
Hrs/Wk Preparing/Class	.06	.09	.02	.07	.02	.60
Came to Class Unprepared	-.35	.21	.07	.06	.19	-.22
% Variance Explained	22%	5%	4%	3%	3%	2%
	Factor Correlations					
Student–Faculty	--					
Active Learning	.45	--				
Diversity	.41	.32	--			
Academic	.56	.36	.39	--		
Info. Tech.	.45	.49	.31	.47	--	
Class Prep.	.13	.16	.02	.20	.18	--

Note. Principal axis factoring was used with promax rotation; the pattern matrix is shown.

4 = *Very Much*) and Relational Environment (scored as 1 = *Unfriendly, Unsupportive, Sense of Alienation* to 7 = *Friendly, Supportive, Sense of Belonging* for relationships with other students; 1 = *Unavailable, Unhelpful, Unsympathetic* to 7 = *Available, Helpful, Sympathetic* for faculty members; and 1 = *Unhelpful, Inconsiderate, Rigid* to 7 = *Helpful, Considerate, Flexible* for administrative personnel and offices). Involvement was measured by four scales: Student–Faculty, Active Learning, Diversity, and Academic Activities (all scored as 1 = *Never* to 4 = *Very Often*). The "Scholarly Environment" item that was common to the two surveys was not included in the Campus Climate scale since it had a relatively low factor loading and including it decreased the scale's Combat's Alpha reliability. The item "Came to Class Unprepared" did not load highly on any of the Involvement scales. The Information Technology and Class Preparation scales were not used in subsequent analyses due to their low reliabilities. Student background variables were recoded for use in the study; these included gender (female = 1, male = 0), race (student of color = 1, Caucasian = 0), and first generation status (1 = first generation, 0 = not first generation). The dichotomous race coding was due to the relatively small number of students of color. Table 1 provides means, standard deviations, and Combat's Alpha reliabilities for the observed variables.

Table 1

Means, Standard Deviations, Number of Items, and Reliabilities for Measured Variables

Variable	Mean	Std. Dev.	Items	Reliability
Two-Year				
Background				
Gender	0.61	0.49		
First Generation	0.47	0.50		
Race	0.30	0.46		
Perceptions of the Environment				
Campus Climate	6.47	2.42	3	0.78
Relational Environment	15.78	3.45	3	0.70
Student Effort				
Student–Faculty	17.00	3.81	7	0.75
Active Learning	6.11	2.33	5	0.65
Diversity	4.84	1.92	2	0.86
Academic Activities	9.94	2.56	4	0.63
Gains				
Academic	19.11	4.74	7	0.85
Personal–Social	9.35	3.35	4	0.86
Four-Year				
Background				
Gender	0.68	0.47		
First Generation	0.42	0.49		
Race	0.19	0.39		
Perceptions of the Environment				
Campus Climate	6.99	2.38	3	0.80
Relational Environment	15.82	3.17	3	0.69
Student Effort				
Student–Faculty	17.44	3.74	7	0.76
Active Learning	9.24	3.10	5	0.60
Diversity	5.12	1.82	2	0.82
Academic Activities	10.90	2.31	4	0.54
Gains				
Academic	20.21	4.31	7	0.84
Personal–Social	10.14	3.09	4	0.83

Note. Items in the Campus Climate scale were scored as 1 = *Very Little* to 4 = *Very Much*. Items in the Relational Environment scales were scored as 1 = *Unfriendly, Unsupportive, Sense of Alienation* to 7 = *Friendly, Supportive, Sense of Belonging* for relationships with other students; 1 = *Unavailable, Unhelpful, Unsympathetic* to 7 = *Available, Helpful, Sympathetic* for faculty members; and 1 = *Unhelpful, Inconsiderate, Rigid* to 7 = *Helpful, Considerate, Flexible* for administrative personnel and offices. Items in the four Student Effort scales were scored as 1 = *Never* to 4 = *Very Often*. Items in the two Gains scales were scored as 1 = *Very Little* to 4 = *Very Much*.

