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

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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, 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 18 institutions to determine that a) a structural and measurement model was able to be developed 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; b) mean self-reported academic and personal-social gains attributed to college attendance were significantly less for students at two-year colleges, and c) the results held true for sub-groups. These results were the same for a sample including only traditional-aged students and students from community college whose stated academic goal was transfer to a four-year institution as well as for a sample of all 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). 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. 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 how institutional experiences affect learning in the two sectors and whether the magnitude of and effects upon learning in the two sectors have conditional effects (e.g., whether they are the same for students in various sub-populations). The purpose of this study is to contribute toward 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 of 20 years of college-student impact studies, reached a conclusion that is eloquently stated by Kuh (2001, 1): "What students do during college counts more in terms of desired outcomes than who they are or even where they go to college." 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, 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. Davis and Murrell (1993) used Pace's (1979) conceptual model and a dataset of College Student Experience Questionnaire (CSEQ) responses from Kuh, Schuh, Whitt, & 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) use existing campus data plus survey results from 827 students at a Midwestern research university to develop a model of the relationships 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 2000

Carnegie classifications; while the magnitudes of gains were significantly different across institutional types, the structural model of gains was stable.

Within the two-year college sector, Knight (1994) used Community College Student Experience Questionnaire (CCSEQ) data from 1,062 students at 7 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 9 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.

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 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, our interest was in using data from similar instruments with a variety of two-year and four institutions to examine magnitude of and effects upon learning in the two sectors. Specifically, our research questions included:

1. Is it 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?
2. Is the research model the same (invariant) between the two- and four-year sectors?
3. Is there a significant difference between the learning gains in the two sectors?, and
4. Are there significant conditional effects upon learning gains in the two 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, 2). The NSSE items relate to practices shown to facilitate engagement or quality of effort (Astin, 1991; Chickering & Reisser, 1993; Kuh, Schuh, Whitt, & Associates, 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 or downstream variables in this study are self-reported student gains. The validity of self-reports has been heavily studied; they are likely to be valid when (1) the information requested is known to the participants; (2) the questions are phrased clearly and unambiguously; (3) the questions refer to recent activities; (4) participants think the questions merit a serious and thoughtful response; and (5) 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, 4).

NSSE and CSSE data were merged into a single data set that contained only items that were phrased in the same way across sectors and years. Factor analysis results (see Tables 1-6) were used to sum items into scales. Learning gains were represented by two

scales: Academic Gains and Personal-Social Gains. Perceptions of the educational environment were represented by three scales: Coursework Environment, Campus Climate, and Relational Environment. Involvement was measured by five scales for traditional-aged students (see below): Student-Faculty, Active Learning, Academic, Diversity, and Effort. Involvement was measured by six scales for the all-student sample: Student-Faculty, Active Learning, Diversity, Classroom, Information Technology, and Integrate. Student background variables were recoded for use in the study; these included gender (female = 1, male = 0), ethnicity (student of color = 1, Caucasian = 0), first generation status (1 = first generation, 0 = not first generation), class rank (1 = freshman, 2 = sophomore, 3 = junior, 4 = senior), and transfer status (1 = transfer student, 0 = not a transfer student). The dichotomous ethnicity coding was due to the relatively small number of students of color. Tables 7 and 8 provide means, standard deviations, and reliabilities for the observed variables.

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. Cases with missing data were removed from the data set. Two samples were used for the study and analyses were carried out separately for each. As a means of promoting similarity in students' background characteristics for the study, the first sample was comprised of 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.

The second sample included all students for whom data were available. A random sample of the four-year students was drawn for the first sample so that the number of students from each sector would be equal in the final sample (n=1,658 total). A random sample of the two-year students was drawn for the second sample so that the number of students from each sector would be equal in the final sample (n=10,092 total). The number of students sampled from each institution and the corresponding dates and methods of survey administration are listed in Table 9.

Data Analysis

While researchers who have analyzed institutional effects in CSEQ (Strauss and 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, corresponding to the four research questions, 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 covariances 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, and Root Mean Square Error of Approximation 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.

The second phase involved determining whether the final model from the first phase was invariant across the two- and four-year institution groups. A variation of the final or baseline 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 were 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 learning 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.

Last, 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, students of color, first generation students, and freshmen.