Sample

Data from 18 institutions, representing NSSE and CCSSE administrations between 2000 and 2006, were included in the original sample. Surveys were administered using recommended procedures. The primary sample for the study included all first- and second-year students for whom data were available (n = 24,051). Two additional samples were used for the study and analyses were carried out separately for each. The first additional sample comprised NSSE data only for students who reported their age as between 18 and 24 and CCSSE data only for students who reported their age as 18–24, their highest current educational credential as a high school diploma or GED, and their educational goal as transfer to a four-year institution (n = 13,995). The second additional sample included all two-year students as well as four-year students from a university with a high percentage of transfer students (n = 22,335); this sample was used to be able to compare two-year and four-year students who were more likely to be employed and enrolled part-time. The number of students sampled from each institution and the corresponding dates and methods of survey administration are listed in Table 2.

Data Analysis

While researchers who have analyzed institutional effects in CSEQ (Strauss & Volkwein, 2002) and CCSEQ (Ethington, 2000) data have made a compelling case for the benefit of using hierarchical linear modeling techniques, our data set did not meet the requirement of a minimum of 30 institutions (Porter, 2005). Structural equation modeling was used with AMOS 4.0.

The data analysis was conducted in four phases, using procedures illustrated by Pike (1999, 2000), Pike and Killian (2001), Pike, Kuh, and Gonyea (2003), and Wang, Ye, Jackson, Rodgers, and Jones (2005). The first set of analyses tested the research model's ability to adequately represent the relationships among the observed variables. Maximum likelihood estimation allowed the use of goodness-of-fit measures that were robust to departures from multivariate normality. Since the chi-square statistic is sensitive to sample size (Cheung & Rensvold, 2002), the Comparative Fit Index, Tucker Lewis Index (each of which with values greater than .90 indicating good model fit), and Root Mean Square Error of Approximation (with a value of less than .05 indicating good model fit) were used to assess model goodness-of-fit (Hu & Bentler, 1999), using guidelines suggested by Hu and Bentler (1999), Browne and Cudeck (1993), and MacCallum, Browne, and Sugawara (1996). Modification indices and critical ratios were inspected to determine whether permitting correlations between error terms and/or removing structural relationships would significantly improve model fit. Standardized direct, indirect, and total effects and squared multiple correlations for the final model were also computed.

Table 2
Institutions, Sample Sizes, Dates, and Modes of CCSSE or NSSE Administration

Sector	Institution	Sample Size	Dates	Modes of Administration
Two-Year	Connecticut Community Colleges (includes 12 institutions)	14,113	2004 and 2006	printed survey, in class
Two-Year	Ivy Tech Community College	661	2006	printed survey, in class
Two-Year	Oakton Community College	1,273	2003 and 2006	printed survey, in class
Two-Year	Sinclair Community College	4,898	2002, 2003, 2004, 2005, and 2006	printed survey, in class
Four-Year	Bowling Green State University	1,554	2000, 2001, 2003, and 2005	printed and/or web, mailed
Four-Year	Indiana University-Purdue University-Indianapolis	1,390	2002, 2004, and 2006	printed and/or web, mailed
Four-Year	Springfield College	162	2004 and 2006	printed and/or web, mailed

The second phase involved determining whether the final model was invariant (i.e., exactly the same) across the two- and four-year institution groups. A variation of the final model was developed where all paths in the structural model and all factor loadings in the measurement model were constrained to be equal across the two sectors. The difference in chi-square values and degrees of freedom between the baseline and invariance models was used to evaluate the goodness-of-fit of the later. Next, a series of additional models was developed that constrained some, but not all, of the structural paths, and factor loadings were constrained between the two sectors; each was tested against the baseline model.

Third, a model consisting of the Gains construct, its two associated observed variables, and their associated error terms was constrained to have structural paths and intercepts equal across sectors, while the mean of the learning gains construct was constrained to zero for one group and free to vary for the other. As shown by Arbuckle and Wothke (1999), who referenced the technique from Sorbom (1974), this approach allowed the estimation of mean differences in learning gains between the two sectors.

Fourth, the technique used in phase three was again employed in a series of additional analyses with subsets of the data to estimate mean differences in learning gains between the two sectors for females only, males only, students of color only, White students only, first-generation students only, and non-first-generation students only.

Finally, the analyses outlined above were repeated for two additional samples: (a) NSSE data only for students who reported their age as between 18 and 24 and CCSSE data only for students who reported their age as 18–24, their highest current educational credential as a high school diploma or GED, and their educational goal as transfer to a four-year institution, and (b) a sample that included all two-year students as well as four-year students from a university with a high percentage of transfer students. These additional analyses were carried out in order to examine whether the results would differ for more homogeneous groups of students.

Results

Development of the Research Model

The initial research model from the primary sample of 24,051 included structural paths from gender, race, and first-generation student status to the Perceptions of the Environment, Involvement and Gains constructs, structural paths from the Perceptions of the Environment and Involvement constructs to the Gains construct, and no covariances among gender, race, and first-generation student status or correlations among error terms. That model was found not to fit the data well ($\chi^2 = 6443$, $df = 36$, $\rho < .001$, RMSEA = 0.11, RFI = 0.67, CFI = 0.77, TLI = 0.68). Development and comparisons of several versions of the research model revealed that including a structural path from the Perceptions of the Environment construct to the Involvement construct; removal of structural paths from gender to Perceptions of the Environment, from race to Involvement, and from first-generation status to Perceptions of the Environment and Involvement; allowing covariance between gender, first-generation status, and race; and allowing correlations between several of the error terms associated with the endogenous observed variables resulted in a final research model (shown in Figure 1

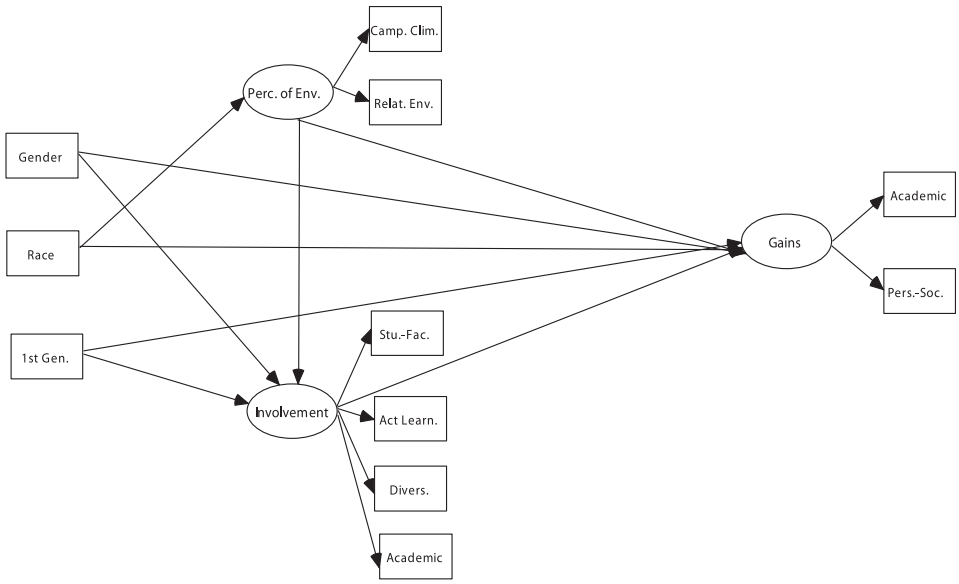

Figure 1. The refined research model.

with covariances, correlations, and error terms removed for clarity) with a highly acceptable fit with the data ($\chi^2 = 982$, $df = 26$, $\rho < .001$, RMSEA = 0.039, RFI = 0.996, TLI = 0.996, CFI = 0.998).

Standardized direct, indirect, and total effects and squared multiple correlations for the final model are shown in Table 3. Being female had a weak positive direct effect on Involvement and weak positive direct and indirect effects on Gains. Being a first-generation student had a weak negative effect on Involvement, a weak positive direct effect and a weak negative indirect effect on Gains. Being a student of color had a weak direct effect upon Perceptions of the Environment, a weak positive effect upon Involvement, and weak positive direct and indirect effects on Gains. Perceptions of the Environment had a strong positive direct effect on Involvement, and strong positive direct effect plus a weak positive indirect effect on Gains. Involvement had a weak positive direct effect on Gains. The research model did a very poor job of explaining Perceptions of the Educational Environment (squared multiple correlation of 0.014), a good job of explaining Involvement (0.315), and a very good job of explaining Gains (0.836).