Results

Traditional Aged Students Including Two-Year Students Intending to Transfer

Development of the Research Model. The initial research model, shown in Figure 1, was found not to fit the data well ($\chi^2 = 1424$, $df = 65$, $\rho < .001$, RMSEA = 0.11, RFI = 0.67, CFI = 0.77, TLI = 0.68,). Development and comparisons of several versions of the research model revealed that removal of the observed variable Coursework Environment; including a structural path from the Perceptions of the Environment construct to the Involvement construct; removal of structural paths from gender to Gains, from ethnicity to Involvement and Gains, from first generation status to Perceptions of the Environment and Involvement, from class rank to Perceptions of the Environment, and from transfer status to Perceptions of the Environment and Gains; allowing covariance between gender and class rank, between first generation status and class rank, and between transfer status and class rank; and allowing correlations between several of the error terms associated with the endogenous observed variables resulted in a final research model (shown in Figure 2 with covariances and correlations removed for clarity) with a highly acceptable fit with the data ($\chi^2 = 153$, $df = 43$, $\rho < .001$, RMSEA = 0.04, RFI = 0.95, TLI = 0.98, CFI = 0.96).

Standardized direct, indirect, and total effects and squared multiple correlations for the final model are shown in Table 10. Being female had a weak positive direct effect on Perceptions of the Environment, a weak positive direct and indirect (through Perceptions of the Environment) effects on Involvement, and a weak positive indirect

effect on Gains. Being a first generation student had a weak positive direct effect on Gains. Class level had a strong positive direct effect on Involvement and moderate positive direct and indirect (through Involvement) effects on Gains. Being a transfer student had a moderate negative direct effect on Involvement and a weak negative indirect effect on Gains. Perceptions of the Environment had a strong positive direct effect on Involvement, and a very strong positive direct effect plus a moderate positive indirect effect (through Involvement) on Gains. Involvement had a moderate positive direct effect on gains. The research model did a very poor job of explaining perceptions of the educational environment (squared multiple correlation of 0.017), a good job of explaining involvement (0.396), and a very good job of explaining gains (0.963).

Invariance Between Groups. While the data fit the models for both groups, they did not fit 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 Table 11, 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. These results were similar whether or not background variables of ethnicity, class level, and first generation status were included.

Differences in Mean Gains. The learning gains construct for two-year college students was found to have a mean of -2.81 and a standard error of 0.22. The resulting critical value of -12.79 indicates that two-year college students had significantly lesser

learning gains than did students at for year institutions (whose mean learning gains were constrained to zero).

Conditional Effects. Table 12 indicates that two-year college students had significantly lower learning gains than did students at four year institutions when separate analyses were carried out for females and males, students of color and Caucasian students, first generation students and non-first generation students, freshmen and upper class students, and transfer and non-transfer students.

All Students

Development of the Research Model. The initial research model, shown in Figure 3, was found not to fit the data well ($\chi^2 = 9200$, $df = 92$, $\rho < .001$, RMSEA = 0.10, RFI = 0.69, CFI = 0.73, TLI = 0.70,). Development and comparisons of several versions of the research model revealed that removal of the observed variable Coursework Environment; 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 ethnicity to Involvement, from first generation status to Perceptions of the Environment, and from transfer status to Gains; allowing covariance between gender and first generation status, class rank, and transfer status, between ethnicity and first generation status, class rank, and transfer, and between transfer status and class rank; and allowing correlations between several of the error terms associated with the endogenous observed variables resulted in a final research model (shown in Figure 4 with covariances and correlations removed for clarity) with an acceptable fit with the data ($\chi^2 = 1630$, $df = 50$, $\rho < .001$, RMSEA = 0.06, RFI = 0.90, TLI = 0.95, CFI = 0.90).

Standardized direct, indirect, and total effects and squared multiple correlations for the final model are shown in Table 13. Being female had a weak positive direct effect on Involvement and a weak positive direct and indirect effect on Gains. Being a student of color had weak a positive direct effect on Perceptions of the Environment, a weak positive indirect effect (through Perceptions of the Educational Environment) on Involvement, and weak positive direct and indirect (through Perceptions of the Environment) effects on Gains. Being a first generation student had a weak negative direct effect on Involvement and a weak positive direct effect and a weak negative indirect effect (through Involvement) on Gains. Class level had a weak negative direct effect on Perceptions of the Environment, a strong positive direct effect and a weak negative indirect effect (through Perceptions of the Environment) on Involvement, and weak positive direct and indirect (through Involvement) effects on Gains. Being a transfer student had a moderate negative direct effect on Involvement, a moderate negative direct and a weak negative indirect (through Perceptions of the Environment and Involvement) effects on Involvement, and a moderate negative indirect effect (through Perceptions of the Environment and Involvement) on Gains. Perceptions of the Environment had a strong positive direct effect on Involvement, and a very strong positive direct effect plus a moderate positive indirect effect (through Involvement) on Gains. Involvement had a moderate positive direct effect on Gains. The research model did a very poor job of explaining perceptions of the educational environment (squared multiple correlation of 0.025), a good job of explaining involvement (0.382), and a very good job of explaining gains (1.000).