Table 3

Standardized Direct, Indirect, and Total Effects, Squared Multiple Correlations, and Standardized Weights of Measured Variables on Latent Variables for the Final Model

	Environment	Involvement	Gains
Effects			
Gender			
Direct		0.061	0.046
Indirect			0.014
Total		0.061	0.060
First Generation			
Direct		-0.025	0.050
Indirect		-0.005	
Total		-0.025	0.045
Ethnicity			
Direct	0.117		0.060
Indirect		0.065	0.103
Total	0.117	0.065	0.163
Environment			
Direct		0.557	0.764
Indirect			0.119
Total		0.557	0.883
Involvement			
Direct			0.214
Indirect			
Total			0.214
SMC	0.014	0.315	0.836
Weights			
Campus Climate	0.788		
Relational Environment	0.511		
Student–Faculty		0.773	
Active Learning		0.627	
Diversity		0.405	
Academic Activities		0.643	
Academic			0.845
Personal–Social			0.785

Note. All direct effects are significant at $p < .01$. SMC = Squared Multiple Correlation.

Invariance Between Groups

While the data fit the models for both groups in the primary sample of 24,051, they did not fit models used in several additional analyses that imposed sector invariances (i.e., that imposed the stricter standard that the pattern of structural paths and/or factor loadings was exactly the same between the CCSSE and NSSE data sets). As shown in Appendix 2, the total invariance model was rejected because it significantly increased poorness-of-fit when evaluated against the baseline model. Several additional models that variously constrained all structural paths only, all factor loadings only, and only selected structural paths or factor loadings were all also rejected when evaluated against the baseline model.

Appendix 2

Goodness-of-Fit Statistics for Group Invariance Tests

Model	χ^2	*df*	$\Delta\chi^2$	Δ *df*	ρ
Baseline Model (combined two-year and four-year)	982	26			
All Structural Paths and Factor Loadings Invariant	1249	66	267	40	< .01
All Structural Paths Invariant	1181	61	199	35	< .01
All Factor Loadings Invariant	1220	57	238	31	< .01
Structural Paths from Involvement to Gains, Perceptions of the Environment to Gains, and Perceptions of the Environment to Involvement Invariant	1157	55	175	29	< .01
Factor Loadings from Observed Variables to Gains Invariant	1149	53	167	27	< .01
Factor Loadings from Observed Variables to Perceptions of the Environment Invariant	1144	53	162	27	< .01
Factor Loadings from Observed Variables to Involvement Invariant	1204	53	222	27	< .01

Differences in Mean Gains

The learning gains construct for two-year college students was found to have a mean of -1.10 and a standard error of 0.86. When compared with the learning gains construct for four-year college students for which the mean and standard error were constrained to be zero, the resulting critical value of -12.99 indicates that two-year college students had significantly less perceived learning gains than did students at four-year institutions from the primary sample of 24,051.

Conditional Effects

Table 4 indicates that two-year college students from the primary sample of 24,051 had significantly lower self-reported learning gains than did students at four-year institutions when separate analyses were carried out for females, males, students of color, Caucasian students, first-generation students, and non-first-generation students.

Other Group Comparisons

Table 5 indicates that the finding of significantly lesser perceived learning gains for two-year college students was replicated for more

Table 4

Conditional Effects of Mean Differences in Learning Gains Between Two-Year and Four-Year Students

Group	Mean Difference	Standard Error	Critical Ratio
First Generation	-0.596	0.139	-6.866*
Not First Generation	-1.507	0.116	-12.967*
Students of Color	-1.167	0.201	-5.801*
Caucasian Students	-1.351	0.098	-13.719*
Female	-0.826	0.105	-7.880*
Male	-1.544	0.144	-10.737*

Note. Mean differences represent values for two-year colleges with means for four-year institutions set to zero. * $\rho < .001$.

Table 5

Mean Differences in Learning Gains Between Two-Year and Four-Year Students With Additional Samples

Sample	Mean Difference	Standard Error	Critical Ratio
Traditional-Aged, Two-Year Students with Highest Educational Credential as a High School Diploma or GED, and Educational Goal as Transfer to a Four-Year Institution	-1.229	0.093	-13.174*
All Two-Year Students and All Four-Year Students from a University with a High Transfer-In Rate	-0.144	0.045	-3.179*

Note. Mean differences represent values for two-year colleges with means for four-year institutions set to zero. * $p < .001$.

homogeneous groups of students, including (a) students who reported their age as between 18 and 24 and CCSSE data only for students who reported their age as 18–24, their highest current educational credential as a high school diploma or GED, and their educational goal as transfer to a four-year institution, and (b) all two-year students as well as four-year students from a university with a high percentage of transfer students.[1]

Discussion

The study found significantly lower perceived learning gains attributed to college attendance in two-year colleges than in four-year institutions. This supported the conclusions of Strauss and Volkwein (2002), who also used self-reported learning gains attributed to college attendance as the dependent variable, but disagreed with those of Bohr and Pascarella (1994) and Pascarella, Bohr, et al. (1995), both of which examined direct measures of learning gains. The importance of involvement in affecting gains follows the precepts of the college impact family of models typified by Astin (1984, 1993), Pace (1979, 1984), and Pascarella (1985). The strong relative importance of perceptions of the environment in impacting gains parallels the findings of Davis and Murrell (1993), Glover and Murrell (1998), and Swigart (2000), and is noted by Astin (1993).

Several important limitations of the current study must be acknowledged. Despite including several institutions with a variety of missions, locations, and student backgrounds, the sample remains one of convenience, and the number of institutions remains relatively small. To the extent that students in institutions not included in the study respond differently to the CCSSE and the NSSE, our results do not generalize to those institutions. Also, the research did not use true longitudinal studies or direct measures of student learning: these are very difficult to obtain across several institutions. Additionally, the NSSE is mailed (in paper or electronically) to random samples of undergraduates, while the CCSSE is administered in randomly chosen classes. Although CCSSE results are weighted to reduce the effects of full-time students, it is not clear how mode of administration effects may have related to the results. Finally, it is unclear how the fact that 12 of the two-year colleges were part of one state system may have affected the results.

Although both the NSSE and the CCSSE ask students to indicate whether they worked and were enrolled on a full-time or part-time basis during the semester in which they completed the surveys, these background variables were not included in the analyses because they were measured with different scales in the two surveys, because of the frequency with which

[3] Additional details on the results of the analyses with the two additional samples are available on request from the author.

students change their employment statuses and because of institutional differences in definitions of *full-time* and *part-time*. These background factors may have had an important effect on the between-sector results. The comparison of two-year students with four-year students at a university with a high percentage of transfer students, which might have acted as a proxy for employment and part-time vs. full-time enrollment, however, still showed significantly lesser mean perceived learning gains at two-year institutions.

Another interpretation involves underlying differences in the two student populations, despite the efforts to control for background characteristics. Students at four-year institutions may be more likely to come from households that perceive college attendance as a positive experience, especially with regard to forwarding goals of socioeconomic mobility. Two-year college students may have more short-term or less well-defined goals and may be likely to have fewer positive experiences in educational settings prior to college enrollment. Thus, they may be somewhat more skeptical or less appreciative of the value added to their lives by higher education (American Association of Community Colleges and American Association of State Colleges and Universities, 2004).

It may be that the strongest contributors to the differences found rest in students' background characteristics not accounted for in the research model and the amount of interaction students are able to have with the campus environment. Unlike many of their four-year residential counterparts, community college students are commuting students. For the most part community college students, by choice or circumstance, may simply not be on campus long enough to take advantage of the myriad of opportunities for engagement outside of the classroom.

Four suggestions for further research follow from this study. The first is to carry out similar comparisons that include upper-division students at four-year institutions. The second is to replicate this study with the full national NSSE and CCSSE data sets. The third is to use HLM to explore institutional-level as well as sector-level differences if the minimum threshold of 30 institutions could be included. HLM would provide less biased coefficients and standard errors (Porter, 2005). The fourth is to carry out a qualitative study with two-year college students in order to better understand their attributions for learning and growth during college.

Since this study found that mean perceived learning gains attributed to college attendance were significantly lesser at two-year colleges and that student involvement was the primary predictor of perceived learning gains in both sectors, the logical implication for practice is to promote greater student involvement at two-year colleges. It may be that some interventions (e.g., learning communities, first year seminars, bridge programs) that are now common on many four-year campuses are just coming into being at some two-year campuses; and as they are adopted, the concomitant enhancements in engagement might be expected. Others, however, contend that many community colleges are far ahead of four-year institutions in offering support services and innovative teaching strategies. Thus, the notion of the effects of infrastructure differences needs to be empirically validated. Other strategies for increasing student involvement at two-year colleges include paired classes (Giegerich, 2006), creating special support structures for at-risk students, sharing information on students' college activities with their families, study groups, active and collaborative learning approaches, mandatory advising, mandatory attendance in gatekeeper courses, faculty professional development (particularly for part-time instructors), strengthening developmental education, supplemental instruction, technology-aided instruction, learning communities, intrusive interventions (CCSSE, 2007), and targeted support for minority students (Jenkins, 2006).