Invariance Between Groups. As shown in Table 14, the data fit a model that imposed the constraint of total sector invariance (i.e., that imposed the stricter standard that the pattern of structural paths and factor loadings was exactly the same between the CCSSE and NSSE data sets).

Differences in Mean Gains. The learning gains construct for two-year college students was found to have a mean of -2.23 and a standard error of 0.09. The resulting critical value of -24.92 indicates that two-year college students had significantly lesser learning gains than did students at for year institutions (whose mean learning gains were constrained to zero).

Conditional Effects. Table 15 indicates that two-year college students had significantly lower learning gains than did students at four year institutions when separate analyses were carried out for females and males, students of color and Caucasian students, first generation students and non-first generation students, freshmen and upper class students, and transfer and non-transfer students.

Discussion

The study demonstrated that a research model that accurately represents the relationships between students' self-reported learning gains attributable to college attendance, involvement, perceptions of the educational environment, and background variables could be developed that adequately fits the data from both the NSSE and CCSSE. No adequate research models including data from traditional students could be developed that constrained any parameters to be equal between the two- and four-year sectors, however a research model using data from all students in the sample that constrained all parameters to be equal across sectors did provide adequate fit with the

data. The mean Gains construct was found to be significantly lower for students in the two-year sector for both samples; this finding remained true when separate analyses were carried out for females and males, students of color and Caucasian students, first generation students and non-first generation students, freshmen and upper class students, and transfer and non-transfer students.

The finding of significantly lower learning gains in two-year colleges attributed to college attendance supported that of Strauss and Volkwein (2002), who also used self-reported learning gains attributed to college attendance as the dependent variable, while they disagreed with those of Bohr and Pascarella (1994) and Pascarella, Bohr, Nora, and Terenzini (1995), both of which examined direct measures of learning gains.

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. Finally, the study did not use true longitudinal studies or direct measures of student learning: these are very difficult to obtain across several institutions.

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.

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 less 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).

Although both the NSSE and the CCSSE ask students to indicate whether they are enrolled on a full-time or part-time basis during the semester in which they complete the surveys, this background factor was not included in the analyses because of the frequency with which students change enrollment their status and because of institutional differences in definitions of full-time and part-time. This background factor may have had an important effect on the between-sector results.

One of the assumptions underlying this study is that more and more young students, who are otherwise eligible for admission to four-year institutions, are opting to begin their education at a community college. In Connecticut, for example, during the fall 2006 semester, 44% of all community college credit students were under the age of

22 representing a 63% increase in the number of students under the age of 22 since 1988. Among Connecticut Community College System students under the age of 24, the top two reasons citied for choosing a community college were affordable tuition and the college's location being "close to home." Based on this assumption the authors felt that the younger students attending two and four year institutions were becoming more and more similar in terms of patterns of engagement and perceptions about college.

As it turns out that this is not the case, the authors have offered some possible explanations, but would hypothesize 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. Among Connecticut Community College System students under the age of 24; 75.6% are employed while going to college; 68% are attending college on a full-time basis; 38% begin their community college experience with the goal of transferring; and the parents of 64% of these students have not earned a Bachelors degree. When asked how they intend to pay for college 45% expect to use some form of state and or federal financial aid. Among Bowling Green State University (BGSU) undergraduates under age 24, in contrast, less than 20% are commuters; about 25% are employed; 93% are full-time students; 42% are first-generation-in-college; and 33% receive federal or state financial aid. About 20% of BGSU graduates have transferred from another institution. For the most part community college students, by choice or circumstance, are simply not on campus long enough to take advantage of the myriad of opportunities for engagement outside of the classroom.

Another caveat worthy of consideration is that the NSSE is mailed (in paper or electronically) to random samples of undergraduates, while the CCSSE which is administered in randomly chosen classes. It is not clear how mode of administration effects may have related to the results.

Two suggestions for further research follow from this study. The first is to replicate this study with the full national NSSE and CCSSE datasets. The second 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.

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