Editor's Note:

Recent discussions about accountability, affordability, and transparency frequently involve discussions about student learning gains and the degree to which colleges and universities use the appropriate methodologies to engage students in an active learning process. In most of these discussions, the National Survey of Student Engagement (NSSE) is discussed as a way to measure student learning and student engagement. While the value of the NSSE is itself a topic of discussion, the fact that it is part of the national higher education landscape seems to be firmly established.

Because of NSSE's relevance, it is particularly good to have thoughtful and comprehensive research

activities that use data from the NSSE. This article by William Knight describes one such research activity.

The purpose of this study speaks directly to the public conversation about student learning. Specifically, it compares self-reported academic and personal–social gains between those who attend two-year institutions and those who attend four-year institutions. It is particularly valuable in that it describes and implements one of our more powerful methodologies, Simultaneous Equation Modeling, as it develops results for its conclusions.

Knight starts with a good review of some of the major work that has been done looking at the NSSE. Of particular interest is the part that addresses criteria for accepting the credibility of self-reported student gains. In fact, if one does not accept the validity of self-reports, then the relevance of the NSSE itself becomes highly questionable.

In addition to a good literature review, a second important aspect of this study is the use of data from both two-year and four-year institutions. Very few research projects have been able to approach questions of student gains with a sufficient database. It is notable that this database was made possible by the cooperation of professional colleagues who supported the project.

In terms of the methodology, one of the first major decisions is to factor analyze the relevant items common in both the NSSE and its community college equivalent, the Community College Survey of Student Engagement. This allows for developing scales that are common to both two-year and four-year respondents. It does, however, limit some of the ability to tie this study's results to previous studies using these instruments. At the same time, it allows for differences between two-year and four-year institutions, as reflected in item response variance, to influence the dimensions that are identified.

The main conclusions come from the use of a methodology that is conducted in four phases. The first phase looks at the ability to fit models to the dependent variables of perceived student gains. The second phase then tested whether the resulting model selected from the first phase seems to be statistically comparable for multiple groups. It would appear that most strategies that use SEM stop after these two steps. Knight, however, extends the use of SEM to look at the issue of mean differences in gains when comparing one group to another group. While this has not become a common extension, it does appear to have a great deal of value in situations of this type. The fact that Knight finds similar results across a range of situations based on different characteristics of the two-year and four-year students adds a sense of construct validity to his conclusions.

In a very operational sense, Knight concludes that the "main perceived learning gains attributed to college attendance were significantly lesser at two-year colleges and that student involvement was the primary predictor of perceived learning gains in both sectors." This conclusion is then logically tested against some of the possible reasons for its occurrence. The implications of its conclusions are left to the discussions of its readers and to those who, hopefully, conduct further research on this issue.

References

American Association of Community Colleges and American Association of State Colleges and Universities. (2004). *Improving access to the baccalaureate*. Washington, DC: Community College Press.

Arbuckle, J. L., & Wothke, W. (1999). *AMOS 4.0 User's Guide*. Chicago: Smallwaters Corporation.

Astin, A. W. (1984). Student involvement: A developmental theory for higher education. *Journal of College Student Personnel, 25*, 297–308.

Astin, A. W. (1991). *Assessment for excellence: The philosophy and practice of assessment and evaluation in higher education*. New York: American Council on Education/Macmillan.

Astin, A. W. (1993). *What matters in college? Four critical years revisited*. San Francisco: Jossey-Bass.

Bohr, L., & Pascarella, E. (1994). Cognitive effects of two-year and four-year institutions: A preliminary study. *Community College Review, 22*, 4–11.

Brandt, R. M. (1958). The accuracy of self-estimates. *Genetic Psychology Monographs, 58*, 55–99.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen, & J. S. Long (Eds.), *Testing structural equation models* (pp. 136–162). Newbury Park, CA: Sage.

Carni, R. M., Kuh, G. D., & Klein, S. P. (2006). Student engagement and student learning: Testing the linkages. *Research in Higher Education, 47*(1), 1–32.

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indices for testing measurement invariance. *Structural Equation Modeling, 9*, 233–255.

Chickering, A. W., & Reisser, L. (1993). *Education and identity* (2nd ed.). San Francisco: Jossey-Bass.

Cohen, A. M., & Brawer, F. B. (2003). *The American community college* (4th ed.). San Francisco: Jossey-Bass.

Community College Survey of Student Engagement (2007). *Committing to student engagement: Reflections on CCSSE's first five years*. Austin, TX: The University of Texas at Austin, Community College Leadership Program.

Coperthwaite, C. (2002). *Entering Student Survey*. Retrieved December 27, 2008, from Connecticut Community Colleges Web site: http://www.commnet.edu/planning/Research/SurveysStudies/EnteringStudentSurvey/ess.html

Coperthwaite, C. (2003). *Entering Student Survey*. Retrieved December 27, 2008, from Connecticut Community Colleges Web site: http://www.commnet.edu/planning/Research/SurveysStudies/EnteringStudentSurvey/ess.html

Coperthwaite, C. (2004). *Entering Student Survey*. Retrieved December 27, 2008, from Connecticut Community Colleges Web site: http://www.commnet.edu/planning/Research/SurveysStudies/EnteringStudentSurvey/ess.html

Coperthwaite, C. (2005). *Entering Student Survey*. Retrieved December 27, 2008, from Connecticut Community Colleges Web site: http://www.commnet.edu/planning/Research/SurveysStudies/EnteringStudentSurvey/ess.html

Davis, T. M., & Murrell, P. H. (1993). A structural model of perceived academic, personal, and vocational gains related to college student responsibility. *Research in Higher Education, 34*(3), 267–289.

DeNisi, A. S., & Shaw, J. B. (1977). Investigation of the uses of self-reports of abilities. *Journal of Applied Psychology, 62*, 641–644.

Dougherty, K. (1987). The effects of community colleges: Aid or hindrance to socioeconomic attainment? *Sociology of Education, 60*, 86–103.

Ethington, C. A. (2000). Influences of the normative environment on peer groups on community college students' perceptions of growth and development. *Research in Higher Education, 41*(6), 703–722.

Ewell, P. T. (2002). *An analysis of relationships between NSSE and selected student learning outcomes for seniors attending public institutions in South Dakota*. Boulder, CO: National Center for Higher Education Management Systems.

Giegerich, S. (2006, Winter). Barrier busters: Two-year institutions help students achieve their dreams. *Lumina Foundation Focus*, 4–25.

Glover, J. W., & Murrell, P. H. (1998). Campus environment and student involvement as predictors of outcomes of the community college experience. *Journal of Applied Research in the Community College, 6*, 5–13.

Hansford, B. C., & Hattie, J. A. (1982). The relationship between self and achievement/performance easures. *Review of Educational Research, 52*, 123–142.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indices in covariance structure analysis: Conventional criteria vs. new alternatives. *Structural Equation Modeling, 6*, 1–55.

Hughes, R., & Pace, C. R. (2003). Using NSSE to study student retention and withdrawal. *Assessment Update, 15*(4), 1–2.

Jenkins, D. (2006). *What community college management practices are effective in promoting student success?: A study of high- and low-impact institutions.* New York, Teachers, College, Columbia University, Community College Research Center. Retrieved December 27, 2008, from http://www.achievingthedream.org/_pdfs/_dataandresearch/_publications/CCRC_institutional_effectiveness.pdf

Knight, W. E. (1994). *Influences on the academic, career, and personal gains and satisfaction of community college students*. Paper presented at the annual conference of the Association for Institutional Research, New Orleans, LA. (ERIC Document Reproduction Service No. ED3736440).

Kuh, G. D. (2001). *The national survey of student engagement: Conceptual framework and overview of psychometric properties*. Bloomington, IN: Indiana University, Center for Postsecondary Research and Planning.

Kuh, G. D., Schuh, J. S., Whitt, E. J., & Associates. (1991). *Involving colleges: Successful approaches to fostering student learning and personal development outside of the classroom*. San Francisco: Jossey-Bass.

Laing, J., Swayer, R, & Noble, J. (1989). Accuracy of self-reported activities and accomplishments of college-bound seniors. *Journal of College Student Development, 29*, 362–368.

Lowman, R. L., & Williams, R. E. (1987). Validity of self-ratings of abilities and competencies. *Journal of Vocational Behavior, 31*, 1–13.

MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods, 1*, 130–149.

Marti, C. N. (n.d.). *Dimensions of student engagement in American community colleges: Using the community college student report in research and practice*. Retrieved December 27, 2008, from http://www.ccsse.org/aboutsurvey/psychometrics.pdf

McClenney, K. M., & Marti, C. N. (2006). Exploring relationships between student engagement and student outcomes in community colleges: Report on validation research. Retrieved December 30, 2008, from http://www.ccsse.org/publications/CCSSE%20Working%20Paper %20on%20Validation%20Research %20December%202006.pdf

Pace, C. R. (1979). *Measuring the outcomes of college: Fifty years of findings and recommendations for the future*. San Francisco: Jossey-Bass.

Pace, C. R. (1984). *Measuring the quality of college student experiences: An account of the development and use of the College Student Experiences Questionnaire*. Los Angeles: University of California, Higher Education Research Institute, Graduate School of Education.

Pace, C. R. (1985). *The credibility of student self-reports*. Los Angeles: University of California, Higher Education Research Institute, Graduate School of Education.

Pascarella, E., Bohr, L., Nora, A., & Terenzini, P. (1995). Cognitive effects of 2-year and 4-year colleges: New evidence. *Educational Evaluation and Policy Analysis, 17*, 83–96.

Pascarella, E. T. (1985). College environmental influences on learning and cognitive development: A critical review and synthesis. In J. Smart (Ed.), *Higher education: Handbook of theory and research*, Vol. I (pp. 1–61). New York: Agathon Press.

Pascarella, E. T., & Terenzini, P. T. (1991). *How college affects students: Findings and insights from twenty years of research*. San Francisco: Jossey-Bass.

Pierson, C. T., Wolniak, G. C., Pascarella, E. T., & Flowers, L. A. (2003). Impacts of two-year and four-year college attendance on learning orientations. *The Review of Higher Education, 26*(3), 299–321.

Pike, G. R. (1995). The relationships between self reports of college experiences and achievement test scores. *Research in Higher Education, 36*, 1–22.

Pike, G. R. (1999). The effects of residential learning communities and traditional residential living arrangements on educational gains during the first year of college. *The Journal of College Student Development, 40*, 269–284.

Pike, G. R. (2000). The influence of fraternity or sorority membership on students' college experiences and cognitive development. *Research in Higher Education, 41*, 117–139.

Pike, G. R., & Killian, T. (2001). Reported gains in student learning: Do academic disciplines make a difference? *Research in Higher Education, 42*, 429–454.

Pike, G. R., Kuh, G. D., & Gonyea, R. M. (2003). The relationship between institutional mission and students' involvement and educational outcomes. *Research in Higher Education, 44*(2), 241–261.

Porter, S. R. (2005). What can multilevel models add to institutional research? In M. A. Coughlin (Ed.), *Applications of intermediate/advanced statistics in institutional research* (pp. 110–131). Tallahassee, FL: The Association for Institutional Research.

Sorbom, D. (1974). A general method for studying differences in factor means and factor structure between groups. *British Journal of Mathematical and Statistical Psychology, 27*, 229–239.

Strauss, L. C., & Volkwein, J. F. (2002). Comparing student performance and growth in 2- and 4-year institutions. *Research in Higher Education, 3*(2), 133–161.

Swigart, T. E. (2000). Learning and personal growth in community college students who intend to transfer: The role of student involvement, institutional environment, and advising. *Journal of Applied Research in the Community College, 8*, 43–55.

Swigart, T. E., & Murrell, P. H. (2000). Factors influencing estimates of gains made among African-American and Caucasian community college students. *Community College Journal of Research and Practice, 25*, 297–312.

Wang, Y., Ye, F., Jackson, G., Rodgers, R., & Jones, S. (2005). Development of student service-learning course survey (SSLCS) to measure service-learning course outcomes. *IR Applications, 3*.

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